NX Digital Simulation: Product capabilities

	NX 7.5 Motion Simulation	NX 7.5 Design Simulation	NX 7.5 Advanced FEM
Geometry modeling			
Geometry modeling	#	#	•
Parasolid® geometry kernal	#	#	•
Parametric solid and surface modeling	#	#	•
Feature modeling	#	#	•
Synchronous technology	#	#	•
CAD assembly modeling	#	#	•
Assembly structure creation	#	#	•
Interpart relationship	#	#	•
Configurations	#	#	•
CAD interfaces	#	#	•
Neutral geometry transfer IGES, STEP, JT™, Parasolid	#	#	•
Direct geometry transfer Catia V4, Catia V5, Pro/E	A	A	A
CAE process and data management			
Teamcenter® integration	•	•	•
Openness			
CAD parameter access	•	•	•
Recordable session file	•	•	•
Programming/debugging session files	•	•	•
Full functionality access via API	•	•	•
Integrated BASIC prog. env. w/debugging	•	•	•
HTML	•	•	•
Knowledge Fusion	•	•	•
WAVE	•	#	•
User interface			
User-defined templates	•	•	•
Customizable menus, toolbars and user commands	•	•	•
Smart selection			•
Support external plug-in apps in UI	•	•	•
Interactive (no-click) query of model/results	•	•	•
Model tree with context-sensitive access to functionality	•	•	•
Command finder	•	•	•

	NX 7.5 Motion Simulation
Motion	
Association to part and assembly geometry	#
Basic motion in assembly task	#
Convert assembly constraints to joints	•
Mechanical and primitive joints	•
Joint couplers (gears, rack and pinion etc.)	•
Kinematic constraints	•
Motion drivers	•
Applied forces	•
Joint friction	•
Initial conditions	•
Spring/damper and bushings	•
2D and 3D body contact	•
General function operators	•
Driver control through articulation and spreadsheet	•
Static equilibrium	•
XY graph plotting	•
Design packaging tools	•
Capture assembly arrangements during animation	•
Kinematic and dynamic solutions	•
Multiple load case support	•
Integrated postprocessor	•
Load transfer to NX™ Advanced FEM	•
Motion controls – co-simulation with Simulink or Matlab	•
Flexible bodies dynamic solution	A**
Mutiple output formats (JT, VRML, animation movies, etc.)	•
Import Tecnomatix® Process Simulate Kinematics model	•

Legend
- • *Standard product capability*
- # *Part of CAD prerequisite for this package*
- P *Available from a Siemens PLM Software partner*
- A *Available add-on capability from Siemens PLM Software*
- A* *Available add-on to NX Advanced FEM. Included in NX Advanced Simulation*
- A** *Available add-on to NX Motion Simulation. Also requires NX Advanced Simulation with NX Nastran®*

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NX Digital Simulation: Product capabilities

FE model building	NX 7.5 Design Simulation	NX 7.5 Advanced FEM
Geometry defeature tools – topology diagnosis, geometry repair, CAD feature suppression, stitch surface, remove hole/fillet, partition (non-manifold topology generation)	•	•
Non-manifold topology generation for volumes		•
CAE topology		•
CAE geometry – creation and deletion, mid-surfacing (constant and variable thicknesses)		•
Automatic topology abstraction – abstraction control, auto stitch geometry, auto merge small regions, auto pinch	•	•
Manual topology modification tools		•
Meshing	•	•
0D, 1D and 2D elements		•
2D mapped meshing		•
3D elements	•	•
Automatic meshing asst. – geometric abstraction and mesh generation in one tool/step	•	•
Batch meshing		•
Transition meshing		•
Manual meshing tools – sweeping, revolve, surface coating, interactive controls, etc.		•
Automatic meshing controls – local element sizing, curvature control		•
General modeling tools	•	•
Axisymmetric meshing		•
Mesh display and control – display filters	•	•
Material property creation and management – isotropic, anisotropic, orthotropic, linear, nonlinear, thermal, etc.	•	•
Mass property calculations		•
Load summation		•
Physical property creation and management	•	•
Variable element thickness		•
Mesh quality checks – coincident nodes, free edge checks, element shape checks, etc.	•	•
FE grouping – by association to geometry, bc's, material, nodes, elements, etc.)		•
FE collectors		•
FE append		•
FEM on assembly	•	•
FE model on CAD assembly	•	•
Beam modeling		•
Model update from CAD	•	•
FEM model update based on geometry change	•	•
FEM model update based on assembly change	•	•

