NX for Simulation: Product capabilities in NX 8

NX 8.0 for Simulation capability chart																			
									NX CAI	E								NX Nast	ran 8.0
					Add	l-on pro	ducts to	NX Adv	/anced l	FEM or A	Advance	d Simul	ation						
• Included in module # Part of prerequisite for this package + Additional product required	NX Advanced FEM	NX Advanced Simulation	NX Topology Optimization	NX Thermal	NX Advanced Thermal	NX Flow	NX Advanced Flow	NX Electronic Systems Cooling	NX Space Systems Thermal	NX Laminate Composites	NX Response Simulation	NX Durability Wizard	NX Advanced Durability	NX FE Model Correlation	NX FE Model Updating	NX Design Simulation	NX Motion Simulation	NX Nastran Basic	NX Nastran Advanced
Preprocessing																			
Geometry import																			
Neutral geometry transfer (IGES, STEP, JT™, Parasolid)	•	•	#	#	#	#	#	#	#	#	#	#	#			#	#		
Direct geometry transfer (CATIA V4, CATIA V5, Pro/E)	+	+	+	+	+	+	+	+	+	+	+	+	+			+	+		
Geometry modeling																			
Parasolid® geometry kernel	•	•	#	#	#	#	#	#	#	#	#	#	#			#	#		
Parametric solid and surface modeling	•	•	#	#	#	#	#	#	#	#	#	#	#			#	#		
Direct modeling with synchronous technology	•	•	#	#	#	#	#	#	#	#	#	#	#			#	#		
Feature modeling	•	•	#	#	#	#	#	#	#	#	#	#	#			#	#		
Assembly structure creation	•	•	#	#	#	#	#	#	#	#	#	#	#			#	#		
Interpart relationship	•	•	#	#	#	#	#	#	#	#	#	#	#			#	#		
Configurations	•	•	#	#	#	#	#	#	#	#	#	#	#			#	#		





NX 8.0 for Simulation capability chart																			
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					Add	l-on pro	ducts to	NX Adv	/anced l	FEM or A	Advance	d Simu	lation						
Legend					_			10					ţ		D	_	_		_
Included in module	5				Thermal		>	tems	v			ard	Durability		Model Updating	NX Design Simulation	Simulation		Advanced
# Part of prerequisite for this package	d FEM	-			d The		NX Advanced Flow	c Syster	Systems			NX Durability Wizard	l Dui		pdn	mula	imul	NX Nastran Basic	Adva
+ Additional product required	NX Advanced	Advanced iulation	logy ation	mal	NX Advanced		nced	NX Electronic Cooling	a)	nate ites	NX Response Simulation	bility	NX Advanced	NX FE Model Correlation	odel	gn Si	on Si	ran E	
	Adva	NX Adva	Topo imiza	Thermal	Adva	NX Flow	Adva	NX Elect Cooling	NX Space Thermal	Lami	NX Respon Simulation	Dura	Adva	NX FE Mode	Æ	Desi	NX Motion	Nast	NX Nastran
	×	NX. Sim	NX Topology Optimization	ž	ž	ž	ž	N S S S	NX The	NX Laminate Composites	Sim	ž	×	Cor	×	ž	×	ž	ž
Preprocessing (continued)																			
Geometry editing prior to meshing																			
Direct editing with synchronous technology	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Defeature tools (geometry repair, feature suppression, stitch surface, remove hole/fillet, partitioning)	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Nonmanifold topology generation for volumes	•	•	#	#	#	#	#	#	#	#	#	#	#						
Mid-surfacing (constant and variable thickness)	•	•	#	#	#	#	#	#	#	#	#	#	#						
Automatic topology abstraction	•	•	#	#	#	#	#	#	#	#	#	#	#						
Manual topology modification tools	•	•	#	#	#	#	#	#	#	#	#	#	#						
Create surface from mesh face	•	•	#	#	#	#	#	#	#	#	#	#	#						
Meshing and modeling			#	#	#	#	#	#	#	#	#	#	#						
Beam modeling	•	•	#	#	#	#	#	#	#	#	#	#	#						
Automated bolt connection meshing	•	•	#	#	#	#	#	#	#	#	#	#	#						
Automated shell meshing	•	•	#	#	#	#	#	#	#	#	#	#	#						
2D mapped meshing	•	•	#	#	#	#	#	#	#	#	#	#	#						
Automated tetrahedral meshing	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Swept hexahedral meshing	•	•	#	#	#	#	#	#	#	#	#	#	#						
Surface coating	•	•	#	#	#	#	#	#	#	#	#	#	#						
Transition meshing	•	•	#	#	#	#	#	#	#	#	#	#	#						
Axi-symmetric meshing	•	•	#	#	#	#	#	#	#	#	#	#	#						
Batch meshing	•	•	#	#	#	#	#	#	#	#	#	#	#						
Mesh quality checks	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Material property creation and management	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Mass property calculations	•	•	#	#	#	#	#	#	#	#	#	#	#						
Physical property creation and management	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Variable element thickness	•	•	#	#	#	#	#	#	#	#	#	#	#						
Grouping	•	•	#	#	#	#	#	#	#	#	#	#	#						
FE assembly management	•	•	#	#	#	#	#	#	#	#	#	#	#						

