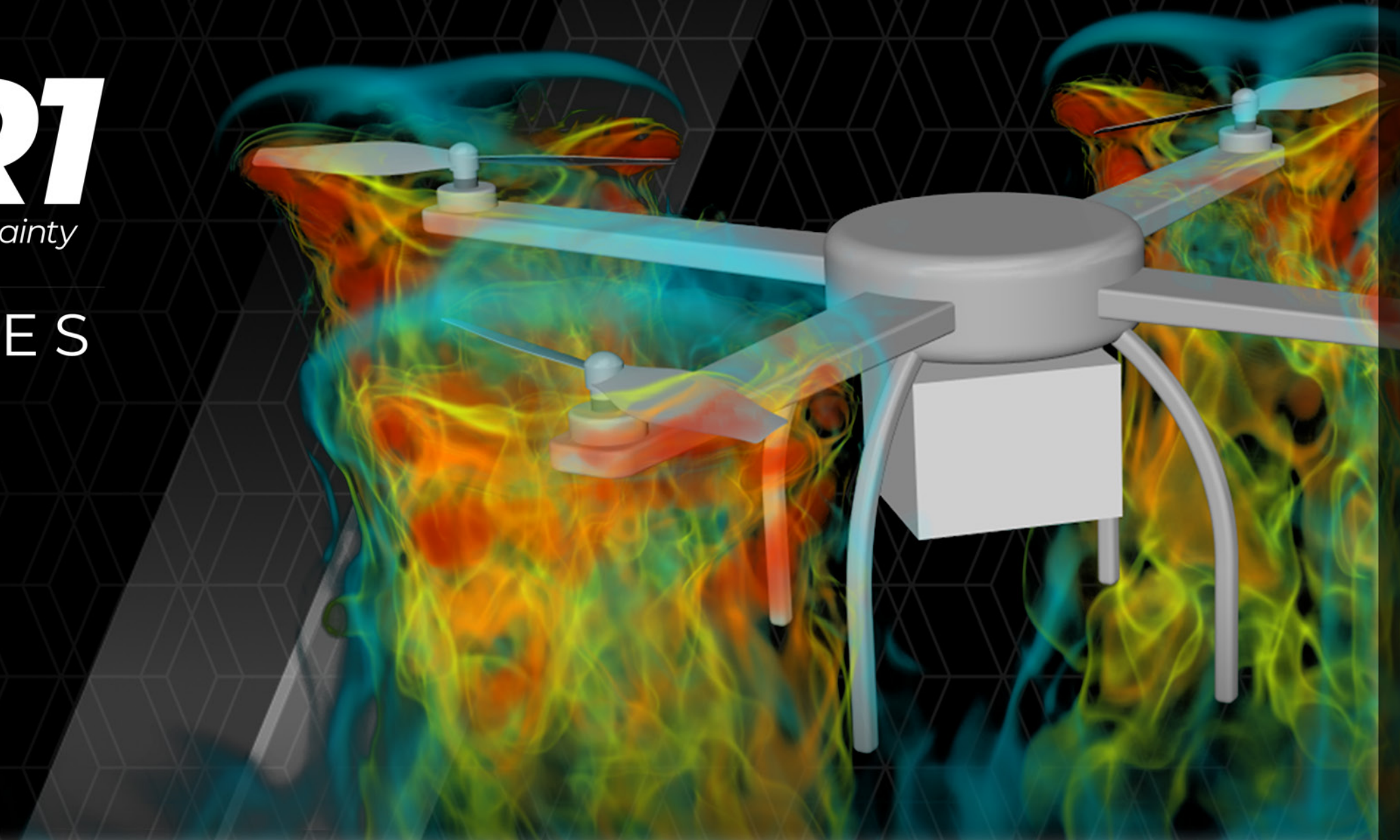


Ansys  
**2023/R1**  
*Take A Leap Of Certainty*

CAPABILITIES



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<b>VIBRATIONS</b>								
Modal	●	●	●		●	●	●	
Modal - Pre-Stressed	●	●	●		●		●	
Modal – Damped/Unsymmetric	●	●						
Transient - Mode-Superposition	●	●			●	●	●	
Harmonic - Mode-Superposition	●	●			●	●		
Harmonic - Full	●	●			▲			
Spectrum	●	●			●			
Random Vibration	●	●			●	●		
Mistuning	●	●						
Multi-Stage Cyclic Symmetry	●							
Rotordynamics	●	●			●			
<b>ACOUSTICS</b>								
Modal Acoustics	●							
Harmonic Acoustics	●				●			
Transient Acoustics	●				●			
Boundary Element Method Acoustics					●			
Spectral Element Method Acoustics					●			
Statistical Energy Analysis Acoustics					●			
Piezoelectric Acoustics	●							
Generation of Acoustic Signature from Contact Regions	●				●		●	
Acoustics Element Library	●	●			●		●	
Acoustics Material Models	●	●			●			

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<b>WAVE HYDRODYNAMICS</b>								
Diffraction and Radiation	●							
Frequency & Time Domain Motions Analysis	●							
Moorings, Joints & Tethers	●							
Internal Tanks	●							
Load Transfer to Structural Analysis	●							
<b>ADDITIONAL PHYSICS</b>								
1-D Thermal-Flow	●	●	●		●			
1-D Coupled-Field Circuits	●							
1-D Electromechanical Transducer	●							
Piezoelectric	●				●			
Piezoresistive	●							
Electromagnetic	●							
Electro-Migration	●					●		
Diffusion-Pore-Fluid	●							
Diffusion-Thermal-Electric-Magnetic	●							
1-Way Fluid Structure Interaction	■ <sup>2</sup>	■ <sup>2</sup>	■ <sup>2</sup>					
2-Way Fluid-Structure Interaction	■ <sup>2</sup>			●	●			
Incompressible Fluid Dynamics (ICFD)					●			
Arbitrary Lagrangian Eulerian Method (ALE)					●			
Electromagnetics (EM) - Boundary Element Method (BEM)					●			
Multi-scale Modeling	●				●			
Conservation Element/Solution Element (CESE)					●			

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<b>COMPOSITE MATERIALS</b>								
Material Definitions	●	●		●	●	●	●	
Ply Definitions	●	▲		●	●	●		
Interface Layers	●				●			
Advanced Ply-Modeling Features	●							
Variable Material Data	●				▲			
Solid Extrusion	●				●			
Lay-Up Mapping	●							
Draping	●				●			
Lay-Up Exchange Interfaces	●							
Advanced Failure Criteria Library	●				▲			
First-Ply Failure	●	●			●			
Last-Ply failure	●				●			
Delamination	●				●			
Composite Cure Simulation	■ <sup>9</sup>				▲			
Sandwich Modeling	●				●			
Automation / Run Scripts	●				●			
Short Fiber Composites	●				●			

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<b>DURABILITY</b>								
Stress-Life (SN)	●	●	●		●		●	
Strain-Life (EN)	●	●	●		●		●	
Dang Van	■ <sup>1</sup>	■ <sup>1</sup>	■ <sup>1</sup>		■ <sup>1</sup>			
Safety Factor	●	●	●		●		●	
Adhesive Bond	■ <sup>1</sup>	■ <sup>1</sup>	■ <sup>1</sup>		■ <sup>1</sup>			
Crack Growth Linear Fracture Mechanics	■ <sup>1</sup>	■ <sup>1</sup>	■ <sup>1</sup>		■ <sup>1</sup>			
Seam Weld	■ <sup>1</sup>	■ <sup>1</sup>	■ <sup>1</sup>		■ <sup>1</sup>			
Spot Weld	■ <sup>1</sup>	■ <sup>1</sup>	■ <sup>1</sup>		■ <sup>1</sup>			
Thermo-Mechanical Fatigue	■ <sup>1</sup>	■ <sup>1</sup>	■ <sup>1</sup>		■ <sup>1</sup>	▲		
Vibration Fatigue	■ <sup>1</sup>	■ <sup>1</sup>	■ <sup>1</sup>		■ <sup>1</sup>	●	●	
Short-Fiber Composite Fatigue	■ <sup>1</sup>							
Virtual Strain Gauge Correlation	■ <sup>1</sup>	■ <sup>1</sup>	■ <sup>1</sup>		■ <sup>1</sup>			
Python Scripting Customization	■ <sup>1</sup>	■ <sup>1</sup>	■ <sup>1</sup>		■ <sup>1</sup>	▲		
<b>EXPLICIT DYNAMICS</b>								
FE (Lagrange) Solver	●			●	●			
Euler Solvers				●	●			
Implicit-Explicit Material States	●			●	●			
Mass Scaling	●			●	●			
Natural Fragmentation	●			●	●			
Erosion Based on Multiple Criteria	●			●	●			
De-Zoning				●	●			
Part Activation and Deactivation (Multi Stage Analysis)				●	●			
Explicit Time Integration	●			●	●			

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<b>IMPLICIT DYNAMICS</b>								
Implicit Time Integration	●	●			●	●	●	
<b>GEOMETRIC IDEALIZATION</b>								
Spring	●	●	▲	●	●		●	
Mass	●	●	●	●	●		●	
Damper	●	●		●	●		●	
Spar	●	●	●		●			
Beam	●	●	●	●	●		●	
Cable	●	●	●		●			
Pipe/Elbow	●	●	●					
Shell - Thin	●	●	●	●	●		●	
Layered Shell -Thin (Composite)	●	●		●	●			
Shell - Thick (Solid Shell)	●	●	●		●	●		
Layered Shell - Thick (Solid Shell) (Composite)	●	●	●		●			
2D Plane / Axisymmetric	●	●	●		●		●	
3D Solids	●	●	●		●	●	●	
Layered 3D Solids (Composite)	●	●			●			
Infinite Domain	●	●	●	●	●		●	
2.5D Elements	●	●						
Reinforcement Elements	●	●		●	●	■		
Coupled Field ROM Element Technology	●	●						
Iso-Geometric Analysis (IGA)					●			
<b>GEOMETRY AND STL FILE HANDLING</b>								
SpaceClaim Direct Modeler	●							

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<b>HPC - STRUCTURES</b>								
Default Number of Cores	4 cores (DMP or SMP) MAPDL, 4 for Explicit, 4 for RBD, 4 for AQWA	4 cores (DMP or SMP) MAPDL, 4 for RBD	4 cores (DMP or SMP)	4 cores	4 core	Default Number of cores based on machine being used	4 core	4 cores
Parallel Solving on Local PC and Cluster	●	●	●	●	●	●	●	▲
MAPDL GPU Offload Acceleration	■ <sup>6</sup>	■ <sup>6</sup>	■ <sup>6</sup>					
Ansys Cloud Support	MAPDL - Yes Explicit - No RBD - No AQWA - No	MAPDL - Yes RBD - No	MAPDL - Yes		●	▲		
Hybrid Parallel	●	●	●					
<b>MATERIALS</b>								
Basic Linear Materials (Linear, Anisotropic, Temperature Dependent)	●	●	●	●	●	●	●	
Basic Nonlinear Materials (Hyperelastic, Plasticity, Rate Independent, Isotropic, Concrete, Viscoelasticity)	●	●	▲	●	●		●	
Advanced Nonlinear Materials (Rate dependent, Anisotropic, Damage Models, Geomaterials, Multiphysics, Acoustics)	●			●	●			
Specialty Materials (Glass, Foam, Kevlar, Fabric, Biomechanic, Paper, Cardboard)					●		●	
Field Dependent	●	●		●				
Reactive Materials (Equations of State, High Explosives, Propellants)				●	●			
User Defined Materials	●			●	●	●	●	
Fracture Mechanics and Crack Growth	●				▲			
Materials Multiscale Homogenization	●				●			
Materials Database	■ <sup>7</sup>	■ <sup>7</sup>	■ <sup>7</sup>	■ <sup>7</sup>	■ <sup>7</sup>	●	■ <sup>7</sup>	

