I-deas to NX Overview and Update

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Nissan Selects UGS’ NX Software as New Standard for Its Next-generation Computer-Aided-Design (CAD) System to Design and Build New Vehicles

UGS win in multi-year-long contest bolsters company’s momentum in CAD segment of Product Lifecycle Management (PLM) market; selection extends to Nissan affiliates

Selection of UGS to help Nissan achieve sustainable growth, profitability and return on investment through Nissan’s mid-term business plan “Nissan Value-Up”; Nissan and UGS currently working to complete deployment plan

PLANO, Texas and TOKYO – UGS Corp., a leading global provider of product lifecycle management (PLM) software and services, today announced Nissan selected UGS to be the provider of the new global PLM system that Nissan and Nissan affiliates will deploy to design and build its next generation of vehicles.

UGS expects the selection to represent its largest win in 2005. Nissan will use UGS’ NX® CAD software to digitally design its vehicles on a global basis and UGS’ Teamcenter® collaborative Product Development Management (cPDM) software to digitally manage product data and enable digital prototyping for all Nissan vehicles across the world. The company will deploy the software as part of a fully integrated, common R&D infrastructure for use inside Nissan.
NX Drivers

Superset Functionality to Improve Customer Workflows

Traditional I-deas Strengths

Process-based Workflows & Industry Expertise

CAE

Drafting

3D Annotation

Meshing

Reverse Engrg.

Traditional Unigraphics Strengths

Research & Development

Customer Requests

Advanced Functionality

Knowledge Engine

Process Wizards

Lg Assembly Mgt

System Based Engineering

Styling & Rendering

Surfacing

Styling & Rendering
Value to Customer

- Broad unified system, able to support most activities in product development & mfg planning
- Lower support costs than multiple niche systems
- Reduces data translation overhead
- Reduces training costs and improves workforce mobility
Vehicle Development Lifecycle

- Concept Layout and Engineering
- Product Test & Validation
- Manufacturing Engineering
- Manufacturing Production
- Sales & Distribution
- Owner's Experience
- Maintenance & Repair
- Disposal & Recycling
- Requirements & Planning
NX offers a wide range of OotB Occupancy and Mechanical packaging tools

**Value to Customer**
- Tools ready to go out of the box requiring no customisation costs
- Simple and intuitive wizards reduce training costs
- Industry standards and process knowledge stored for repeatability and standardisation

**Technology Enablers**
- NX General Packaging Module
  - Hip Point Design, Vision Zone, Reach Zones …
- NX Human Modelling and Posture Prediction
- Embedded Knowledge;
  - Industry Standards (SAE, EEC…)
  - Empirical Research (University of Michigan)
Value to Customer

- Reusable product layout templates stores knowledge
- Increases innovation by decreasing development time
- Higher Quality through repeatability
- Lower cost through design reuse

Technology Enablers

- Powerful approach to system level conceptual design and engineering
- Conceptual layout is managed by TC Engineering

NX System Level Design enables requirements driven concept layout

3 Cylinder Concept Engine System
Vehicle Development Lifecycle

Product Design Engineering

Manufacturing Engineering

Product Test & Validation

Manufacturing Production

Sales & Distribution

Owner’s Experience

Maintenance & Repair

Disposal & Recycling

Requirements & Planning

Concept Engineering
NX creates and uses a single 3-D representation of the Product definition … stored and managed centrally within Teamcenter

Value to Customer

- Reduced data transfer (which always leads to delays)
- Reduced Data Management (data translation is always a copy operation)
- Reduced support costs – less effort to install, versions…
- Increased concurrency
- Enables production changes without disruption (Master Model)
Value to Customer

- Faster and more design iterations
  - Increase time designing, reduce time working around technology
- C3P I-deas skills preserved
- Ability to work parametrically on non-parametric, imported data (Catia V4)

Technology Enablers (Examples)

- Filletting and draft
- Leading Geometry Engine
- Integrated Modeling Environment; model with solids, surfaces, JT and mesh in a single environment
- Parametrics on demand (DMX)
- Specialized automotive modeling functions
- I-deas features implemented and improved in NX
**Product Design Engineering**
*Integrated Class A*

**Value to Customer**
- Integrated physical and digital models
- Integrated Design Verification
- Easier/Faster Reaction To Change

**Technology Enablers**
- Integrated surfaces and solids with Parasolid
- Mixed Mode Surfacing tools (Pole Editing, Sweeping, By Curves)
- Hybrid Modeling
  - Surfaces, facets, Solids, Wireframe one model
- Parametric Class A functions
  - Styled Blend, Silhouette Flange, Styled Sweep, Styled Corner, …
- Scans (STLs) -> rapid surfacing, fit curves and surfaces to scans