FE model building	NX 7.5 Design Simulation	NX 7.5 Advanced FEM
Boundary conditions	•	•
Application methods	•	•
On geometry	•	•
Local coordinate system	•	•
On FE entities		•
Frictions		•
Time variation		•
Constraints – statics, dynamics, thermal, symmetric, contact, etc.	•	•
Structural loads	•	•
Structural thermal – flux, radiation, generation	•	•
Advanced thermal – convection, temperature – linear and nonlinear, simple radiation, thermal coupling, adv. radiation		•
Flow – bc's, flow surface/blockage/screen definition, fluid domain definition		•
Axisymmetric boundary conditions	•	
Automatic contact detection and setup	•	•
Automated load transfer		•
Laminate composites		A
Solution setup		
Structural linear		
Static, buckling	•	•
Structural linear dynamics		
Normal modes	•	•
Direct frequency response		•
Direct transient response		•
Modal frequency response		•
Modal transient response		•
Structural nonlinear		
Static, transient, geometric, elastic/plastic material	•	•
Implicit solver		•
Explicit solver		•
Structural contact and connection modeling		
Surface-to-surface contact	•	•
Node-to-node contact		•
Rigid elements		•
Constraint elements		•
Glue connection	•	•
Thermal		
Steady-state	•	•
Diurnal solar heating		A
Rigid-body transient motion		A
Transient		A
Conduction		A
Convection		A
Radiation		A

	NX 7.5 Design Simulation	NX 7.5 Advanced FEM
Solution setup		
Fluid dynamics		
Steady-state/transient flow		A
Incompressible flow		A
Compressible flow		A
Laminar/turbulent flow		A
Internal/external flow		A
Motion-induced flow		A
Multiple rotational frames of reference		A
Forced and natural convection		A
Conjugate and radiation heat transfer		A
Coupled physics		
Thermal-structural	•	A
Fluid-thermal		A
Motion-structural		A
External solver support		
FE data export	•	•
Abaqus (inp)		A
Ansys		A
Nastran	•	A*
LS-Dyna		A
FE data import	•	•
Abaqus (fil, inp)		A
Ansys (rst)		A
Nastran (op2, dat)	•	A*
LS-Dyna		A
NX I-deas® (unv, afu, bun)	A	•

	NX 7.5 Design Simulation	NX 7.5 Advanced FEM
FE results visualization		
Contour displays (continuous or isolines)	•	•
Beam cross-section contour displays		•
Vector displays	•	•
Isosurface displays	•	•
Cutting planes	•	•
Advanced lighting control	•	•
Animations	•	•
Complex dynamic response results		•
Multiple viewports	•	•
Probing of results on nodes	•	•
Postprocessing data table w/sort/criteria	•	•
Results listings	•	•
Transparency display	•	•
Local coordinate system	•	•
XY graphing		•
Synchronized contour and XY plotting displays		•
Annotated graphs		•
Output (JT, VMRL, postscript, tif, etc.)	•	•
Meta solutions		
Durability	•	•
FE parameter optimization	•	•
FE model correlation		A
Dynamic forced response simulation		A
Laminate composites analysis		A

	NX Nastran	NX Multi-physics (NX Flow/ NX Thermal)
Solutions		
Structural linear		
Static	•	
Modal	•	
Buckling	•	
Structural nonlinear		
Static	•	
Transient	•	
Geometric	•	
Elastic/plastic material	•	
Hyperelastic material	•	
Gasket material	•	
Nonlinear buckling	•	
Implicit solver	•	
Explicit solver	•	
Structural contact and connection modeling		
Surface-to-surface contact	•	
Node-to-node contact	•	
Spot welds	•	
Rigid elements	•	
Constraint elements	•	
Glue connection	•	
Structural linear dynamics		
Modal transient	•	
Modal frequency	•	
Direct transient	•	
Direct frequency	•	
Shock spectrum	•	
Random vibration	•	
Rotor dynamics	•	
Thermal		
Steady-state, transient	•	•
Temperature-dependent properties	•	•
Nonlinear thermal contact		•
Thermal couplings (welded, bolted, bonded)		•
Disjoint meshes support in assembly modeling		•
Surface-to-surface radiative heat transfer	•	•
Hemicube-based view factor calculation		•
Radiation in participating media		•
Radiation enclosures		•
Environmental radiative heating		•
Orbital modeling and analysis		•
Specular, transmissive surfaces	•	•
Convection	•	•
Forced and natural convection correlations		•
Hydraulic fluid networks		•
Joule heating		•
Phase change		•
Heater and thermostat modeling	•	•
Material charring and ablation		•
Transient rigid body motion		•
Peltier cooler modeling		•
Heat sink models and modeler		•
Electronic thermal components library		•
PCB modeler/xchange (ECAD/MCAD)		A