NX 8.0 for Simulation capability chart																			
									NX CA	E								NX Nast	tran 8.0
Legend					Add	l-on pro	ducts to	NX Ad	vanced	FEM or A	Advance	ed Simu							
 Included in module # Part of prerequisite for this package + Additional product required 	NX Advanced FEM	NX Advanced Simulation	NX Topology Optimization	NX Thermal	NX Advanced Thermal	NX Flow	NX Advanced Flow	NX Electronic Systems Cooling	NX Space Systems Thermal	NX Laminate Composites	NX Response Simulation	NX Durability Wizard	NX Advanced Durability	NX FE Model Correlation	NX FE Model Updating	NX Design Simulation	NX Motion Simulation	NX Nastran Basic	NX Nastran Advanced
Preprocessing (continued)																			
Boundary conditions																			
Apply on geometry	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Apply to local coordinate system	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Apply on FE entities	•	•	#	#	#	#	#	#	#	#	#	#	#						
Apply on groups	•	•	#	#	#	#	#	#	#	#	#	#	#						
Axi-symmetric boundary conditions	•	•	#	#	#	#	#	#	#	#	#	#	#						
Automatic contact detection and setup	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Automated load transfer from motion analysis	•	•	#	#	#	#	#	#	#	#	#	#	#						
External solver data deck support (import and export)																			
Abaqus	+	+																	
ANSYS	+	+																	
LS-Dyna	+	+																	
MSC Nastran	+	•														•			
NX™ Nastran®	+	•														•			
NX I-deas™ (import only)	+	•																	
Analysis model-to-design associativity																			
Automatic analysis model update based on geometry change	•	•	#	#	#	#	#	#	#	#	#	#	#	#	#	•	•		
Postprocessing																			
Contour displays	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Beam cross-section contour displays	•	•	#	#	#	#	#	#	#	#	#	#	#						
Vector displays	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Isosurface displays	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Cutting planes	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Advanced lighting control	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Animations	•	•	#	#	#	#	#	#	#	#	#	#	#			•			
Complex dynamic response results	•	•	#	#	#	#	#	#	#	#	#	#	#						
Multiple viewports	•	•	#	#	#	#	#	#	#	#	#	#	#			•			

NX 8.0 for Simulation capability chart																			
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Legend					Ado	l-on pro	ducts to	o NX Adv	/anced l	FEM or A	Advance	d Simul							
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Postprocessing (continued)																			
Geometry editing prior to meshing																			
Probing of results on nodes Postprocessing data table with sort/criteria Results listings Transparency display Local coordinate system XY graphing Bar graphing Synchronized contour and XY plotting displays Annotated graphs Output (JT, postscript, tif, etc.) External solver result file support Abaqus ANSYS LS-Dyna MSC Nastran NX Nastran Structural analysis	· · · · · · · · · · · · · · · · · · ·	• • • • • • • • • • • • •	# # # # # #	# # # # # #	# # # # # #	# # # # #	# # # # # #	# # # # # #	# # # # # #	# # # # # #	# # # # # #	# # # # # #	# # # # # #					•	
Structural linear Static Normal modes Buckling Structural linear dynamics Modal transient Modal frequency Direct transient Direct frequency		•														•		• • + + +	