NX offers a complete, integrated and productive Class A Solution
**Product Design Engineering**

**Body Design Assistants**

**Beyond general world class modeling, NX offers OOtB integrated tools**

**NX Body Design** is a collection of assistants tailored to the specialized task of automotive body design

1. Hinge Location  
2. B Pillar  
3. Glass Drop  
4. Egress Curve  
5. Body Side  
6. Sectional Formability  
7. Stone Impingement  
8. …

**Value to Customer**

- Significant savings through OOtB process automation

Typical Modeling Times:

<table>
<thead>
<tr>
<th>Practice</th>
<th>Conventional Method (experienced CAD user)</th>
<th>Process Assistant Method (novice NX user with assistant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinge Location</td>
<td>3-4 days</td>
<td>7 min</td>
</tr>
<tr>
<td>Glass Drop</td>
<td>1 day</td>
<td>12-15 min</td>
</tr>
</tbody>
</table>

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Value to Customer

- Reduce dependency on drawings through the application of product and manufacturing information (PMI)
- Automated Drafting

Technology Enablers (Examples)

- Highly Productive User Interface
- PMI Application
  - ASME Y14.41
  - ISO standard 16792
- Drawing Templates
- PMI is associatively inherited onto a drawing

PMI Authoring in NX

Drawing Templates increase documentation productivity
Product Design and Engineering

Electrical Systems Routing

**Value to Customer**
- Concurrency with rest of vehicle development
- Automatically handles change
- Factors in Manufacturing requirements

**Technology Enablers**
- Fully associative electrical routing capabilities
- Design Optimisation
- Harness dressings
- Associative Electrical Formboard
- Knowledge-driven Routing and Automation
- Design Rule Validation

NX enables associative, integrated mechanical & electrical routing
Value to Customer

- Ability to create, review, modify and validate very large virtual Multi-CAD designs
- Increase time designing, reduce time working around technology

Technology Enablers

- Direct access to and interoperability with JT parts and assemblies enables seamless multi-CAD environment
- Integrated JT representations
- Extensive component filtering capabilities
- Solid and facet based clearance analysis
- Sectioning and measurement tools
- Sequencing
- Direct support of migrated I-deas configurations and assembly constraints
Vehicle Development Lifecycle
Advanced Complex Meshing

Batch meshing improves vehicle timing

Getting to a high quality mesh accounts for over 65% of the time we spend in the analysis cycle -- GM

- List of Input Parts
- Parameters (mesh size, quality)
- Outputs for Nastran Bulk Data, Native pre/post, other solver
- Server or grid computing compatible
- Used in overall simulation process to reduce significant manual interaction for meshing

Block -- 659K Tet 10 Elements 1.6 M nodes; Zero Nastran element quality failures

- Previous time to meshed model ready for solve: ~ 2 wks
- Auto meshed in NX 4 in 2:00 hr
Simulation During Design …

Opel AG

- 80 design engineers trained to use simulation
- Approach used for early evaluation of different variants
  - Dynamic Clearance Analysis
  - Calculation and optimization of joint forces
  - Deflection and stress analysis of simple parts
  - Thermal analysis of exhaust
  - Vibration of simple parts and attachments
- Processes and best practices are easy to automate in NX

“Simulation during design phase saves time (less iteration cycles), improves quality (less mistakes, better security).

"An important side effect of the design time analysis is the fact that the design and the traditional analysis grow closer together and a mutual understanding is fostered,"

OPEL AG, Germany
NX Nastran
Satisfying the most demanding analysts

NX Nastran is available to Customer at no additional cost as a replacement for Model Solution

- Nastran is the world’s leading solver in its class
  - Performance and accuracy are critical to the Nastran community
    - World’s latest hardware; grid computing
    - **UGS leads the competition**
  - Discipline Extensions
    - Nonlinear Analysis
    - Explicit Nonlinear
    - Rotor Dynamics
  - Process improvements
    - Analyst productivity
- Customer led development is being rewarded by continued sales momentum

Engine Model Case History
- 3 M Grids ..... 9 M DOF
- SOL 103 ..... 200 Modes
- 10 Hrs Elapsed
- Used 12 GB RAM

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Vehicle Development Lifecycle

Knowledge Driven Design

Manufacturing Engineering
Product Engineering
Concept Engineering
Requirements & Planning
Product Test & Validation
Launch
Manufacturing Production
Sales & Distribution
Owner's Experience
Maintenance & Repair
Disposal & Recycling
Knowledge Driven Design

*Strategy and Direction*

Sequential

Concurrent Engineering

Next Generation

**Knowledge Driven Design**

Capture Knowledge

Apply Knowledge Propagate Change

before program execution
during program execution

$ Saving

$% Saving

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Capture vehicle development knowledge in re-usable “templates” that provide a jump-start for new programs.
Capture vehicle development knowledge in re-usable “templates” that provide a jump-start for new programs.