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<b>MISCELLANEOUS AND USABILITY</b>										
Ansys SpaceClaim	●	■ <sup>4</sup>	■ <sup>4</sup>	■ <sup>4</sup>	■ <sup>4</sup>		■ <sup>4</sup>			
Ansys Customization Suite (ACS)	●									
Support ACT Extensions	●	●	●	●	●					
Journaling and Scripting	●	●	●		●	●	▲			
Command Snippet Support	●	●	●							
Batch run capability	●	●	●	●	●	●	●			
Read/Write 3rd Party Matrix CAE Data	●	●		●	●		●			
CDB and 3rd party FE Model Import	●	●	●		●		●			
Nastran Bulk File Export	●	●	●			●				
Direct Input of Nastran Bulk Data Files					●					
Pre-stressing from Nastran Linear Solution					●					
Global/Selective Mass Scaling	●			●	●					
Keyword Input	●	●	●		●					
Splitting of Input File into Subfiles	●	●	●		●					
User Subroutines	●			●	●		●			
Re-mapping	●			●	●					
Transmitting boundaries	●			●	●					
Dynamic Storage Allocation	●	●	●		●					
Extensive Output Data Controls (ascii/binary)	●	●	●		●					
Sense Switch Controls - Monitor Simulations Status	▲	▲	▲		●					
Interactive Real-Time Graphics	●	●	●	●	●					
Double Precision	●	●	●	●	●		●			

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<b>MODELING CAPABILITIES</b>										
Contact - Linear	●	●	●	●	●		●			
Contact - Nonlinear	●	●	●	●	●		●			
Joints	●	●	●	●	●		●			
Seam Welds	●	●	●	●	●		●			
Spot Welds	●	●	●	●	●		●			
Element Birth and Death	●	●			●		●			
Gasket Elements	●				●					
Rezoning and Adaptive Remeshing	●				●					
Inverse Analysis	●									
<b>MULTI ANALYSIS</b>										
Submodeling	●	●	●		●	▲				
Data Mapping	●	●	●		●		●			
Multiphysics Data Mapping	●	●	▲			▲	●			
Initial State	●	●		●	●		●			
Advanced Multi-Stage 2-D to 3-D Analysis	●	●								
<b>NONLINEAR MULTI-BODY DYNAMICS</b>										
Rigid Body Mechanisms	●	●			●		●			
Rigid Body Dynamics with CMS Components for Flexible Bodies	●						●			
Full Transient	●	●		●	●		●			
CMS with Substructuring	●						●			
Mixed Rigid - Flexible Systems	●	●	●	●	●		●			
Function Expression					●		●			
Drivetrain Creation							●			
Links							●			
Vehicle Dynamics					●		●			

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<b>OPTIMIZATION</b>										
DesignXplorer included	●	●	●	■ <sup>3</sup>	■ <sup>3</sup>					
Parameters	●	●	●	●	●	▲	●			
Design Point Studies	●	●	●	●	●		●			
Correlation Analysis	●	●	●	●						
Design of Experiments	●	●	●	●			●			
Sensitivity Analysis	●	●	●	●						
Goal Drive Optimization	●	●	●	●						
<b>STRUCTURAL SOLVER CAPABILITIES</b>										
Linear Static	●	●	●		●	●	●			
Nonlinear Static	●	●	●		●		●			
Pre-Stress Effect, Linear Perturbation	●	●	●	▲	▲		●			
Nonlinear Geometry	●	●	●	●	●		●			
Buckling - Linear Eigenvalue	●	●	●		●		●			
Buckling - Nonlinear Post Buckling Behavior	●	●	●		●					
Buckling - Nonlinear Post Buckling Behavior - Arc Length	●	●			●					
Steady State Analysis Applied to a Transient Condition	●				●					
Advanced Wave Loading	●									
<b>THERMAL</b>										
Steady State Thermal	●	●	●		●	▲				
Transient Thermal	●	●	●		●		●			
Conduction	●	●	●	●	●	●	●			
Convection	●	●	●		●					
Radiation to Space	●	●	●		●					
Radiation - Surface to Surface	●	●	●		●					
Phase Change	●	●	●	●	●					
Thermal Analysis of Layered Shells and Solids	●	●	●		●					

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<b>/ STRUCTURES</b>	<b>MECHANICAL ENTERPRISE</b>	<b>MECHANICAL PREMIUM</b>	<b>MECHANICAL PRO</b>	<b>AUTODYN</b>	<b>LS-DYNA</b>	<b>SHERLOCK</b>	<b>MOTION</b>	<b>FORMING PRO</b>
<b>TOPOLOGY AND LATTICE OPTIMIZATION</b>								
Structural Optimization	●	●	●					
Modal Optimization	●	●	●					
Thermal Loads	●	●	●					
Inertial Loads	●	●	●					
Optimized Design Validation	●	●	●					
Manufacturing Constraints	●	●	●					
Stress Constraints	●	●	●					
Symmetry	●	●	●					
Lattice Optimization	■ <sup>8</sup>							
Overhang/Additive Constraints	■ <sup>8</sup>							
<b>PARTICLE METHODS</b>								
Smooth Particle Hydrodynamics (SPH)				●	●			
Smooth Particle Galerkin (SPG)					●			
Corpuscular Particle Method (CPM)					●			
Discrete Element Method (DEM)					●			
<b>AUTOMOTIVE</b>								
Seat-belts - including modeling of accelerometer, pretensioner, retractor, sensor, and slip ring					●			
Inflator Models					●			
Airbag Fabric Constitutive Models					●			
Accelerometers					●			
Airbag Sensors					●			
Airbag Breakout					●			
Eulerian Deployment of Airbags					●			
Airbag Folder					●			
Unfolded Reference Geometry for Airbags					●			

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<b>AUTOMOTIVE</b>								
Dummy Positioner					●			
Side-Impact Dummy Special Damper					●			
Airbag Deployment					●			
<b>METAL STAMPING</b>								
Multi-Stage Forming Process Validation								●
Material Data Library and Management								●
Process Definition								●
Tool Setup and Preview								●
Drawbead Definition								●
Multiple Lancing Operation								●
Stamping Specific Post Processing (FLD, Formability Index, Wrinkling, Skidmark)								●
Clamping Simulation								●

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<b>/ ACOUSTICS SIMULATION</b>	<b>ANSYS SOUND ENTERPRISE</b>	<b>ANSYS SOUND PREMIUM</b>	<b>ANSYS SOUND PRO</b>
<b>ACOUSTICS &amp; SOUND QUALITY</b>			
Listen and Modify Sound (SAS)	●	●	●
Perform Acoustic Analysis and Psychoacoustic Criteria Calculations (SAS)	●	●	●
Automatic Sound Component Detection and Separation (SAS)	●	●	●
Connect and Listen to Ansys Mechanical, LS-DYNA, Fluent and Motion CAE Simulations (SAS)	●	●	●
3D Sound for Listening Room and VR (VR Sound)	●	●	
Interactive Sound for Driving Simulator (Car Sound Simulator)	●	●	
Measure Sound Perception with Listening Test (Jury Listening Test)	●	●	
Engine Sound Design and Engine Sound Enhancement for ICE Vehicle (ASD)	●		
Active Sound Design for Electric Vehicles (ASD for EV)	●		
Combine Test and Simulation Data to Assess Sound Quality	●	●	●

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/ ADDITIVE MANUFACTURING	ADDITIVE PRINT	ADDITIVE SUITE							
<b>ADDITIVE PREP</b>									
Define Build Envelope	■	■							
Multiple Parts	■	■							
Optimize Part Orientation Based upon Distortion Tendency, Build Time and Supports	■	■							
Support Region Detection and Manual Modification	■	■							
Created Multiple Support Types in One Region	■	■							
Control of Support Parameters	■	■							
Multiple Support Types	■	■							
Angled Supports	■	■							
Perforations, Tooth Patterns, Intrusion, Sizing and Distribution of Support Walls	■	■							
Automatic Support Generation	■	■							
Export of STL and SpaceClaim Files	■	■							
Export of Additive Manufacturing Equipment (OEM) Build Files	■	■							
Cost Estimation	■	■							
Layer/Scan Vector Visualization	■	■							
<b>WORKBENCH ADDITIVE</b>									
Nonlinear and Temperature Dependent Material Properties		●							
Thermo-Mechanical Coupled Strain Solution		●							
Native Mechanical Environment		●							
Part Distortion and Residual Stress after Baseplate Cut-Off and/or Support Removal		●							
Directional Part and Support Removal		●							
Recoater Interference Detection		●							
Identification of High Strain (Crack) Locations		●							
Layer by Layer Stress and Distortion Visualizations		●							
Option to Output Only the Last Layer of the Build or Every Nth Layer		●							
Distortion Compensation									

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/ ADDITIVE MANUFACTURING	ADDITIVE PRINT	ADDITIVE SUITE							
<b>WORKBENCH ADDITIVE</b>									
User-Defined Step Option as 1st or Last Sequence Step		●							
Layered Tetrahedral Meshing		●							
Post Build Heat Treatment		●							
Import of STL Supports		●							
Inherent Strain Isotropic and Anisotropic		●							
Strain Scaling Factor for Thermal and Structural Analyses		●							
STL Files can be Exported from STL Supports		●							
Voxel Mesh Generation		●							
Wizards to Transfer Results from Additive Print to Workbench Additive		●							
Calibration setup in AM Wizard		●							
AM Bond Implementation		●							
Layer End Temperature Output		●							
Process Simulation for Directed Energy Deposition		●							
Direct Energy Deposition - Wizard		●							
Direct Energy Deposition - G-Code Clustering		●							
Direct Energy Deposition - Manual Clustering		●							
Automatic Distortion Compensation Optimization		●							
Scan Pattern Based Anisotropic Strain		●							
Machine Learning Thermal Strain		●							
"Binder Jet Sintering		●							
Sintering Material Model		●							
Sintering Material Model - Wizard		●							
<b>ADDITIVE PRINT</b>									
Nonlinear and Temperature Dependent Material Properties	●	●							
Uniform Assumed Isotropic Strain	●	●							
Scan Pattern Based Anisotropic Strain	●	●							
Thermal Ratcheting Based Anisotropic Strain	●	●							

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<b>ADDITIVE PRINT</b>									
Stress-Based Automatically Generated Supports	●	●							
Part Distortion and Residual Stress (as-built)	●	●							
Directional Part and Support Removal	●	●							
Part Distortion and Residual Stress after Baseplate Cut-Off and/or Support Removal	●	●							
Distortion Compensation	●	●							
Recoater Interference Detection	●	●							
Identification of High Strain (Crack) Locations	●	●							
Input Strain Hardening Factor	●	●							
Import of STL Supports	●	●							
Subvoxel Material Density Assignment	●	●							
Layer by Layer Stress, Distortion and Blade Crash Visualizations	●	●							
Build File Readers for Multiple AM Machines	●	●							
Auto Queue Multiple Successive Simulations	●	●							
Additive Print to Workbench Additive Transfer for Post Processing	●	●							
<b>ADDITIVE SCIENCE</b>									
Meltpool Dimensions		●							
Detailed Thermal History		▲							
% Lack of Fusion Porosity		●							
Sensor Measurement Predictions		▲							
Ability to Add User-Define Materials		●							
Material Tuning Wizard		▲							
Microstructure Prediction		●							
Parallel Solving of 2D Microstructure		●							

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<b>/ MATERIALS</b>	<b>GRANTA MI ENTERPRISE</b>	<b>GRANTA MI PRO</b>	<b>GRANTA SELECTOR</b>	<b>GRANTA EDUPACK</b>	<b>MATERIALS DATA FOR SIMULATION</b>				
<b>MATERIALS DATA MANAGEMENT</b>									
Granta MI Database - "Gold Source" System to Store Corporate Materials Information	●	●							
Manage Specialist Materials Data Types	●	●							
Manage Meta-Data and Context for Materials	●								
Traceability for All Materials Data	●	●							
Favorites List: Personal, Public	●	●	▲	▲					
Access Control	●	▲							
Version Control	●								
Multiple Unit System Support	●	●	●	●	●				
Admin UI to Setup and Configure Database	●								
Template Data Structures for Key Materials Use Cases: Metals, Composites, Additive Manufacturing	●								
Template for Simulation		●							
Web App for Fast Upload and Export of Materials Data	●	●							
Browse Materials Data	●	●	●	●					
Edit and Update Materials Data	●	●	▲	▲					
Search and Query Materials Data	●	●	●	●					
Represent Property Data in Interactive Charts	●	▲	●	●					
Comparison Tables and Comparison Charts	●	▲	●	●					
Generate Reports on Selected Materials Records	●								
Export Data to Excel and Third Party Software	●	▲	●	●					
Personalize System Homepages and User Profiles	●								
Configure Web App UI for Specific User Groups	●								
Private Cloud with Azure and AWS	●	●							
Single Sign On	●	●							
Ansys Material Calibration	●	●							