NX 8.0 for Simulation capability chart																			
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					Add	d-on pro	ducts to	NX Adv	vanced I	FEM or A	Advance	d Simul	lation						
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Structural analysis (continued)																			
Structural linear dynamics (continued)																			
Shock spectrum											•							+	•
Random vibration																		+	•
Rotor dynamics																		+	•
Structural nonlinear																			
Basic implicit nonlinear analysis		•																•	•
Transient																		+	+
Geometric																		+	+
Elastic/plastic material																		+	+
Hyperelastic material																		+	+
Gasket material																		+	+
Nonlinear buckling																		+	+
Implicit solver																		+	+
Explicit solver																		+	+
Structural contact and connections																			
Surface-to-surface contact																		+	•
Node-to-node contact																		+	•
Spot welds		•																•	•
Rigid elements		•																•	•
Constraint elements		•																•	•
Glue connection		•																•	•
Advanced structural analysis capabilties																			
Dynamic response analysis											•							+	•
Superelements analysis module																		+	•
Direct matrix abstraction programming (DMAP)																		+	•
Design optimization module																		+	+
Aeroelasticity analysis module																		+	•

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Legend					Add	l-on pro	ducts to	NX Adv	/anced I	FEM or A	Advance	d Simul	ation						
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Structural analysis (continued)																			
Parallel processing																			
Shared memory parallel (SMP) Distributed memory parallel (DMP)		•																+	•
Optimization																			
Topology optimization		+	•															+	+
Size and shape optimization		•																+	+
Laminate composites																			
Zone-based modeling		•								•								•	•
Ply-based modeling		•								•								•	•
Import ply orientations from FiberSIM										•									
3D layup extrusion										•									
Draping										•									
Ply materials		•								•								•	•
Laminate validation										•									
Optimization		•								•								•	•
Solver support for composites on Nastran, Abaqus, ANSYS, LS-Dyna										•									
View shell stress resultants, ply stresses, ply strains, ply failure indices (ply and bond) and ply strength ratios (ply and bond)		•								•								•	•
Enveloping, filtering and sorting tools										•									
Durability																			
Static events												•	•						
Transient events													•						
Strain gage durability													•						
Stress life												•	•						
Strain life												•	•						
Smith-Watson-Topper												•	•						
Weld life													•						

NX 8.0 for Simulation capability chart																			
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Structural analysis (continued)																			
Durability (continued)																			
Plate thickness correction for stress life and weld life													•						
Uni-axial stress/strain												•	•						
Bi-axial stress/strain													•						
Mean stress effects													•						
Notch effects													•						
Cyclic stress-strain relations													•						
Rainflow cycle counting													•						
NX Nastran results support												•	•						
MSC Nastran, Abaqus, ANSYS results support												•	•						
Durability reports												•	•						
Plots for fatigue life, damage and safety factors												•	•						
NX Response Simulation transient event durability													•						
Durability computation for NX flexible body motion solutions with Recurdyne or ADAMS													•						
Dang Van fatigue safety factor													•						
Damage computation for user-specified stress/strain histories													•						
Fatigue stress/strain history output (in NX 8.0.1)													•						
Quasi-static result path excitations (in NX 8.0.1)													•						
Thermal analysis																			•
Analysis types																			
Steady-state		•		•	•			•	•									•	•
Transient		•		•	•			•	•									•	•
Conduction																			
Phase change		•		•	•			•	•									•	
Anisotropic thermal conductivity		•		•				•	•									•	