	NX Nastran	NX Multi-physics (NX Flow/ NX Thermal)
Solutions		
Fluid dynamics		
Steady-state/transient flow		•
Incompressible flow		•
Compressible flow		•
Laminar/turbulent flow		•
Forced and natural convection		•
Conjugate and radiation heat transfer		•
Porous media modeling		•
Nonlinear fluid properties		•
Humidity and condensation		•
Automatic fluid domain and boundary layer meshing		•
Motion-induced flow		•
Automated connection of disjoint fluid meshes		•
Fan models		•
Embedded 2D/3D flow blockages		•
General scalars and particle tracking		•
Non-Newtonian fluids		•
Multiple rotating frames-of-reference		•
Two-phase flow		•
Coupled physics		
Acoustics	•	
Acoustics-structural	•	
Subsonic aeroelastic	•	
Supersonic aeroelastic	•	
Fluid-thermal		•
Thermal-structural	•	•
Fluid-structural		•
Interface to multi-body dynamics (ADAMS and RecurDyn)	•	
Solvers		
Iterative	•	•
Sparse direct	•	
Shared memory processing	•	
Distributed memory processing	•(1)	•
Optimization	•	•
Cyclic symmetry	•	•
Axisymmetric	•	•
FE-based finite volume solver	•	
Advanced capability		
Superelement/substructuring	•	•
Solution customization (DMAP)	•	
Solution customization (user subroutine)	•	

(1) Available in Enterprise versions only.

Note: The NX Nastran and NX Multi-Physics solver suites are comprised of multiple products. Please check the individual product fact sheets to determine the simulation capabilities contained in each core bundle or add-on module.

	Basic bundle	Advanced bundle*	Available separately
NX Nastran analysis feature packaging			
Basic analysis capabilities			
Linear static analysis	•		
Normal modes analysis	•		
Buckling analysis	•		
Heat transfer analysis (steady-state and transient)	•		
Basic implicit nonlinear analysis	•		
Spot weld analysis	•		
Advanced analysis capabilities*			
Distributed memory parallel capability (DMP)**		•	•
Dynamic response analysis module		•	•
Advanced nonlinear analysis module			•
Superelements analysis module		•	•
Direct matrix abstraction programming (DMAP)		•	•
Design optimization module			•
Aeroelasticity analysis module		•	•
Rotor dynamics			•

Characteristics of NX Nastran Desktop
- Solution initialized from CAE preprocessing environment (Femap, I-deas or NX) on the same system
- All solution definitions are performed in the preprocessing tool (either the preprocessor or as part of the Bulk Data Deck creation)
- Solver execution is restricted to use with the same cpu as the FE preprocessing solution

Characteristics of NX Nastran Enterprise
- Solves any valid Nastran deck from any source (Femap, I-deas, NX, MSC Patran, Altair HyperMesh and others)
- Full access to bulk deck during creation (in Siemens pre/post tools) and after through any text editor
- Solver platform not restricted to preprocessing system – separate machines, OS, etc. all okay

Characteristics of NX Advanced Simulation
- NX Advanced Simulation is a bundle that includes NX Advanced FEM and NX Nastran Desktop-Basic

Software architecture features
- Native 64-bit support for both NX and NX Nastran
- Problem size in NX and NX Nastran is limited only by amount of memory available and hardware platform/OS
- Platforms supported – Windows (32 & 64-bit), Linux 64-bit
- Platforms supported for NX Nastran – Windows (32 & 64-bit), Linux 64-bit, Unix

* *The Basic bundle is a prerequisite for all add-on modules and the Advanced bundle. The Advanced bundle is not available with Femap™ software.*

***DMP is not available in the NX Nastran Desktop version. DMP capabilities provided in the NX Nastran Enterprise version can be run on up to 64 simultaneous CPUs with no additional license costs.*