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<b>MATERIALS DATA ANALYSIS</b>					
Interactive Plotting of Data: Scatter, Contour, Error Bar, Surface, Plotyy, Semilogx, Semilogy, Loglog	●				
Custom Curve Fitting	●				
Cross-Table Comparisons of Materials Data	●				
Scripting Toolkit for Python	●				
Machine Learning	●				
<b>DATA FLOW MANAGEMENT</b>					
Design and develop material data flow	●				
Execute material data flows - Processes, Approvals, Notifications	●				
<b>INTEGRATION WITH CAD, CAE, PLM</b>					
Ansys Workbench	●	●	▲	▲	■
Ansys Electronics Desktop	●	●			■
Ansys Discovery	●	●	▲	▲	■
Ansys LS-DYNA	●				
Ansys Minerva	●				
Ansys optiSlang	●				
Abaqus	●	●			
ANSA	●				
HyperMesh	●	●			
Creo	●	●			
NX & Simcenter 3D	●	●			
Windchill	●				
Teamcenter	●				
Material Card Connect - Automated File Export	●				
File Export (CATIA v5, SOLIDWORKS, and others)	●	▲	▲	▲	
<b>RESTRICTED SUBSTANCES</b>					
Data Structures to Support Restricted Substance Analytics, Store Specs, Materials, Legislations, Substances, Parts	●				
Report on Restricted Substance Risk for Materials and Process Portfolio	●				

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<b>RESTRICTED SUBSTANCES</b>					
Build and Edit Bills of Materials within a Web App	●				
At-a-Glance Restricted Substance Compliance for a BoM	▲				
Run Reports Across Multiple BoMs	▲				
Integrate Restricted Substance Reporting with PLM, CAD	▲				
<b>GRANTA MI - ADDITIVE</b>					
Traceability and Capture of Additive Manufacturing Data	●				
AM Data Analytics Including Machine Learning	●				
Integration with CAD CAE and PLM Systems	●				
<b>MATERIALS SELECTION &amp; RELATED TOOLS</b>					
Reference Data for Materials Selection on PC/Laptop			●	●	
Interactive 'Ashby Charts' of Materials Property Space	▲		●	●	
Systematic Materials Selection Methodology			●	●	
Filter Materials Based on Property Profile	●	●	●	●	
Filter Materials Based on Links to Other Materials / Processes / Objects	▲		●	●	
Materials Substitution and Equivalency - 'Find Similar'			●	●	
Performance Index Finder			●	●	
Engineering Solver - Convert Engineering Requirements to Materials Properties			●	●	
Synthesizer - Predict Properties of Hybrid Materials			●	●	
Part Cost Estimator			●	●	
Selection Reports and Export of Charts for Presentations			●	●	
Eco Audit for a Product or Conceptual Design			●	●	
Early stage batter pack design, configuration and performance evaluation - incl. battery cells database			●	●	
<b>DATA LIBRARY FOR INDUSTRY</b>					
Core MaterialUniverse™ Data	●	●	●		▲
Core JAHM Curve Data	●		●		
Advanced Metals Data	■		■		

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<b>DATA LIBRARY FOR INDUSTRY</b>									
Advanced Polymers Data	■		■						
Advanced Composites Data	■		■						
Advanced Medical Data	■		■						
Advanced Aero Data	■	■	■						
Advanced ESDU Aero Alloys	■		■						
Advanced Additive Manufacturing Data	■		■						
Advanced Eco Design	■		■						
Advanced Electromagnetic Data	■	■	■		●				
<b>TEACHING RESOURCES</b>									
Granta EduPack Level 1-3 Teaching Databases				●					
The Elements Teaching Database				●					
Materials Science and Engineering Teaching Database				●					
Sustainability Teaching Database				●					
Bioengineering Teaching Database				●					
Architecture Teaching Database				●					
Lecture units				●					
Student exercises				●					
Videos				●					
Micro-Projects				●					
White Papers				●					
Case Studies				●					
Active Learning Toolkits				●					
Data Booklets				●					
Sample Project Files				●					
Phase Diagram Tool				●					
Medical Devices Teaching Database				●					
Design Teaching Database				●					

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<b>/ FLUIDS</b>	<b>CFD Pro</b>	<b>CFD Premium</b>	<b>CFD Enterprise</b>	<b>BladeModeler</b>	<b>Vista TF</b>
<b>FLUENT CAPABILITIES</b>					
Steady-State Flow	●	●	●		
Transient Flow	●	●	●		
2D and 3D Flow	●	●	●		
Compressible and Incompressible Flow	●	●	●		
Customizable Material Properties	●	●	●		
Non-Newtonian Viscosity	●	●	●		
Real fluids models (steam, refrigerants, cryogenics, NIST data)		●	●		
Pressure-Based Solver	●	●	●		
Density-Based Solver		●	●		
Native Multi-GPU Solver			●		
Coupled and Segregated Solvers	●	●	●		
Subsonic Flow	●	●	●		
Supersonic and Hypersonic Flow		●	●		
Turbulence – RANS models	●	●	●		
Turbulence - LES/SAS/DES		●	●		
Heat Transfer - Natural Convection, Conduction and CHT	●	●	●		
Heat Transfer - Shell Conduction		●	●		
Thermal Radiation - Participating & Transparent Media		●	●		
ECAD Import for PCB Thermal Modeling		●	●		
Expressions, Inc. Functions of Solution Values	●	●	●		
Flow-Drive Solid Motion (6-DOF)		●	●		
Porous Media	●	●	●		
Reduced Order Model (ROM) creation		●	●		
Dynamic/Moving-Deforming Mesh		●	●		
Overset Mesh		●	●		
Dynamic Solution-Adaptive Mesh Refinement		●	●		

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<b>FLUENT CAPABILITIES</b>					
Fan Model	●	●	●		
Virtual Blade Model		●	●		
Inert and Massless Particle Tracking	●	●	●		
Coupled Particle Tracking (with Mass)		●	●		
Wall Film Modeling		●	●		
Macroscopic Particle Model		●	●		
Reacting/Combusting Particles		●	●		
Particle Break-Up and Coalescence		●	●		
Dense Particle Coupling (DDPM) and Granular Particle modeling		●	●		
Wall Erosion Modeling		●	●		
Discrete Element Model (DEM)		●	●		
Free Surface VOF model		●	●		
Regime change between particle and free surface (VOF <-> DPM)		●	●		
Multiphase flow modeling		●	●		
Complex Multiphase Regime Transitions		●	●		
Surface Tension		●	●		
Gas – Liquid – Solid Phase Change models, including Cavitation, Boiling, Evaporation, Condensation, Solidification and Melting		●	●		
Reactions Between Fluid Phases		●	●		
Non-reacting Multicomponent Flow/Species Transport	●	●	●		
Reacting Multicomponent Flow/Species Transport		●	●		
Extensive Combustion modeling including FGM		●	●		
Finite Rate Chemistry modeling		●	●		
Pollutants and Soot Modeling		●	●		
Ability to use Model Fuel Library Reaction Mechanisms		●	●		
Comprehensive Surface-Kinetics		●	●		
Flamelet Table Generation		●	●		

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<b>FLUENT CAPABILITIES</b>					
Virtual cooling hole models (effusion and blade film cooling)		●	●		
Electrochemistry modeling for Li-ion Batteries		●	●		
Battery swelling modeling		●	●		
Battery life modeling		●	●		
Fuel Cell modeling		●	●		
Multiple Stationary & Rotating Reference Frames	●	●	●		
Periodic Interfaces		●	●		
Mixing Plane/Stage Frame Change Interface		●	●		
Sliding-Mesh/Transient Rotor-Stator Frame Change Interface		●	●		
Pitch Change across Frame Change Interfaces		●	●		
Aerodynamic damping (Blade Flutter)		●	●		
Dedicated Aerodynamics workspace (Fluent Aero)			●		
In-flight Aircraft Icing modeling			●		
Adjoint Solver for Shape Optimization		●	●		
Parameter-driven mesh morphing and optimization		●	●		
Parameters	●	●	●		
Design Point Studies	●	●	●		
Design of Experiments	●	●	●		
Local Parallel Solving	●	●	●		
Distributed Parallel Solving		●	●		
Batch solving		●	●		
Parallel Solving on Cloud launched from Desktop		●	●		
Workbench Integration		●	●		
Simulation Reports	●	●	●		
Functional Mockup Unit (FMU) Coupling		■	■		
Fluid Structure Interaction (FSI) with Ansys Mechanical		■	■		

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<b>FLUENT CAPABILITIES</b>					
Fluid Thermal Deformation with Ansys Mechanical		■	■		
Built-in FEA solver for Fluid-Structural and Fluid-Thermal Stress Coupling		●	●		
Fluid Electro-Thermal Interaction		■	■		
Electromechanical Thermal Management		■	■		
Aero-optics		■	■		
Aero Acoustics and Vibro Acoustics		●	●		
Acoustic-Structural		●	●		
Fluid Magnetohydrodynamics (MHD)		●	●		
<b>FLUENT MESHING CAPABILITIES</b>					
Polyhedral, Poly-Hexcore, Hexcore, Tet and Prism meshing	●	●	●		
Mosaic-Enabled Meshing Technology	●	●	●		
Task-Based Workflow - Watertight Geometries	●	●	●		
Task-Based Workflow - Fault Tolerant Geometries		●	●		
Parallel Mesh Generation	●	●	●		
Wrap meshing		●	●		
Rapid Octree meshing		●	●		
<b>CFX CAPABILITIES</b>					
Steady-State Flow		●	●		
Transient Flow		●	●		
Customizable Material Properties		●	●		
Non-Newtonian Viscosity		●	●		
Real fluids models (steam, refrigerants, cryogenics, NIST data)		●	●		
Flow-Drive Solid Motion (6-DOF)		●	●		
Pressure-Based Coupled Solver		●	●		
Expressions, inc. functions of solution values		●	●		
Dynamic/Moving-Deforming Mesh		●	●		

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<b>CFX CAPABILITIES</b>					
Compressible and Incompressible Flow		●	●		
Porous Media		●	●		
Subsonic Flow		●	●		
Supersonic Flow		●	●		
Turbulence – RANS models		●	●		
Turbulence - LES/SAS/DES		●	●		
Heat Transfer - Natural Convection, Conduction and CHT		●	●		
Thermal Radiation - Participating & Transparent Media		●	●		
Particle Tracking (Discrete Phase Modeling)		●	●		
Liquid Droplets (including Evaporation)		●	●		
Reacting/Combusting Particles		●	●		
Wall Erosion Modeling		●	●		
Free Surface VOF model		●	●		
Surface Tension		●	●		
Multiphase flow modeling (Eulerian)		●	●		
Gas – Liquid – Solid Phase Change models, including Cavitation, Boiling, Evaporation and Condensation		●	●		
Reactions Between Fluid Phases		●	●		
Multicomponent Flow/Species Transport		●	●		
Combustion Modeling		●	●		
Acoustics / Aerodynamic noise		●	●		
Blade film cooling model		●	●		
Multiple Stationary & Rotating Reference Frames		●	●		
Periodic Interfaces		●	●		
Mixing Plane / Stage Frame Change Interface		●	●		
Transient Rotor-Stator Frame Change Interface		●	●		
Pitch Change Across Frame Change Interfaces		●	●		

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<b>CFX CAPABILITIES</b>					
Pitch Change across Frame Change Interfaces		●	●		
Aerodynamic Damping (Blade Flutter Analysis)		●	●		
Transient Blade Row		●	●		
Time Transformation		●	●		
Fourier Transformation		●	●		
Harmonic Analysis		●	●		
Automated Speedline / Performance Map creation		●	●		
Local and Distributed Parallel Solving		●	●		
Parallel Solving on Cloud launched from Desktop		●	●		
Workbench Integration		●	●		
Functional Mockup Unit (FMU) Coupling		●	●		
Fluid Structure Interaction (FSI) with Ansys Mechanical		■	■		
Fluid Thermal Deformation with Ansys Mechanical		■	■		
Fluid Electro-Thermal Interaction		■	■		
Electromechanical Thermal Management		●	●		
Fluid Magnetohydrodynamics (MHD)		●	●		
<b>TURBOGRID CAPABILITIES</b>					
Automatic block-structured Hex meshing		●	●		
Predefined block topologies for blades		●	●		
Axial, Radial and Mixed machines		●	●		
Splitter blades		●	●		
Compressors, Fans, Turbines, Pumps		●	●		
Rounded and sharp leading/trailing edges		●	●		
Partial tip clearances		●	●		
Automated hybrid meshing for secondary flow paths, complex tips, partial tip and hub gaps (buttons), and blends		●	●		
Automatic addition of approximate blends/filletts		●	●		