NX 8.0 for Simulation capability chart									NX CA	-								NV No.	tran 8.0
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 Legend Included in module # Part of prerequisite for this package + Additional product required 	NX Advanced FEM	NX Advanced Simulation	NX Topology Optimization	NX Thermal	NX Advanced Thermal B	-on pro No⊞ XN	NX Advanced Flow	NX Electronic Systems XX Cooling	NX Space Systems on Thermal	NX Laminate W Composites o	NX Response Simulation	NX Durability Wizard	NX Advanced Durability oi	NX FE Model Correlation	NX FE Model Updating	NX Design Simulation	NX Motion Simulation	NX Nastran Basic	NX Nastran Advanced
Thermal analysis (continued)																			
Convection																			
Free convection		•		•	•			•	•									•	•
Forced convection		•		•	•			•	•									•	
Radiation																			
Surface-to-surface radiative heat transfer		•		•	•			•	•									•	•
Radiation matrix control		•		•	•			•	•									•	•
Multiple radiation enclosures		•		•	•			•	•									•	•
Diffuse view factor calculations with shadowing		•		•	•			•	•									•	•
Net view factor calculations		•		•	•			•	•									•	•
Hemicube-based view (form) factors calculation using graphics card hardware				•	•			•	•										
Radiation patch generation to condense large element-based radiation models				•	•			•	•										
Deterministic and Monte Carlo ray tracing					•				•										
Nongray multiband radiative heat transfer					•				•										
Solar heating with atmospheric and albedo flux models					•				•										
Radiative source definition					•				•										
Parallelized radiation solver					•				•										
Thermal modeling																			
Temperature-dependent properties		•		•	•			•	•									•	•
Heater and thermostat modeling		•		•	•			•	•									•	•
Temperature boundary conditions		•		•	•			•	•									•	•
Specular, transmissive surfaces		•		•	•			•	•									•	•
Nonlinear thermal contact				•	•			•	•									+	+
Thermal couplings				•	•			•	•										
Disjoint meshes support in assembly modeling				•	•			•	•										
Joule heating					•			•	•										

NX 8.0 for Simulation capability chart																			
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# Part of prerequisite for this package	d FE	70			d The		d Flo	c Sys	stem	4.	4)	y Wiz	d Dui		pdn	mul	imul	3asic	Adva
+ Additional product required	ance	ance	logy ation	mal	nce		ance	troni	e Sy:	inate ites	onse	bility	ance	lodel ion	lodel	gn Si	on S	ran E	ran /
	NX Advanced FEM	NX Advanced Simulation	NX Topology Optimization	NX Thermal	NX Advanced Thermal	NX Flow	NX Advanced Flow	NX Electronic Systems Cooling	NX Space Systems Thermal	NX Laminate Composites	NX Response Simulation	NX Durability Wizard	NX Advanced Durability	NX FE Model Correlation	NX FE Model Updating	NX Design Simulation	NX Motion Simulation	NX Nastran Basic	NX Nastran Advanced
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Thermal analysis (continued)																			
Thermal modeling (continued)																			
Constant, time and spatially-varying heat loads and temperature constraints								•										+	+
Material charring and ablation					•				•										
Peltier cooler modeling					•			•	•										
1D hydraulic network modeling					•				•										
Advanced thermal couplings					•				•										
Advanced optical properties					•				•										
Environmental solar heating models																			
Articulation and motion modeling					•				•							-			
Orbital modeling and analysis									•										
Multi-layer shells specific formulation for MLI and TPS applications									•										
Direct interfaces to other radiation and thermal analysis tools for space systems (SINDA, ESATAN, TSS, ESARAD, TRASYS, Thermica)									•										
Electronic thermal components library								•											
PCB modeler and exchange change (ECAD/MCAD)				+	+	+	+	•											
Fluid dynamics																			
Fluid modeling																			
Steady-state flow						•	•	•											
Transient flow						•	•	•											
Laminar flow						•	•	•											
Turbulent flow						•	•	•											
Incompressible flow						•	•												
Compressible flow						•	•												
Forced, natural and mixed convection						•	•												
Heat loads and temperature restraints on the fluid						•	•												
Fluid buoyancy						•	•	•											