Develop the Template

Template Possibilities are known and understood systems:
- Suspension setup
- Chassis layout and nodes
- Body Panel Joints
- Packaging studies
- Door/Body Side Relationship
- Base Engine
- Drive train
- Ancillaries

Use the Template

Why this is of value to Customer?
- Fast use of pre-defined systems

Benefit opportunity:
- More design iterations
- Increased design capacity
- Higher quality through repeatability
- Lower design costs through reuse
Knowledge Driven Design
NX Template Modeling Example

Library of Templates

Body Design
Prior door designs and templates

Tooling and NC
Prior tooling designs and templates

New Vehicle Program

Replay existing door inner design with new styling data as input

Replay existing die design with new door inner as input

Further changes
Vehicle Development Lifecycle

Integrated Design Validation

Manufacturing & Validation

Product Test & Validation

Launch

Manufacturing Production

Sales & Distribution

Owner's Experience

Maintenance & Repair

Disposal & Recycling

Concept Engineering

Requirements & Planning

Product Engineering

Manufacturing Engineering
What is Integrated Design Validation?

Automated Checking of

- Product data quality (from suppliers)
- Company Standards
- Of design against requirements
- …

Why Integrated Design Validation?

- Concurrency means there is less time to check manually
- More design iterations means more checks
Integrated Design Validation

Value to Customer

- Validate supplier data to Customer standards
- Catch errors earlier and reduce change risk
- Link product validation with requirements
- Educate less experienced designers / engineers

Technology Enablers

- Automatically trigger/enforce validations at appropriate times like part save, part release, etc. (Check-Mate, Teamcenter Validation Objects)
- Embed validations to make designs smarter and guide usage (Quick Check)
- Link validations in NX to requirements from external sources (Excel spreadsheets, Teamcenter Requirements, XML, etc.)
- Collect metrics and create reports based on validation results (Quality Dashboard)
Automotive Business Challenges

- Too little manufacturability validation taking place early in the design process
- Designers need manufacturability education

Technology Enablers

- OOTB manufacturability validation tools enable frequent checking and guide designers
  - Wall thickness checker for cast parts
  - Sheet metal DFM advisor
  - Draft analysis for molded/cast parts
  - Many others…
- Easy-to-use tools guide and educate designers
  - High performance and precise results
  - Easy-to-interpret results

“By using NX molded part validation, we reduced the time to analyze wall thicknesses of complicated parts from a range of 3 to 10 days to less than 1 day, while also improving accuracy for identifying potential design issues.”
Ben Yadao, Engineer
International Truck and Engine Corporation
NX Managed Development Environment
NX and Teamcenter are scalable and functionally rich

- Simulation Management
  - Manage CAE data & processes
  - Simulation Process Studio
- Design Collaboration
- Rich Design Configuration Management
  - Visual Change, Revision Rules, Alternates, Options and Variants…
- Design Management
  - Vaulting
  - Check in/out
- User Defined Features
- Part Families
- Requirements
- Knowledge Fusion
- WAVE relationships
- Inter-part relationships
- PMI

- Manufacturing Mgt
  - CAM Manager
  - Process Planning
  - Factory Management
- Multi-CAD Expansion
  - Integrated multi-CAD design environment
  - Cross CAD boundaries in both NX and Teamcenter
- Design Digital Mockup & Validation
  - Design and validate in configuration context, issue mgt
- Spatial information to check for manufacturability and maintainability
  - Compositions, occurrence groups
- Synchronized Product Data
- Simulation
- Tooling
- Machining
- Styling
- Managed Development Environment
Summary

- Robust migration from I-deas to NX native models
  - E.g. model history, sketches, reference geometry, associative drawings, assembly constraints, PMI, …
- Nissan selected NX as their next generation system after proving the technology through exhaustive benchmarking
- NX offers best in class capabilities for the complete vehicle
  - E.g. A-class creation / visualization, Body CAD creation, Powertrain, Electrical harness design, Knowledge Based Engineering, Simulation

Moving to NX is Low Risk, Low Cost, High Value