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<b>TURBOGRID CAPABILITIES</b>					
Support for multiple input formats (CAD, NDF, profiles/curves)		●	●		
Automatic creation of high-fidelity CAD from profile/curve input		▲	▲		
Mesh refinement maintaining consistent mesh topology		●	●		
<b>BLADEGEN AND BLADEEDITOR CAPABILITIES</b>					
Turbomachinery blade design				●	
Turbo-specific CAD geometry creation				●	
Single CAD definition for CFD and FEA				●	
Flow Path CAD geometry creation				●	
Blade CAD geometry creation				●	
Splitter Blade CAD geometry creation				●	
Create high fidelity variable radius blade blends				●	
Flank milled blades				●	
<b>VISTA CAPABILITIES</b>					
Meanline / 1D Turbomachinery Design				●	
Centrifugal Compressor Design (CCD)				●	
Centrifugal Pump Design (CPD)				●	
Radial Turbine Design (RTD)				●	
Axial Fan Design (AFD)				●	
Through-Flow Quasi-2D Analysis for Turbomachinery Design					●
Centrifugal Compressor Map creation (CCM)					●
<b>CFD POST CABILITIES</b>					
Simulation Reports		●	●		
Turbo-specific Surface and Line locators		●	●		
Turbo coordinate systems		●	●		
Turbo macros and calculations		●	●		
Multiple case file comparison		●	●		

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<b>CFD POST CAPABILITIES</b>					
Point, Line, Surface and Volume locators		●	●		
GPU accelerated animations		●	●		
Keyframe animations		●	●		
Charts		●	●		
Contours, Vectors, Streamlines, Particle Tracks		●	●		
Expressions and quantitative calculations		●	●		
Operating Map post-processing		●	●		
Mesh quality metrics and calculations		●	●		
Polyflow Results Post-processing	●	●	●		
<b>POLYFLOW CAPABILITIES</b>					
Viscoelasticity and Yield Stress models		●	●		
Extrusion & Co-extrusion modeling	●	●	●		
Blow Molding modeling	●	●	●		
Fiber Spinning modeling	●	●	●		
Thermoforming modeling	●	●	●		
Screw extruder modeling		●	●		
2D and 3D forming		●	●		
Mixers and Filling modeling		●	●		
<b>FORTE CAPABILITIES</b>					
Automatic On-the-fly Mesh Generation with Dynamic Refinement		●	●		
Species Transport		●	●		
Finite Rate Chemistry		●	●		
Pollutants and Soot Modeling		●	●		
Sparse Chemistry Solver Dynamic Cell Clustering Dynamic Adaptive Chemistry		●	●		
Ability to Use Model Fuel Library Mechanisms		●	●		
Flame-speed from Fuel-Component Library		●	●		

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<b>FORTE CAPABILITIES</b>					
DPIK Spark-Ignition Model		●	●		
Internal Combustion Engine Specific Solution		●	●		
Ge-rotor, screw compressor and scroll compressor modeling		●	●		
<b>CHEMKIN-PRO CAPABILITIES</b>					
Species Transport			●		
Finite Rate Chemistry			●		
Multiphase Reactions			●		
Pollutants and Soot Modeling			●		
Sparse Chemistry Solver Dynamic Cell Clustering Dynamic Adaptive Chemistry			●		
Ability to Use Model Fuel Library Mechanisms			●		
Flame-speed from Fuel-Component Library			●		
Internal Combustion Engine Specific Solution			●		
0-D/1-D/2-D Reactor Models and Reactor Networks			●		
Plasma Reactions			●		
Comprehensive Surface-Kinetics			●		
Chemical and Phase Equilibrium			●		
Flamelet Table Generation			●		
Flame speed and Ignition Table Generation			●		
Reaction Sensitivity, Uncertainty and Path Analysis			●		
Surrogate Blend Formulation and Optimization			●		
Mechanism Reduction			●		
Reaction Workbench			●		
Model Fuel Library		●	●		
<b>FENSAP-ICE CAPABILITIES</b>					
Simulation of Standard Droplets, SLD and Ice Crystals			●		
Inclusion of Vapor/Humidity Effects on Icing			●		

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<b>FENSAP-ICE CAPABILITIES</b>					
Icing Environments of Appendices C, O (SLD) and D (Ice Crystals)			●		
Pre-Defined Droplet Size Distributions			●		
Simulation of Rime, Glaze and Mixed Icing			●		
Single and Multi-Shot Icing Simulations with Mesh Deformation for Prediction of Ice Accretion and Aerodynamic Performance Degradation			●		
Single and Multi-Shot Icing Simulations with Automatic Re-Meshing for Prediction of Ice Accretion and Aerodynamic Performance Degradation			●		
Conjugate Heat Transfer (CHT) for Anti and De-Icing Simulations			▲		
Ice Cracking			●		
Ice Shedding			●		
<b>ACCESS TO ADDITIONAL APPLICATIONS</b>					
DesignModeler				●	
Discovery Modeling / SpaceClaim		●	●		
Ansys Meshing (Workbench Meshing)	●	●	●		
ICEM CFD		●	●		
EnSight Enterprise		●	●		
DesignXplorer		●	●		

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<b>/ AUTONOMOUS VEHICLE SIMULATION</b>	<b>AVxcelerate for Headlamp</b>	<b>AVxcelerate for Sensors</b>							
<b>HUMAN VISION</b>									
Glare Simulation	●								
<b>HEADLAMP SIMULATION</b>									
Advanced Lighting System	●	●							
Lamp Control	●	●							
Virtual Measurement	●								
Glaring Simulation	●								
IIHS / C-IASI Regulation Validation	●								
<b>SENSORS SIMULATION</b>									
Ground-Truth Sensor	▲	▲							
Optical Camera Sensor		●							
LiDAR Sensor		●							
Radar Sensor		●							
Multi Sensors		●							
<b>ENVIRONMENT SIMULATION</b>									
Basic Driving Scenario	●	■							
Advanced Driving Scenario	■	■							
Advanced Vehicle Dynamic	■	■							
MiL/SiL Connectivity	●	●							
HiL Connectivity		●							
<b>PREPARATION</b>									
Environment Preparation		●							
Headlamp Preparation	●								
Sensor Models Preparation		●							
Libraries of Assets	●	●							

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/ <b>DIGITAL TWIN</b>		<b>TWIN BUILDER</b>																		
<b>SYSTEM SIMULATION, VALIDATION AND DIGITAL TWINS</b>																				
Integrated Graphical Modeling Environment	●																			
Standard Modeling Languages and Exchange Formats	●																			
Mult-domain Systems Modeler	●																			
Extensive OD Application-Specific Libraries	●																			
3rd Party Tool Integrations	●																			
3D ROM	●																			
Embedded Software Integration	●																			
Mult-Domain System Simulation	●																			
Rapid HMI Prototyping	●																			
System Optimization	●																			
XIL Integration	●																			
IIOT Connectivity (Microsoft® Azure® IoT, Microsoft Azure Digital Twins, PTC ThingWorx®, SAP Predictive Asset Insights, Rockwell Automation Emulate 3D and Rockwell Studio 5000)	●																			
Digital Twin Runtime Deployment	●																			
Hybrid Analytics	●																			

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/ EMBEDDED SOFTWARE	SCADE Architect	SCADE Suite	SCADE Display	SCADE Test	SCADE Lifecycle	SCADE for A661 Applications	SCADE Vision			
<b>MODEL-BASED SYSTEMS ENGINEERING</b>										
Systems Requirements Analysis	▲	▲								
System & Software Architecture Design	●	●								
SysML Models Import	●	●								
Collaborative Work through Libraries and Model Synchronizations	●	●								
Model Checks	●	●								
Model Diff/Merge	●	●								
System/Software Bi-Directional Sync	●	●								
Model Sharing and IP Protection	●	●								
Model-Based Interface Control Document Production	●	●								
Configurable for Industry Standards (IMA, AUTOSAR, etc.)	●	●								
Product Configuration for Automotive Developers	●	●								
<b>EMBEDDED CONTROL &amp; HMI SOFTWARE</b>										
Traceability with Requirement Management Tools	●	●	●	●	●	●	●			
Automatic Document Generation	●	●	●	●	●	●	●			
Data Flow and State Machine Design and Simulation Capabilities		●					●			
Extensive Set of Libraries		●	●	●			●			
Record and Playback Scenarios		●	●	●						
Plant Model co-Simulation including FMI		●	●	●			●			
On Host and on Target Testing		●	●	●						
Model and Code Structural Coverage		●	●	●			●			
AUTOSAR-Compliant Code Generation		●								
Formal Verification		●								
Timing and Stack Optimization		●								
Worst Case Execution Time Estimates on Target		●								
Integration with Real-Time Operating Systems		●								

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<b>EMBEDDED CONTROL &amp; HMI SOFTWARE</b>										
Certified Code Generation for DO-178C, EN 50128, ISO26262, IEC 61508		●	●							
Certification Kits for DO-178C, EN50128, ISO 26262, IEC 61508		●	●	●	●	●				
Model-Based Prototyping and Specification of HMIs			●			●				
Support of OpenGL, OpenGL SC and OpenGL ES			●			●				
Font Management			●			●				
Optimization of Graphical Specifications			●							
Solutions for ARINC 661		●	●			●				
<b>PERCEPTION SOFTWARE TESTING</b>										
Preception Software Robustness Testing							●			
Triggering Conditions Identification							●			

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<b>LICENSING AND INSTALLATION</b>										
Upgrade to Aras SP14		●								
Elastic Licensing	●									
Scalar Variations for Parametric Design Study				●	●					
<b>DATA MANAGEMENT</b>										
Data and Project Comparison		●								
Enhanced Branching		●								
Custom Digital Thread Configurability		●								
Automatic file conversion		●								
New folder widget, saved search for details list		●								
Added file support for metadata extraction		●								
Query Builder		●								
Metadata Extraction		●								
3D Viewer with Rich Exploration Options		●								
ECAD Viewer		●								
SCADE Project File Support		●								
Revision Management		●								
File Format Conversion		●								
<b>PROCESS MANAGEMENT</b>										
Work Request History Report		●								
New Voting Dialog		●								
Enhanced Gantt Chart		●								
Change Notice Comparison		●								
Task Completion		●								
Simulation Task Review		●								
<b>APPLICATION MANAGEMENT</b>										
New Applications Page Layout		●								
Publish and Deploy Apps (optiSLang supported out-of-the-box)		●								
Ansys LS-Dyna Batch Job Template		●								

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<b>APPLICATION MANAGEMENT</b>								
Job Submission to Ansys HPC Cluster or Ansys Cloud		●						
Access Local Applications		●						
Run Apps without Input Files		●						
Remote Virtual Desktop		●						
<b>INTEGRATIONS</b>								
Ansys Electronics Desktop Add-In		●	●					
Integration with Ansys Workbench			●	●	●			
Integration with Ansys Materials Product Family		●	●	●	●			
Two-Way Integration with ModelCenter				●	●			
Integration with optiSLang		●						
German Language Support		●						
Integration with LS-OPT			●	●	●			
<b>WORKFLOW MANAGEMENT</b>								
Completely Secure Workflows	●							
Enhanced File Management	●							
<b>TOOL INTEROPERABILITY</b>								
Ability to submit HPC jobs from desktop apps to Ansys Cloud	●							
Supported running Ansys Cloud In browser interactively	●							
Support of HPC Solver Licenses	●			●	●			
Improved submission in AEDT	●							
<b>ORCHESTRATION AND AUTOMATION</b>								
Build and Automate Workflows				●	●			
Integrate 3rd Party Tools				●	●			
App Generation Wizard					●			
Test-Run and Desktop App				●	●			
Classic Design of Experiments			●	●	●			
Sampling and Sensitivity Analysis			●	●	●			
Robust Design Optimization			●	●	●			