NX 8.0 for Simulation capability chart																			
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					Add	l-on pro	ducts to	NX Ad	vanced I	FEM or A	Advance	d Simul	lation						
Legend					_			10					ţ						
Included in module	_				Thermal		≥	Systems	S			ard	Durability		atino	tion	atior		nced
# Part of prerequisite for this package	FEM	_			l The		l Flo		Systems			, Wiż	Dur		pdn	mula	Simulation	asic	dvai
+ Additional product required	nced	nced	ogy	nal	nced		nced	ronic	e Sys	nate tes	onse	billity	nced	on	odel	ın Si	on Si	an B	an A
	NX Advanced	Adva ulati	lopo miza	NX Thermal	NX Advanced	NX Flow	NX Advanced Flow	NX Electronic Cooling	Spac	ami posi	NX Response Simulation	NX Durability Wizard	NX Advanced	E M	NX FE Model Updating	NX Design Simulation	Motion	NX Nastran Basic	NX Nastran Advanced
	××	NX Advanced Simulation	NX Topology Optimization	×	×	×	X	NX Elect Cooling	NX Space (Thermal	NX Laminate Composites	NX F	×	×	NX FE Model Correlation	×	××	X	×××	××
Fluid dynamics (continued)																			
Fluid modeling (continued)																			
Multiple enclosures						•	•	•											
Multiple fluids						•	•	•											
Internal or external flows						•	•	•											
Porous media modeling						•	•												
Nonlinear fluid properties						•	•												
Humidity						•	•												
Automatic fluid domain and boundary layer meshing						•	•	•											
Automated connection of disjoint fluid meshes						•	•	•											
Fan models						•	•	•											
Embedded 2D/3D flow blockages						•	•												
Condensation							•												
Motion-induced flow							•												
General scalars and particle tracking							•												
Non-Newtonian fluids							•												
Multiple rotating frames-of-reference							•												
Two-phase flow							•												
Head loss inlets and openings (fixed or velocity dependent)								•											
Fluid swirl at inlet and internal fans								•											
Fluid recirculation loop models								•											
Parallel processing																			
Up to 8 cores on one machine							•	•											
Distributed memory parallel (DMP) – unlimited cores						+	+	+											

NX 8.0 for Simulation capability chart																			
									NX CAI	E								NX Nas	tran 8.0
					Add	l-on pro	ducts to	NX Adv	vanced F	FEM or A	Advance	d Simul	lation						
Legend					<u></u>			S					lity		<u>p</u>	_	_		-
Included in module	Σ				Thermal		>	Systems	SL			zard	rabil		datin	atio	latio		ınce
# Part of prerequisite for this package	H b	ъ	٠ -		d Th		d Flo	ic Sy	sten	a)	a)	W	d Du	_	I Up	imul	imu	Basic	Adva
+ Additional product required	ance	Advanced Iulation	ology ation	mal	ance	_	ance	troni	se Sy I	inate	onse	abilit	ance	lode ion	lode	gn S	Motion Simulation	tran	tran
	NX Advanced FEM	NX Advance Simulation	NX Topology Optimization	NX Thermal	NX Advanced	NX Flow	NX Advanced Flow	NX Electronic Cooling	NX Space Systems Thermal	NX Laminate Composites	NX Response Simulation	NX Durability Wizard	NX Advanced Durability	NX FE Model Correlation	NX FE Model Updating	NX Design Simulation	Mot	NX Nastran Basic	NX Nastran Advanced
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Coupled analysis																			
Thermal-fluid				•	•	•	•	•											
Thermal-structural		•		•	•													•	•
Motion-structural		+															+	•	•
Motion-controls																	+		
Correlation																			
Modal analysis to physical modal test correlation														•					
Modal analysis to modal analysis correlation														•					
Analysis normal mode solution access and results viewing														•					
Pretest planning														•					
Geometry mapping														•					
Modal assurance criteria (MAC)														•					
Coordinate modal assurance criteria (COMAC)														•					
Cross-orthogonality														•					
Mode pairing														•					
Visual comparison														•					
Interactive design variable definition															•				
Dedicated DESOPT 200 – Model Update solution															•				
Design variable sensitivities															•				
Filtering of design variables															•				
Frequency and mode shape															•				
Embedded eigenvalue solver															•				
Multiple optimization algorithms															•				
Accommodation of FEM changes															•				
FEM and SIM update capability															•				

