

# NX Digital Simulation: Product capabilities

Siemens PLM Software

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	NX 5 Motion Simulation	NX 5 Design Simulation	NX 5 Advanced FEM (Mach 2)		NX 5 Motion Simulation	NX 5 Design Simulation	NX 5 Advanced FEM (Mach 2)	
<b>Geometry modeling</b>					<b>Motion</b>			
<b>Geometry modeling</b>	#	#	•	Association to part and assembly geometry	#	#	•	
Parasolid® geometry kernel	#	#	•	Basic motion in assembly task	#	#	•	
Parametric solid and surface modeling	#	#	•	Convert assembly constraints to joints	•			
Feature modeling	#	#	•	Mechanical and primitive joints	•			
<b>CAD assembly modeling</b>	#	#	•	Joint couplers	•			
Assembly structure creation	#	#	•	(gears, rack and pinion etc.)	•			
Interpart relationship	#	#	•	Kinematic constraints	•			
Configurations	#	#	•	Motion drivers	•			
<b>CAD interfaces</b>	#	#	•	Applied forces	•			
Neutral geometry transfer				Joint Friction	•			
IGES, STEP, JT, Parasolid	#	#	•	Initial conditions	•			
Direct geometry transfer				Spring/damper and bushings	•			
Catia V4, Catia V5, Pro/E	P	P	P	2D and 3D body contact	•			
<b>CAE process and data management</b>				General function operators	•			
Teamcenter® integration	•	•	•	Driver control through articulation and spreadsheet	•			
<b>Openness</b>				Static equilibrium	•			
CAD parameter access	•	•	•	XY graph plotting	•			
Recordable session file	•	•	•	Design packaging tools	•			
Programming/debugging session files	•	•	•	Kinematic and dynamic solutions	•			
Full functionality access via API	•	•	•	Multiple load case support	•			
Integrated BASIC prog. env. w/debugging	•	•	•	Integrated postprocessor	•			
HTML	•	•	•	Load transfer to FEA	•		•	
Knowledge Fusion	•	•	•	Multiple output formats (JT, VRML, animation movies, etc.)	•			
WAVE	•	#	•					
<b>User interface</b>								
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	•	•	•					

**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

**NX 5  
Design  
Simulation**  
**NX 5  
Advanced  
FEM (Mach 2)**

**NX 5  
Design  
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FE model building	
<b>Geometry defeature tools</b> – topology diagnosis, geometry repair, CAD feature suppression, stitch surface, remove hole/fillet, partition	•
Non-manifold topology generation for volumes	•
<b>CAE topology</b>	•
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	•
<b>Meshing</b>	•
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	•
<b>General modeling tools</b>	•
Axi-symmetric 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	•
Mesh quality checks – coincident nodes, free edge checks, element shape checks, etc.	•
FE grouping – by association to geometry, bc's, material, etc.)	•
FE collectors and sets	•
FE append	•
<b>FEM on assembly</b>	•
FE model on CAD assembly	•
<b>Beam modeling</b>	•
<b>Model update from CAD</b>	•
FEM model update based on geometry change	•
FEM model update based on assembly change	•

FE model building	
<b>Boundary conditions</b>	•
Application methods	•
On geometry	•
Local coordinate system	•
On FE entities	•
Friction definition	•
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	•
Axi-symmetric boundary conditions	•
Automatic contact detection and setup	•
Automated load transfer	•
<b>Laminate composites</b>	A
Solution setup	
<b>Structural linear</b>	•
Static and buckling analysis	•
<b>Structural linear dynamics</b>	•
Normal modes	•
Direct frequency response	•
Direct transient response	•
Modal frequency response	•
Modal transient response	•
<b>Structural nonlinear</b>	•
Static, transient, geometric, elastic/plastic material	•
Implicit solver	•
Explicit solver	•
<b>Structural contact and connection modeling</b>	•
Surface-to-surface contact	•
Node-to-node contact	•
Rigid elements	•
Constraint elements	•
Glue connection	•
<b>Thermal</b>	•
Steady-state	•
Diurnal solar heating	A
Rigid-body transient motion	A
Transient	A
Conduction	A
Convection	A
Radiation	A

	NX 5 Design Simulation	NX 5 Advanced FEM (Mach 2)		NX 5 Design Simulation	NX 5 Advanced FEM (Mach 2)
<b>Solution setup</b>			<b>FE results visualization</b>		
<b>Fluid dynamics</b>					
Steady-state/transient flow		A	Contour displays (continuous or iso-lines)	•	•
Incompressible flow		A	Vector displays	•	•
Compressible flow		A	Isosurface displays	•	•
Laminar/turbulent flow		A	Cutting planes	•	•
Internal/external flow		A	Advanced lighting control	•	•
Motion-induced flow		A	Animations	•	•
Multiple rotational frames of reference		A	Complex dynamic response results		•
Forced and natural convection		A	Multiple viewports	•	•
Conjugate and radiation heat transfer		A	Probing of results on nodes	•	•
			Postprocessing data table w/sort/criteria	•	•
<b>Coupled physics</b>			Results listings	•	•
Thermal-structural	•	A	Transparency display	•	•
Fluid-thermal		A	Local coordinate system	•	•
<b>FE data export</b>	•	•	XY graphing		•
Abaqus (inp)		A	Synchronized contour and XY plotting displays		•
Ansys		A	Annotated graphs		•
Nastran	•	A*	Output (JT, VMRL, postscript, tif, etc.)	•	•
<b>FE data import</b>	•	•	<b>Meta solution</b>		
Abaqus (fil, inp)		A	Durability	•	•
Ansys (rst)		A	FE parameter optimization	•	•
Nastran (op2, dat)	•	A*	Dynamic forced response simulation		A
NX I-deas® (unv, afu, bun)		•	Laminated composites analysis		A



	Basic bundle	Advanced bundle*	Available separately
<b>NX Nastran analysis feature packaging</b>			
<b>Basic analysis capabilities</b>			
Linear static analysis	•		
Normal modes analysis	•		
Buckling analysis	•		
Heat transfer analysis (steady-state and transient)	•		
Basic implicit nonlinear analysis	•		
Spot weld analysis	•		
<b>Advanced analysis capabilities*</b>			
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		•	•

\* 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 an unlimited number of CPUs with no additional license costs. Practical limits are currently about 64 simultaneous CPUs.

**Characteristics of NX Nastran Desktop**

- Solution initialized from the company's CAE preprocessing environment (Femap, NX I-deas or NX software) on the same cpu
- All solution definitions are performed in the preprocessing tool (either by the preprocessor or as part of the bulk data deck creation)
- Solver execution is restricted to use with the same cpu as the FE pre-processing 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 data deck creation (in all the company's pre/post tools) and through any text editor
- Solver platform not restricted to preprocessing cpu – separate machines, OS, etc. all OK

**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, Linux and Unix (majority)

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