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<b>PRODUCT IMPROVEMENT</b>								
Scalar Meta-Modeling (including test data)			●	●	●			
Signal/Field Meta-Modeling (including sensor & 3D scan data)					●			
Modeling of Imperfect Surfaces for UQ					●			
AI for Metamodeling (including algorithms from Probaligence)					●			
Optimization & Sensitivity Analysis				●	●		●	●
Model Calibration				●	●			
Concurrent Design Point Variations				●	●			
Linux Support for DesignXplorer Algorithms				●	●			
<b>PRODUCT ROBUSTNESS</b>								
Robust Design & Reliability Analysis				●	●			
Reliability Importance				●	●			
Poisson Distribution for Stochastic Parameters				●	●			
<b>DASHBOARDS AND REPORTS</b>								
Dashboard 2.0		●						
Custom Widget Framework		●						
Bookmark Dashboards		●						
<b>AUTOMATE ANY MODELING AND SIMULATION TOOL</b>								
Automate File I/O tools						●	●	●
Scripting with VBScript, JScript, Java, Perl, and Python						●	●	●
Integration with 3rd Party Tools						●	●	●
<b>AUTHOR ENGINEERING WORKFLOWS</b>								
Sequence						●	●	●
Loop						●	●	●
If-Then Branch						●	●	●
Parallel Branch						●	●	●
Link Editor						●	●	●

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<b>AUTOMATICALLY EXECUTE THE WORKFLOW</b>										
Single Execution						●	●	●		
Multi-Run Trade Studies						●	●	●		
Run in Parallel						●	●	●		
<b>SHARE AUTOMATED ANALYSES AND WORKFLOWS</b>										
Remote Execution						●	●	●		
Protect Intellectual Property						●	●	●		
<b>GAIN INSIGHT TO THE DESIGN PROBLEM</b>										
Trade Study: Parametric Study							●	●		
Trade Study: Design of Experiments (DOE)							●	●		
Trade Study: Adaptive Design of Experiments							●	●		
Sensitivity Analysis							●	●		
<b>VISUALIZE THE DESIGN SPACE</b>										
2D Bar Plot							●	●		
2D Line Plot							●	●		
2D Scatter Plot							●	●		
3D Scatter Plot							●	●		
Carpet Plot							●	●		
Contour Plot							●	●		
Histogram Plot							●	●		
Interaction Effects Plot							●	●		
Main Effects Plot							●	●		
Main Effects Summary Plot							●	●		
Parallel Coordinates							●	●		
Prediction Profiler Contour Plot							●	●		
Prediction Profiler XY Plot							●	●		
Scatter Matrix							●	●		
Variable Importance Plot							●	●		
Variable Importance Summary Plot							●	●		

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<b>PROBABILISTIC ANALYSIS</b>								
Monte Carlo Analysis							●	●
<b>DESIGN OF EXPERIMENTS (COMMON)</b>								
Box-Behnken							●	●
Custom							●	●
Central Composite							●	●
Eighth Fractional Factorial							●	●
Face Centered Central Composite							●	●
Foldover							●	●
Franklin-Bailey 2 Level Fractional Factorial							●	●
Full Factorial							●	●
Half Factorial							●	●
Latin-Hypercube							●	●
Parameter Scan							●	●
Plackett-Buman							●	●
Selected 2 Level Fractional Factorial							●	●
Sixteenth Fractional Factorial							●	●
Taguchi 2 Level Orthogonal Array							●	●
<b>DESIGN OF EXPERIMENTS (NORTH AMERICA ONLY)</b>								
Noesis Adaptive DOE							●	●
<b>DESIGN OF EXPERIMENTS (GLOBAL)</b>								
Design Explorer Orthogonal Array							●	●
Design Explorer Orthogonal Array + LHS							●	●
<b>CONNECT ANY ENGINEERING ANALYSIS TO SYSTEMS ARCHITECTURE MODEL</b>								
NoMagic MagicDraw® / Cameo®						●	●	●
IBM Rhapsody®						●	●	●
PTC Windchill Modeler®						●	●	●
Vitech (Zuken) GENESYS®						●	●	●
Capella						●	●	●

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<b>SIMULATE COMPLEX SYSTEM BEHAVIOR</b>										
Execute State Machine Diagrams (Cameo®)									●	
<b>VERIFY REQUIREMENTS</b>										
Physical Requirements						●	●	●		
Behavioral Requirements (Cameo® and Windchill Modeler®)						●	●	●		

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<b>/ SAFETY ANALYSIS</b>	<b>medini analyze</b>	<b>medini analyze for Semiconductors</b>	<b>medini analyze for Cybersecurity</b>	<b>Digital Safety Manager</b>			
<b>FUNCTIONAL SAFETY ANALYSIS</b>							
Safety Concept Modeling	●	●					
Model Based Safety Analysis	●	●					
Reliability Prediction and Analysis	●	●					
Traceability and Validation Teamwork	●	●					
Integration into Engineering Environment	●	●					
Customization and Process Adaption	●	●					
Ansys Product Integration	●	●					
Reporting and Documentation	●	●					
Safety of Intended Functional Analysis	●	●					
<b>CYBERSECURITY ANALYSIS</b>							
Analysis Context Establishment and Asset Identification			●				
Systems Vulnerability Analysis			●				
Threat Identification			●				
Attack Trees, Attack Path Calculation and Attack Collections			●				
Threat Assessment and Treatment			●				
Requirement Analysis and Management			●				
Rich Traceability			●				
Teamwork and Integrated Task Management			●				
Reporting and Customization			●				
<b>SAFETY MANAGEMENT</b>							
Tool Guided Safety Planning				●			
Assignment & Assisted Reuse of Analysis Results for Safety Activities				●			
Task Based Safety Plan Execution				●			
Dashboard with KPI Monitoring and Reporting				●			

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<b>/ OPTICS</b>	<b>Speos Pro</b>	<b>Speos Premium</b>	<b>Speos Enterprise</b>	<b>Speos Optical Part Design</b>	<b>Speos Optical Sensor Test</b>	<b>Speos Hud Design And Analysis</b>	<b>Speos Far Infrared Extension</b>	<b>Speos Optical Design Optimizer</b>	<b>OpticsBuilder</b>	<b>OpticStudio Professional</b>	<b>OpticStudio Premium</b>	<b>OpticStudio Enterprise</b>		
<b>ANSYS PRODUCTS EMBEDDED</b>														
Ansys SpaceClaim Direct Modeler	●	●	●											
Ansys SpaceClaim Catia V5 Interface	●	●	●											
Ansys DesignXplorer	●	●	●											
Ansys License Manager	●	●	●											
<b>GENERAL SOLVER CAPABILITIES</b>														
Monte-Carlo Forward Ray Tracing	●	●	●											
Monte-Carlo Backward Ray Tracing		●	●											
Deterministic Simulation	▲	●	●											
Spectral Propagation	●	●	●											
Dispersion	●	●	●											
Surface Diffusion	●	●	●											
Volumic Diffusion	●	●	●											
Ambiant Material	●	●	●											
Non-Homogeneous Materials	●	●	●											
SPEOS Live Preview (GPU Acceleration)		● <sup>12</sup>	● <sup>12</sup>											
Speos GPU Compute (GPU Acceleration)		● <sup>12</sup>	● <sup>12</sup>											
Virtual BSDF			● <sup>10</sup>											
<b>PHOTOMETRY / RADIOMETRY</b>														
Intensity	●	●	●											
Illuminance	●	●	●											
3D Illuminance	●	●	●											
Luminance	▲	●	●											
3D Energy Density		●	●											
360 View - Observer		●	●											
360 View - Immersive		●	●											

● Full Support    ▲ Limited Capability    ■ Requires more than 1 product

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<b>HUMAN VISION</b>														
Dynamic Adaption			●											
Glare Simulation			●											
HDR10 Screen Support			●											
<b>WAVELENGTH RANGE</b>														
Visible (360nm - 830nm)	●	●	●											
UV (100nm - 360 nm)		●	●											
Near IR (830nm - 2.5um)		●	●											
Far Infra-Red (2.5um - 100um)							●							
<b>OPTICAL DESIGN</b>														
Parabolic Surface	● <sup>12</sup>	● <sup>12</sup>	● <sup>12</sup>											
TIR Lens	● <sup>12</sup>	● <sup>12</sup>	● <sup>12</sup>											
Projection Lens	● <sup>12</sup>	● <sup>12</sup>	● <sup>12</sup>											
Optical Lens				●										
Optical Surface				●										
Light Guide				●										
Sharp Cut-Off Reflector				●										
Poly-Ellipsoidal Surface				●										
Micro Optical Stripes				●										
Freeform Lens				● <sup>11</sup>										
Honeycomb Lens				●										
<b>OPTICAL SENSOR</b>														
Field of View					●									
Export Sensor Grid as Geometry					●									
Camera Sensor					●									
Camera Raw Signal Export					●									
Camera Sensor Post Processing					●									
Dynamic Effects in Camera Simulation	●	●	●											
Dynamic Effects in LiDAR Simulation	●	●	●											

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<b>OPTICAL SENSOR</b>														
SPEOS Lens System Importer (ZEMAX OpticStudio)					●									
LiDAR Sensor					●									
LiDAR Rotating & Scanning					●									
LIDAR Raw Time of Flight generation					●									
<b>HEAD-UP DISPLAY</b>														
HUD Optical Analysis						●								
HUD Optical Design						●								
HUD Visualisation						●								
<b>SOLVER PERFORMANCES</b>														
Default Number of Cores	4	4	4											
Parallel Solving on Local PC	●	●	●											
Parallel Solving on Cluster	●	●	●											
Parallel Solving with Ansys Cloud Launched from Desktop	●	●	●											
Ansys RSM Compatibility	●	●	●											
Multi-GPU Solving on Local PC		●	●											
<b>SIMULATION PREPARATION</b>														
Source Group	●	●	●											
Geometry Group	●	●	●											
Local Meshing	●	●	●											
3D Textures		●	●											
Polarizer		●	●											
Fluorescent Converter		●	●											
Light Field	●	●	●											
Preset Manager	●	●	●											

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<b>SIMULATION PREPARATION</b>														
Texture Mapping (Bump, Multi-Layer)		●	●											
Uniform Ambient Source	●	●	●											
HDRI Source	●	●	●											
CIE Sky Source		●	●											
Natural Light Source		●	●											
Near Infrared Extended Ambient Source		●	●											
Thermic Source							●							
<b>POST PROCESSING</b>														
Virtual Lighting Controller		●	●											
Photometric Numerical Certification	●	●	●											
Colorimetric Analysis	●	●	●											
Spectral Analysis		●	●											
Light Expert	●	●	●											
Layer by Source		●	●											
Layer by Face		●	●											
Layer by Sequence		●	●											
Stray Light Analysis		●	●											
Layer by Polarisation		●	●											
Visibility and Legibility			●											
Night Vision Goggle							●							
Script Automation	●	●	●											
<b>OPTIMIZATION</b>														
Parameters	●	●	●											
Design of Experiment	● <sup>3</sup>	● <sup>3</sup>	● <sup>3</sup>											
Design Optimisation	● <sup>3</sup>	● <sup>3</sup>	● <sup>3</sup>					● <sup>10</sup>						
Ansys optiSLang Interface (12)	■	■	■											

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<b>TOOL INTEROPERABILITY</b>														
Shared Workflows with Ansys Lumerical Products	●	●	●											
Shared Workflows with Ansys Zemax OpticStudio	●	●	●											
Shared Workflows with Ansys Mechanical	●	●	●											
<b>IMAGING &amp; AFOCAL DESIGN</b>														
Sequential Ray Tracing										●	●	●		
12 Field Points										●	●	●		
50 Field Points (Best For Aspheric Design)										●	●	●		
2000+ Field Points (Best For Freeforms)											●	●		
Optimization										●	●	●		
Contrast Optimization										●	●	●		
High-Yield Optimization										●	●	●		
Tolerancing										●	●	●		
Quick Yield Analysis										●	●	●		
Tolerance Data Viewer										●	●	●		
Tolerance Data Analysis										●	●	●		
Black Box Encryption										●	●	●		
Image Quality Analysis										●	●	●		
Image Simulation Analysis										●	●	●		
Full-Field Aberration Analysis										●	●	●		
Aspheric Design										●	●	●		
Freeform Optics										●	●	●		
Diffraction Optics										●	●	●		
Ghost Focus Generator										●	●	●		
Multiple Configurations										●	●	●		
Birefringence										●	●	●		
Stock Lens Matching Tool										●	●	●		
TrueFreeform											●	●		