NX 8.0 for Simulation capability chart																			
									NX CAI	E								NX Nast	tran 8.0
					Add	l-on pro	ducts to	NX Adv	vanced I	FEM or A	Advance	d Simul	lation						
Legend					_			10					Ιţ		D)	_	_		
Included in module	_				rma		>	Systems	S			ard	abili		atino	ıtion	atior		peor
# Part of prerequisite for this package	FE				The		Flo	Sys	Systems			Wiz	Dur		Upd	mula	mula	asic	dvar
+ Additional product required	nced	nced	ogy tion	nal	nced		nced	onic	s Sys	nate	onse	oillity	nced	on	labo	ın Siı	n Si	an B	an A
	NX Advanced FEM	Adva Ilatio	opol miza	NX Thermal	NX Advanced Thermal	wo!	NX Advanced Flow	NX Electronic Cooling	pace	ami. posi	NX Response Simulation	NX Durability Wizard	NX Advanced Durability	NX FE Model Correlation	NX FE Model Updating	NX Design Simulation	Motion Simulation	NX Nastran Basic	Nastran Advanced
	××	NX Advanced Simulation	NX Topology Optimization	X	XX	NX Flow	XX	NX Elect Cooling	NX Space S Thermal	NX Laminate Composites	NX F Simu	×	XX	NX F Corr	X	X	X	×	X
Motion analysis																			
Kinematic simulation																	•		
Dynamic simulation																	•	+	+
Automatic assembly constraint conversion to motion joints																	•		
Association to part and assembly geometry																	•		
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																	•		
Multiple load case support																	•		
Integrated postprocessor																	•		
Load transfer to NX Advanced FEM/NX Advanced Simulation																	•		
Motion controls – co-simulation with Simulink or Matlab																	+		
Flexible bodies dynamic solution																	+		
Mutiple output formats (JT, VRML, animation movies, etc.)																	•		
Import Tecnomatix® Process Simulate Kinematics model																	•		

Additional notes

Characteristics of NX CAE

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

NX CAE add-on products require NX Advanced FEM or NX Advanced Simulation as a prerequisite.

Platforms supported – Windows (32 and 64-bit), Linux 64-bit.

Model and solution size is limited only by amount of memory available and hardware platform/OS.

Characteristics of NX Nastran Desktop

Solution initialized from CAE preprocessing environment (NX or Femap™ software) 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.

Model and solution size are limited only by amount of memory available and hardware platform/OS.

Platforms supported for NX Nastran Desktop – Windows (32 and 64-bit), Linux 64-bit.

The NX Nastran Basic bundle is a prerequisite for all add-on NX Nastran modules and the NX Nastran Advanced bundle.

The NX Nastran Advanced bundle is not available with Femap software.

DMP is not available in the NX Nastran Desktop version.

Characteristics of NX Nastran Enterprise

Solves any valid Nastran deck from any source (NX, Femap, MSC Patran, Altair HyperMesh and others).

Solver can be located on a different CPU from the preprocessing system, such as on a separate server or cluster.

Model and solution size is limited only by amount of memory available and hardware platform/OS.

Platforms supported for NX Nastran Enterprise – Windows (32 and 64-bit), Linux 64-bit, Unix.

The NX Nastran Basic bundle is a prerequisite for all add-on NX Nastran modules and the NX Nastran Advanced bundle.

The NX Nastran Advanced bundle is not available with Femap™ software.

One license of NX Nastran DMP can be used to spawn a solve over as many processors as wanted.