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<b>LIGHTING AND ILLUMINATION DESIGN</b>														
Non-sequential ray tracing										●	●	●		
Geometric light sources										●	●	●		
Measured light sources										●	●	●		
Objects										●	●	●		
Detectors										●	●	●		
Optimization										●	●	●		
Freeform Optics										●	●	●		
Tolerancing										●	●	●		
Colorimetry										●	●	●		
Ray splitting										●	●	●		
Ray scattering										●	●	●		
Measured source models											●	●		
Measured surface scattering models											●	●		
LightningTrace											●	●		
Source Illumination Map											●	●		
Phosphor & fluorescence modeling											●	●		
Path analysis											●	●		
<b>PROGRAMMING AND INTERFACE</b>														
Zemax Programming Language										●	●	●		
User-configurable shortcut keys										●	●	●		
MATLAB interoperability										●	●	●		
User-defined surfaces and objects										●	●	●		
User-defined scatter profiles and sources										●	●	●		
Programmable interface (ZOS-API)										●	●	●		



<b>/ OPTICS</b>	<b>Speos Pro</b>	<b>Speos Premium</b>	<b>Speos Enterprise</b>	<b>Speos Optical Part Design</b>	<b>Speos Optical Sensor Test</b>	<b>Speos Hud Design And Analysis</b>	<b>Speos Far Infrared Extension</b>	<b>Speos Optical Design Optimizer</b>	<b>OpticsBuilder</b>	<b>OpticStudio Professional</b>	<b>OpticStudio Premium</b>	<b>OpticStudio Enterprise</b>		
<b>LASERS &amp; FIBERS</b>														
Gaussian beams										●	●	●		
Scanning systems										●	●	●		
Single mode fiber coupling										●	●	●		
Multi-mode fiber coupling										●	●	●		
Optimization										●	●	●		
Tolerancing										●	●	●		
Physical Optics Propagation										●	●	●		
M2 & beam quality										●	●	●		
<b>CAD INTEGRATION</b>														
Export to STEP, IGES, SAT, STL										●	●	●		
Import STEP, IGES, SAT, STL										●	●	●		
Dynamic link to CAD Software											●	●		
Part-designer - static parts										●	●	●		
Part-designer - dynamic parts											●	●		
<b>DATA LIBRARIES</b>														
Design Templates collection										●	●	●		
Lens Catalog										●	●	●		
Materials Catalog										●	●	●		
Coatings Catalog										●	●	●		
Test Plate Lists										●	●	●		
Spectrum Data Files										●	●	●		
IS Scatter Catalog											●	●		
Radiant Source Models											●	●		
IES Source Models											●	●		

<b>/ OPTICS</b>	<b>Speos Pro</b>	<b>Speos Premium</b>	<b>Speos Enterprise</b>	<b>Speos Optical Part Design</b>	<b>Speos Optical Sensor Test</b>	<b>Speos Hud Design And Analysis</b>	<b>Speos Far Infrared Extension</b>	<b>Speos Optical Design Optimizer</b>	<b>OpticsBuilder</b>	<b>OpticStudio Professional</b>	<b>OpticStudio Premium</b>	<b>OpticStudio Enterprise</b>		
<b>STAR</b>														
FEA Data Viewer												●		
Load FEA Data tool												●		
Fit Assessment tool												●		
Alignment Check												●		
Structural Data Summary												●		
Thermal Data Summary												●		
STAR System Viewer												●		
Performance Analysis												●		
2D Deformation Plot												●		
Thermal Index Plot												●		
<b>OPTICSBUILDER</b>														
Import .ZBD file									●					
Update .ZBD file									●					
Export .ZBD file									●					
Static Boundary Rays									●					
Generate reference geometry									●					
Add mounting edge									●					
Add fold mirror									●					
Add sources and detectors									●					
Region of interest									●					
Apply surface properties									●					
Create ray filter									●					
Animate rays									●					
Hide/Show Rays									●					
Partial Rays									●					
Ray Geometry									●					
Chief Rays									●					

● Full Support    ▲ Limited Capability    ■ Requires more than 1 product

/ OPTICS	Speos Pro	Speos Premium	Speos Enterprise	Speos Optical Part Design	Speos Optical Sensor Test	Speos Hud Design And Analysis	Speos Far Infrared Extension	Speos Optical Design Optimizer	OpticsBuilder	OpticStudio Professional	OpticStudio Premium	OpticStudio Enterprise		
<b>OPTICSBUILDER</b>														
Ray Footprints									●					
Show Tolerances									●					
Generate lens drawings									●					
Optical geometry properties									●					
Editable optics									●					
System settings									●					
Optomechanical Packaging Analysis									●					
Simulation									●					
Results									●					
Show detectors									●					
Report									●					
Show Clipping Rays									●					
Show Contaminating Rays									●					
Print									●					

<b>/ ELECTRONICS</b>	<b>Maxwell</b>	<b>HFSS</b>	<b>Siwave</b>	<b>Q3D Extractor</b>	<b>Icepak</b>	<b>Motor-CAD</b>	<b>EMA3D Cable</b>	<b>EMA3D Charge</b>	<b>Nuhertz FilterSolutions</b>	<b>Electronics Pro 2D</b>	<b>Electronics Enterprise</b>
<b>LOW FREQUENCY ELECTROMAGNETICS</b>											
Electrostatics	●									●	●
AC Conduction	●									●	●
DC Conduction	●									●	●
Magnetostatics	●									●	●
Adaptive Field Mesh	●									●	●
AC Harmonic Magnetic	●									●	●
Electric Transient	●										●
<b>MAGNETIC TRANSIENT</b>											
Translational Motion	●									●	●
Fully Automatic Symmetrical Mesh Generation	●									●	●
Rotational Motion	●									●	●
Non-Cylindrical Motion	●									●	●
Advanced Embedded Circuit Coupling	●									●	●
Circuit Coupling with Adaptive Time Stepping	●									●	●
Direct and Iterative Matrix Solvers	●									●	●
<b>ADVANCED MAGNETIC MODELING</b>											
Vector Hysteresis Modeling	●									●	●
Multi-Conductive Terminals Modelling (PCBs, Busbars etc.) / A-Phi Solver	●										●
Hysteresis Modeling for Anisotropic Material	●									●	●
Frequency Dependent Reduced Order Models	●									●	●
Reduced Order Model Extraction (Linear-Motion, Rotational-Motion, No- Motion)	●									●	●
Functional Magnetization Direction	●									●	●
Magnetization/De- Magnetization Modeling	●									●	●
Manufacturing Dependent Core L Loss Models	●									●	●
Noise – Vibration Modeling	■									■	■
Temperature Dependent De-Magnetization Modeling	●									●	●

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<b>/ ELECTRONICS</b>	<b>Maxwell</b>	<b>HFSS</b>	<b>Siwave</b>	<b>Q3D Extractor</b>	<b>Icepak</b>	<b>Motor-CAD</b>	<b>EMA3D Cable</b>	<b>EMA3D Charge</b>	<b>Nuhertz FilterSolutions</b>	<b>Electronics Pro 2D</b>	<b>Electronics Enterprise</b>
<b>ADVANCED MAGNETIC MODELING</b>											
Temperature Dependent Core Loss Computation	●									●	●
Lamination Modeling	●									●	●
Magnetostriction and Magnetoelastic Modeling	●									●	●
Hardware in the Loop Modeling	●									●	●
Integrated Motor Synthesis and Design Kit	●									●	●
Integrated Planar Magnetics Synthesis and Design Kit	●									●	●
Temperature Dependant Litz Wire Modeling	●									●	●
Litz Wire Modeling	●									●	●
<b>CONCEPT DESIGN SOLUTION FOR ELECTRICAL MACHINE</b>											
Template-Based Magnetic Topologies						●					
Template-Based Cooling Topologies						●					
Magnetic 2D FEA with Analytical Solution						●					
Thermal 2D FEA						●					
3D Thermal and Fluid Network						●					
Optimization Workflow						■					
Temperature Dependent Duty-Cycle Analysis						●					
Manufacturing Effects Due to Winding Impregnation and Housing Interfaces						●					
Linear Structural 2D FEA						●					
Noise Vibration Harness Analytical Modelling						●					
Electrothermal Reduced Order Model (FMU)						●					
<b>HIGH FREQUENCY ELECTROMAGNETICS</b>											
Fully Automated Adaptive Mesh Refinement		●									●
Multi-Frequency Broadband Adaptive Meshing		●									●
Frequency Domain Finite Element (FEM) Analysis		●									●
Frequency Domain Integral Equation (MoM) Analysis		●									●
Time Domain FEM Analysis		●									●
FEM Eigenmode Analysis		●									●
MoM Characteristic Mode Analysis		●									●

● Full Support    ▲ Limited Capability    ■ Requires more than 1 product

<b>/ ELECTRONICS</b>	<b>Maxwell</b>	<b>HFSS</b>	<b>Siwave</b>	<b>Q3D Extractor</b>	<b>Icepak</b>	<b>Motor-CAD</b>	<b>EMA3D Cable</b>	<b>EMA3D Charge</b>	<b>Nuhertz FilterSolutions</b>	<b>Electronics Pro 2D</b>	<b>Electronics Enterprise</b>
<b>HIGH FREQUENCY ELECTROMAGNETICS</b>											
Physical Optics (PO) Analysis		●									●
Shooting and Bouncing Ray+ (SBR+) Analysis		●									●
Physical Theory of Diffraction (PTD) Correction for SBR		●									●
Uniform Theory of Diffraction (UTD) Correction for SBR		●									●
Visual Ray Tracing for SBR+ Analysis		●									●
SBR+ Creeping Wave Correction for RCS of Curved Objects		●									●
Range Doppler Plots for Radar Scenario Analyses											●
Accelerated Doppler Processing (ADP) for SBR+ Range Doppler Analyses											●
RF and Digital Filter Synthesis and Design									●		
Domain Decomposition Method (DDM) for Frequency Domain FEM Analysis		●									●
Hybrid Finite Element/ Integral Equation Analysis		●									●
Efficient Wirebond Package Meshing		●									●
UI Coupled Finite Element and/or IE with SBR+ Analysis		●									●
Modal Wave Port Excitation		●									●
Terminal Wave Port Excitations		●									●
Lumped, Voltage and Current Excitations		●									●
Circuit Port Excitations		●									●
Parametric Antenna Excitations for SBR+		●									●
Floquet Excitations		●									●
Incident Wave Excitation		●									●
Magnetic Ferrite Bias Excitation		●									●
Perfect Electric and Magnetic Boundary		●									●
Finite Conductivity Boundary		●									●
Lumped RLC Boundary		●									●
Symmetry Boundary		●									●
Periodic Boundary		●									●
Frequency Dependant Materials		●									●

<b>/ ELECTRONICS</b>	<b>Maxwell</b>	<b>HFSS</b>	<b>Siwave</b>	<b>Q3D Extractor</b>	<b>Icepak</b>	<b>Motor-CAD</b>	<b>EMA3D Cable</b>	<b>EMA3D Charge</b>	<b>Nuhertz FilterSolutions</b>	<b>Electronics Pro 2D</b>	<b>Electronics Enterprise</b>
<b>HIGH FREQUENCY ELECTROMAGNETICS</b>											
Spatial XYZ Material Properties Via Dataset		●									●
Higher and Mixed Order Elements		●									●
Curvilinear Element Mesh Correction		●									●
S,Y,Z Matrix Results		●									●
E, H, J, P Field Results		●									●
Direct and Iterative Matrix Solvers		●									●
Antenna Parameter Calculation		●									●
Infinite and Finite Antenna Array Calculations		●									●
Radar Cross Section Calculation		●									●
FSS, EBG and Metamaterial Calculation		●									●
Specific Absorption Rate Calculation		●									●
EMI/EMC Calculation		●									●
System Level EMI and RFI Analysis		●								●	●
Linear Circuit Analysis with EM Dynamic link		●									●
Integrated Antenna Synthesis and Design Kit		●									●
5G SAR Standards Toolkit		●									●
Power Density and CDF		●									●
Radar Prep/Post Simulation Wizards		●									●
3D Component Libraries with User Controlled Parametrics		●									●
3D Component with Encryption Creation		●									●
3D Component with Encryption Utilization		●									●
RF Discharge Solver		●									●
Mutli-paction Solver		●									●
Volumetric SBR+ for 3D Dielectrics		●									●
Surface Roughness Model for SBR+		●									●
Accelerated Doppler Processing (ADP) for SBR+ Range-Doppler Analysis											●

<b>/ ELECTRONICS</b>	<b>Maxwell</b>	<b>HFSS</b>	<b>Siwave</b>	<b>Q3D Extractor</b>	<b>Icepak</b>	<b>Motor-CAD</b>	<b>EMA3D Cable</b>	<b>EMA3D Charge</b>	<b>Nuhertz FilterSolutions</b>	<b>Electronics Pro 2D</b>	<b>Electronics Enterprise</b>
<b>POWER AND SIGNAL INTEGRITY BOARD SIMULATION CAPABILITIES</b>											
Electronics Desktop 3D Layout GUI		●	●		●						●
ECAD Translation (Altium, Cadence, Mentor, Pulsonix, & Zuken)	●	●	●	●	●						●
MCAD (.sat) Generation from ECAD		●	●	●							●
Lead Frame Editor		●	●								●
DC Voltage, Current and Power Analysis for PKG/PCB			●								●
DC Joule Heating with Ansys Icepak			■	■	■						●
Passive Excitation Plane Resonance Analysis			●								●
Driven Excitation Plane Resonance Analysis			●								●
Automated Decoupling Analysis			●								●
Capacitor Loop Inductance Analysis			●								●
AC SYZ Analysis			●								●
Dynamically Linked Electromagnetic Field Solvers			●								●
Chip, Package, PCB Analysis (CPM)		●	●								●
Near-Field EMI Analysis											●
Far-Field EMI Analysis											●
EMI/EMC Full Board Scan											●
Characteristic Impedance (Zo) L PKG/PCB Scan											●
Full PCB/PKG Cross-Talk Scanning											●
TDR Wizard											●
TDR Analysis		●	●	●						●	●
Transient IBIS Circuit Analysis		●	●								●
Signal Net Analyzer											●
SerDes IBIS-AMI Circuit Analysis											●
Macro-Modeling (Network Data Explorer)	●	●	●	●							●
Steady State AC (LNA) Analysis			●								●
Virtual Compliance - DDRx, GDDRx, & LPDDRx											●



<b>/ ELECTRONICS</b>	<b>Maxwell</b>	<b>HFSS</b>	<b>Siwave</b>	<b>Q3D Extractor</b>	<b>Icepak</b>	<b>Motor-CAD</b>	<b>EMA3D Cable</b>	<b>EMA3D Charge</b>	<b>Nuhertz FilterSolutions</b>	<b>Electronics Pro 2D</b>	<b>Electronics Enterprise</b>
<b>POWER AND SIGNAL INTEGRITY BOARD SIMULATION CAPABILITIES</b>											
SPISIM Com and USB-C Compliance											●
SPISIM IBIS AMI Generation											●
Synopsys HSPICE Integration			●								●
Cadence PSPICE Support			●								●
Electromagnetically Circuit Driven Field Solvers		●	●								●
<b>RLCG PARASITIC EXTRACTION</b>											
DCRL, ACRL & CG Solver				●						●	●
IC Packaging RLCG IBIS Extraction for Signals & Power				●							●
Touchpanel RLCG Unit Cell Extraction				●							●
Adaptive Meshing for Accurate Extraction				●						●	●
Bus Bar RLCG Extraction	●			●						●	●
Power Inverter & Converter Component Extraction				●							●
3D Component Library				●							●
Reduced RLCG Matrix Operations				●							●
SPICE Equivalent Modeling Export				●						●	●
DCRL & ACRL Joule Heating Analysis with Icepak				●							●
Macro-Modeling (Network Data Explorer)				●							●
2D Cable Modeling Toolkit				●							●
<b>ELECTRONICS COOLING</b>											
Multi-Mode Heat Transfer					●						●
Steady-State and Transient					●						●
CFD Analysis					●						●
Turbulent Heat Transfer					●						●
Multiple-Fluid Analysis					●						●
Species Transport					●						●
Solar Loading					●						●
Reduced Order Flow and Thermal					●						●

● Full Support    ▲ Limited Capability    ■ Requires more than 1 product

<b>/ ELECTRONICS</b>	<b>Maxwell</b>	<b>HFSS</b>	<b>Siwave</b>	<b>Q3D Extractor</b>	<b>Icepak</b>	<b>Motor-CAD</b>	<b>EMA3D Cable</b>	<b>EMA3D Charge</b>	<b>Nuhertz FilterSolutions</b>	<b>Electronics Pro 2D</b>	<b>Electronics Enterprise</b>
<b>ELECTRONICS COOLING</b>											
Network Modeling	■	■	■	■	●						●
Joule Heating Analysis					●						●
Thermo-Electric Cooler Modeling					●						●
Thermostat Modeling					●						●
Package Characterization					●						●
<b>CABLE MODELING</b>											
Finite Difference Time Domain Analysis							●				
Multi-Conductor Transmission Line Analysis	●	●	●	●	●		●			●	●
Two-Way Coupling FDTD and Transmission Line Solver		▲					●				▲
Twisted Conductors							●				
Seam Impedance							●				
Cable Junctions							●				
Braided Shield Support							●				
Pin Voltage, Current Density, Plane Wave Excitations							●				
Multi-Conductor and Multi-Shield Support							●				●
Uses SpaceClaim Design Modeler UI							●				
Thin Surface and Thin Wire Algorithms							●				
<b>HPC FOR ELECTRONICS</b>											
GPU Support	▲	▲			▲						●
HPC Meshing, Multi-Domain, Multi-Technology		●									●
HPC Accelerated Frequency Sweeps	●	●	●								●
HPC Accelerated Broadband Fast Frequency Sweep		●									●
HPC Distributed Hybrid Solving		●									●
HPC Enabled Domain Decomposition Method	●	●									●
HPC Time Decomposition Method	●									●	●
HPC Enabled Multi-port Excitation Acceleration		●									●
HPC Acceleration for DCRL, ACRL and CG				●							●
HPC 2D Skew Parallel Processing	●									●	●
HPC Enabled Parallel Processing	●	●		●	●					●	●

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<b>/ ELECTRONICS</b>	<b>Maxwell</b>	<b>HFSS</b>	<b>Siwave</b>	<b>Q3D Extractor</b>	<b>Icepak</b>	<b>Motor-CAD</b>	<b>EMA3D Cable</b>	<b>EMA3D Charge</b>	<b>Nuhertz FilterSolutions</b>	<b>Electronics Pro 2D</b>	<b>Electronics Enterprise</b>
<b>SYSTEM MODELING FOR POWER ELECTRONICS</b>											
Circuit Simulation	●	●	●	●	●					●	●
Block Diagram Simulation	●	●	●	●	●					●	●
State Machine Simulation	●	●	●	●	●					●	●
VHDL-AMS Simulation	●	●	●	●	●					●	●
Integrated Graphical Modeling Environment	●	●	●	●	●					●	●
Power Electronics Component Libraries	●	●	●	●	●					●	●
Reduced Order Modeling	●	●	●	●	●					●	●
Power Electronic Device and Module Characterization	●	●	●	●	●					●	●
Push-Back Excitation	●	●								●	●
Co-Simulation with Low Frequency Electromagnetics	●									●	●
Co-Simulation with MathWorks Simulink	●	●	●	●	●					●	●
<b>SYSTEM MODELING FOR RF / MICROWAVE</b>											
Radio Frequency Interference (RFI) System Solver		●								●	●
Electromagnetic Interference System Solver		●								●	●
RF Link Budget Analysis		●								●	●
RF Co-Site and Antenna Coexistence Analysis		●								●	●
Automated Diagnostics for Rapid Root-Cause Analysis		●								●	●
RF Component Library		●								●	●
Wireless Propagation Models		●								●	●
Multi-Fidelity Parametric Radio Models		●								●	●
<b>SYSTEM MODELING FOR SI/PI</b>											
SerDes Channel Modeling - IBIS-AMI, QuickEye and VerifEye											●
Multi-Drop & Parallel Bus Modeling - IBIS, HSPICE, Spectre, PSPICE, and Nexxim Transient		▲	●								●
Network Data Exploration	●	●	●	●							●
TDR analysis		●	●								●
Steady State AC (LNA) Analysis		●	●								●
Virtual Compliance - DDRx, GDDRx, & LPDDRx											●

<b>/ ELECTRONICS</b>	<b>Maxwell</b>	<b>HFSS</b>	<b>Siwave</b>	<b>Q3D Extractor</b>	<b>Icepak</b>	<b>Motor-CAD</b>	<b>EMA3D Cable</b>	<b>EMA3D Charge</b>	<b>Nuhertz FilterSolutions</b>	<b>Electronics Pro 2D</b>	<b>Electronics Enterprise</b>
<b>MULTIPHYSICS-PLATFORM TECHNOLOGIES</b>											
Advanced, Automated Data Exchange	●	●	●	●	●						●
Drag-n-Drop Multiphysics	■	■	■	■	■						●
Direct Coupling Between Physics	●	●	●	●	●						●
Collaborative Workflows	●	●	●	●	●						●
Fully Managed Co-Simulation	●	●	●	●	●						●
Flexible Solver Coupling Options	●	●	●	●	●						●
<b>MULTIPHYSICS ELECTRO-THERMAL INTERACTION</b>											
Convection Cooled Electronics	■	■	■		■						●
Conduction Cooled Electronics	■	■	■		■						●
High Frequency Thermal Management		■		■	■						●
Low Frequency Thermal Management	■			■	■						●
<b>MATERIALS FOR ELECTRONICS</b>											
Granta Materials Data for Simulation	■	■	■	■	■	■				■	■
Granta MI Materials Gateway	■	■	■	■	■	■				■	
Ansys Granta Advanced Materials – Electromagnetic	■	■	■	■	■	▲					■
<b>MISCELLANEOUS</b>											
Integrated Windows HPC Support	●	●	●	●	●						
Integrated IBM Spectrum LSF Support	●	●	●	●	●						
Customizable 3rd Party Scheduler Support	●	●	●	●	●						
Support ACT Extensions	▲	▲	▲	▲	▲						▲
Parallel Solving with Ansys Cloud Launched from Desktop	●	●	●	●	●						
Elastic Licensing	●	●	●	●	●	●					
<b>CHARGING AND DISCHARGING MODELING</b>											
Internal Charging								●			
Electrostatic Discharge in Air								●			
Surface Charging								●			
3D Particle Transport								●			
Arcing in Solid Dielectrics								●			
Coupled Charging Simulations								●			

<b>/ PHOTONICS</b>	<b>CHARGE</b>	<b>CML Compiler</b>	<b>DGTD</b>	<b>FDTD</b>	<b>FEEM</b>	<b>HEAT</b>	<b>INTER-CONNECT</b>	<b>qINTER-CONNECT</b>	<b>MODE</b>	<b>MQW</b>	<b>STACK</b>	<b>RCWA</b>	<b>Verilog-A Platform</b>
<b>DESIGN ENVIRONMENT</b>													
Finite Element IDE (with 2D/3D modeling)	●		●		●	●							
Finite Difference IDE (with 2D/3D modeling)				●					●		●	●	
Hierarchical Schematic Editor							●	●					
<b>GENERAL</b>													
HPC-ready / compatible with cloud providers				●					●				
PIC Element Library							●						
Supports CML development and distribution		●					●						
Automated CML generation		●											
Version controlled CMLs		●											
Structured input with template and data validation		●											
Automated test case generation		●											
IP protected CMLs		●					●						
INTERCONNECT and Verilog-A models from single source		●					●						●
Leverage build-in analysis from 3rd party EDA tools													●
Design and model using Verilog-A in 3rd party EDA tools													●
Available in Ansys Cloud	●	●	●	●	●	●	●		●	●	●	●	●
Ansys Cloud HPC Services Integration	●		●	●	●	●			●	●	●	●	
<b>GENERAL SOLVER CAPABILITIES</b>													
Charge transport (electrostatic potential and drift diffusion)	●												
Self-consistent heat/charge modeling	●					●							
Heat transport (heat flux, convection, and radiation)						●							
Finite Element Eigenmode Solver				●	●								
Discontinuous Galerkin Time Domain Solver			●										
Finite Difference Time Domain solver				●									
Finite Difference Eigenmode solver				●					●				
Bidirectional eigenmode expansion									●				
2.5D variational FDTD (varFDTD)									●				
Advanced Finite Difference Conformal Meshing				●					●			▲	

<b>/ PHOTONICS</b>	<b>CHARGE</b>	<b>CML Compiler</b>	<b>DGTD</b>	<b>FDTD</b>	<b>FEEM</b>	<b>HEAT</b>	<b>INTER-CONNECT</b>	<b>qINTER-CONNECT</b>	<b>MODE</b>	<b>MQW</b>	<b>STACK</b>	<b>RCWA</b>	<b>Verilog-A Platform</b>
<b>GENERAL SOLVER CAPABILITIES</b>													
Quantum mechanical band structure calc. (kp method)										●			
Waveguide and band diagram calculation										●			
Gain and spontaneous emission calculation										●			
Temperature, strain, and field effects										●			
Closed form solver for rapid multilayer thin-film analysis											●	●	
Planewave and dipole illumination											●	●	
Capture Interface and microcavity effects											●	●	
Circuit frequency domain analysis							●	●					
Circuit transient mode simulator							●						
Circuit transient block mode simulator							●						
Circuit multi-mode and multi-channel support							●	●					
Circuit mixed signal representation							●						
Laser library with TWLM solver							●						
System library including optical fibre, FEC and MLSE models							●						
Rigorous Coupled-Wave Analysis Solver												●	
Waveguide Bend Calculation for Bend Loss and Ring Analysis					●								
Quantum Logic Gate Simulation								●					
Quantum Loss Extraction								●					
<b>MATERIALS SELECTION &amp; RELATED TOOLS</b>													
Comprehensive Material Models	●		●	●	●	●			●	●	●	●	
Multi-coefficient Models			●	●					●				
Non-linearity Modeling				●	▲				▲				
Anisotropy Modeling				●	▲				▲		●		
<b>OPTIMIZATION</b>													
Inverse Design with lumopt				●					▲				
Particle Swarm	●		●	●	●	●	●		●		▲	▲	
Parameter Sweeps	●		●	●	●	●	●		●	▲	▲	▲	
<b>POST PROCESSING</b>													
Far-Field Projection			●	●	●				●				
Band Structure Analysis				●									
Bidirectional Scattering Distribution Function				●									

● Full Support    ▲ Limited Capability    ■ Requires more than 1 product

<b>/ PHOTONICS</b>	<b>CHARGE</b>	<b>CML Compiler</b>	<b>DGTD</b>	<b>FDTD</b>	<b>FEEM</b>	<b>HEAT</b>	<b>INTER-CONNECT</b>	<b>qINTER-CONNECT</b>	<b>MODE</b>	<b>MQW</b>	<b>STACK</b>	<b>RCWA</b>	<b>Verilog-A Platform</b>
<b>POSTPROCESSING</b>													
Q-Factor Analysis			●	●									
Charge Generation Rate			●	●									
Bend Loss Analysis									●				
Overlap analysis									●				
Model area analysis									●				
Helical waveguides									●				
Extract gain/absorption and spontaneous emission coefficients for TWLM model (INTERCONNECT)										●			
Statistical support (Monte-Carlo Analysis)	●		●	●	●	●	●		●				
Statistical Support (Corner analysis)							●						
Small-signal analysis	●												
Steady-state and transient analysis	●					●							
Laser Self-Heating							●						
<b>TOOL INTEROPERABILITY</b>													
Multiphysics Solver Interoperability	●		●	●	●	●			●				
Automation API (Lumerical script/Matlab/Python)	●		●	●	●	●	●		●	●	●	●	
Circuit electronic photonic co-simulation (3rd party tools)							●						●
optiSLang Integration	●		●	●	●	●	●		●	●	●	●	
Shared workflows with Speos				●							●	●	
Speos Surface Models: BSDF/BRDF format exchange				●									
Speos Surface Models: Diffraction Grating SOP Plugin				●							●	●	
Optics Interoperability Workflows with Speos and/or Zemax				●							●	●	
Process Enabled Photonic Component Design Workflows	●		●	●	●	●			●				
Virtuoso layout integration				●					●				
KLayout integration							●						

<b>/ DESIGN TOOLS</b>	<b>SpaceClaim</b>	<b>DesignModeler</b>	<b>Discovery</b>
<b>FLUIDS</b>			
Inlet and Outlet Conditions			●
Steady-state Flow			●
Transient Flow			●
Incompressible Flow			●
Compressible Flow			▲
Porous Media			●
Rotating Fluid Zone			●
<b>GEOMETRY</b>			
Direct Modeling Technology	●		●
Feature Based Modeling Technology	●	●	●
Open Data from All Major CAD Systems	●	●	●
Modify Imported Geometry	●	●	●
Defeaturing and Simplification Tools	●	●	●
Model Repair	●	●	●
Add Parameters for Design Exploration	●	●	●
Extract Mid-Surfaces/Shells and Beams	●	●	●
Extract Fluid Volumes	●	●	●
Shared Topology for Conformal Meshing	●	●	●
Boundary Condition Mapping	●	●	●
Reverse Engineering Faceted Data	●		●
Prep for Additive Manufacturing	●		●
<b>HEAT TRANSFER</b>			
Steady-state Solid Conduction			●
Transient Solid Conduction			●
Natural Convection			●
Conjugate Heat Transfer			●
External Radiation			●

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- Aqwa = Aqwa



<b>/ DESIGN TOOLS</b>	<b>SpaceClaim</b>	<b>DesignModeler</b>	<b>Discovery</b>
<b>GRANTA MATERIALS DATA FOR SIMULATION</b>			
Materials Data for Simulation			■
<b>MULTIPHYSICS</b>			
Conjugate Heat Transfer			●
Thermal-Stress			●
<b>STRUCTURAL</b>			
Static Structural Analysis			●
Modal Analysis			●
Pre-Stressed Modal Analysis			■
Point Masses			●
Springs			●
Joints			●
Nonlinear Contact			■
Pre-Tension Bolts			●
Large Deformation			■
Topology Optimization			●
<b>TOOL INTEROPERABILITY</b>			
Supported running on the Ansys Cloud In browser interactively	●	●	●
Geometry Transfer to Workbench (WB), Fluent, and Mechanical	●	●	●
Physics Transfer to Fluent, Mechanical, and HFSS			●
<b>HIGH FREQUENCY ELECTROMAGNETICS</b>			
Automated Antenna Simulation Workflow			●
FDTD Solution with Automated Graded Cartesian Grid			●
Circuit Port Excitations			●
Mode Port Excitations			●
Electric and Magnetic Material Properties			●
S Parameters Including Smith Charts and Touchstone Export			●
Electric and Magnetic Field Results			●
Antenna Parameter Calculation			●

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<b>/ DIGITAL MISSION ENGINEERING</b>	<b>STK Pro</b>	<b>STK Premium (Space)</b>	<b>STK Premium (Air)</b>	<b>STK Enterprise</b>	<b>STK Scheduler</b>	<b>STK Solis</b>	<b>STK Missile Tool Kit</b>	<b>PropNav</b>	<b>ODTK</b>	<b>ODTK SSA</b>	<b>STK Engine</b>	<b>DME Component Libraries</b>
<b>MODELING CAPABILITIES</b>												
Physics-based object modeling	●	●	●	●					●			
Full 3D and 2D visualization	●	●	●	●								
Streaming imagery	●	●	●	●								
Integrated timeline view	●	●	●	●								
Reporting and graphing	●	●	●	●					●			
Moviemaking	●	●	●	●								
Geometric sensor models (rectangular, complex conic, SAR, etc.)	●	●	●	●								
Platform attitude profiles (aligned, ECF, ECI, fixed in axes, external-file, etc.)	●	●	●	●								
System constraints (azimuth, elevation, range, line of sight, temporal, lighting, etc.)	●	●	●	●								
Single object access calculations	●	●	●	●								
Many vs. many, multinode access computations	●	●	●	●								
Body masking	●	●	●	●								
Sensor obscuration tool	●	●	●	●								
Import digital terrain data	●	●	●	●								
Terrain-based analysis and route following	●	●	●	●								
RF communications system modeling	●	●	●	●								
Radar system modeling	●	●	●	●								
Urban environment signal attenuation	●	●	●	●								
User-defined coverage grids for data visualization	●	●	●	●								
Advanced orbit trajectory design	▲	●	▲	●								
Test and evaluation planning and results analysis	▲	▲	▲	●								
Parallel computing	▲	●	●	●								
Missile and launch vehicle modeling	●	●	●	●			■ <sup>1</sup>					
Real-time tracking data feeds		●	●	●								
DIS and HLA interfaces		●	●	●								

<b>/ DIGITAL MISSION ENGINEERING</b>	<b>STK Pro</b>	<b>STK Premium (Space)</b>	<b>STK Premium (Air)</b>	<b>STK Enterprise</b>	<b>STK Scheduler</b>	<b>STK Solis</b>	<b>STK Missile Tool Kit</b>	<b>PropNav</b>	<b>ODTK</b>	<b>ODTK SSA</b>	<b>STK Engine</b>	<b>DME Component Libraries</b>
<b>MODELING CAPABILITIES</b>												
Electro-optical and infrared sensor modeling		●	●	●	●							
Model advanced space environment effects		●		●	●							
Consider spacecraft perturbation effects (e.g., solar radiation pressure drag)		●		●	●							
Spacecraft rendezvous and proximity operation maneuver planning templates		●		●	●							
Solar panel power estimation tool		●	●	●	●							
Performance-based aircraft route design			●	●	●							
Wind effects on airborne vehicle trajectories			●	●	●							
Runway and waypoint catalogs			●	●	●							
Correlate external ephemeris to known platform performance envelopes				●	●							
Integrate analysis with SysML state machine simulations					●							
Resource and asset scheduling in STK-modeled missions						■ <sup>1</sup>						
Dynamic spacecraft attitude system modeling							■ <sup>1</sup>					
Emulate onboard spacecraft attitude flight control systems							■ <sup>1</sup>					
Design attitude system P-I-D controls							■ <sup>1</sup>					
Model onboard spacecraft reaction wheels and gyros							■ <sup>1</sup>					
Advance multi-stage missile system modeling								■ <sup>1</sup>				
Proportional navigation and guidance simulation									■ <sup>1</sup>			
<b>SIMULATE &amp; PROCESS SATELLITE / SPACECRAFT TRACKING DATA</b>												
Process spacecraft tracking and measurement data									●			
Resolve spacecraft maneuvers from tracking measurements									●			
Multiple simultaneous orbit solutions									●			
Combine multisource satellite tracking data									●			
Collection of common automation routines for on-orbit operations									■			
Object association and correlation against existing catalog									■ <sup>1</sup>	●		
Automated maneuver processing, characterization, and refined orbit estimations										●		

<b>/ DIGITAL MISSION ENGINEERING</b>	<b>STK Pro</b>	<b>STK Premium (Space)</b>	<b>STK Premium (Air)</b>	<b>STK Enterprise</b>	<b>STK Scheduler</b>	<b>STK Solis</b>	<b>STK Missile Tool Kit</b>	<b>PropNav</b>	<b>ODTK</b>	<b>ODTK SSA</b>	<b>STK Engine</b>	<b>DME Component Libraries</b>
<b>APP DEVELOPMENT API'S</b>												
Software development kit APIs for workflow automation & scripting	●	●	●	●	●	●	●	●	●			
Deployment of custom applications developed using STK's API's											●	
Scalable .DLL's for building custom stand-alone or server-based applications and services												●

<b>/ CLOUD</b>	<b>Ansys Cloud Direct</b>	<b>Ansys Gateway Powered by AWS</b>							
<b>VDI SUPPORT</b>									
Windows (RDP)	●	●							
Linux		●							
In-browser	●								
<b>HPC SUPPORT</b>									
HPC Support	●	●							
<b>CLOUD HARDWARE PROVIDER</b>									
Ansys Managed	●								
Bring Your Own Cloud		●							
<b>STORAGE</b>									
Object Storage	●								
Volume Storage		●							
Shared SMB and NFS Storage		●							
<b>LICENSING</b>									
Bring Your Own License	●	●							
Elastic Licensing	●	●							
<b>AUTHENTICATION</b>									
Ansys ID/SSO	●								
Active Directory Integration		●							
<b>WEB PORTAL</b>									
Access Controls		●							
Template Creation		●							
Budget Control	●	●							
Usage Reporting	●	●							
<b>3RD PARTY TOOLS</b>									
3rd Party Tools		●							

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