



# HI-FIDELITY SIMULATION CAPABILITIES COMPARISON

REQUEST A DEMO →



Designed uniquely for the engineer, PTC's simulation software has the familiar Creo user interface, engineering terminology, and seamless integration with CAD and CAE data. You have at your fingertips a complete structural, thermal, and vibration analysis solution with a comprehensive set of finite elements analysis (FEA) capabilities. Discover how these four offerings compare with one another.

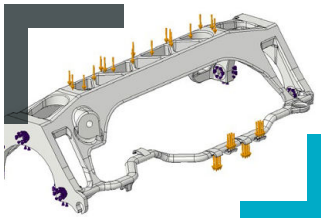
Capability	Creo Ansys Simulation	Creo Ansys Simulation Advanced	PTC Creo Simulation Extension	PTC Creo Advanced Simulation Extension
Static Structural Analysis	✓	✓	✓	✓
Finite Element Modeling Idealization	✓	✓	✓	✓
Automatic Meshing	✓	✓	✓	✓
Results Display & Reporting	✓	✓	✓	✓
H-Element Technology	✓	✓		
P-Element Technology			✓	✓
Modal Analysis	✓	✓	✓	✓
Buckling Analysis			✓	✓
Steady State Thermal Analysis	✓	✓	✓	✓
Design Optimization			✓	✓
Linear Contact Analysis	✓	✓	✓	✓
Large Deformation	✓	✓		✓
Midsurface Shell Compression	✓	✓	✓	✓
Joints	✓	✓		
Non-Linear Contact		✓		✓
Non-Linear Materials		✓		✓
Pre-Stress Static And Modal				✓
Transient Structural				✓
Combined Structural/Thermal		✓		✓
Random Vibration				✓
Dynamic Analysis				✓

## CREO ANSYS SIMULATION AND CREO ANSYS SIMULATION ADVANCED

With Creo Ansys Simulation (CAS) and Creo Ansys Simulation Advanced (CASA), PTC and Ansys put the power of gold-standard simulation at the fingertips of the design engineer. Both solutions offer high-fidelity, high-accuracy simulation for design refinement and validation. Best of all, the capabilities do not require expert knowledge to use and are accessible via the familiar Creo user interface. You can analyze your model and quickly identify problem areas. Once you update the design, you can easily rerun the analysis, without recreating it. CASA gives you all the features of CAS with additional support for non-linear contact, non-linear materials and combined structural and thermal analysis.

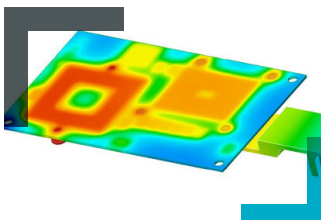
### CREO ANSYS SIMULATION

#### »»» Structural Boundary Conditions



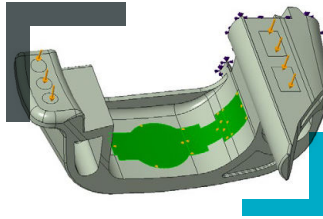
- Fixed Support
- Enforced Translations and Rotations (Optional - apply from a remote point)
- Planar, Cylindrical, Ball and Frictionless Constraints
- Force Load
  - Specified in terms of total or per unit area
  - Total load at a point
- Moment Load
- Pressure Load
- Bearing Load
- Gravity Load
- Centrifugal Loads specified by the angular velocity or angular acceleration of the structure
- Temperature Load
- Linear Acceleration Load

#### »»» Thermal Boundary Conditions



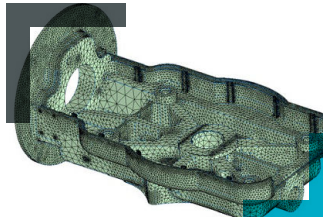
- Boundary Conditions specified on geometry
- Prescribed Temperature
- Convection Condition
- Radiation Condition
- Heat Flow
- Heat Flux
- Heat Generation

## »»» General Modeling Tools



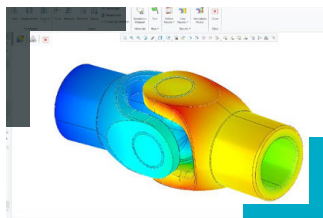
- Units Manager - Commonly used units for all quantities available
  - Creation of custom units and unit systems
  - Model definition in user selected units
- Results in user selected units
- Surface Regions
  - Defined by sketch or curves
- Coordinate Systems
  - History-based, associative, parametric features
  - User defined Cartesian coordinate systems
- Typical metals and plastics included
- Storage of user defined materials

## »»» Meshing, Element Types and Idealizations



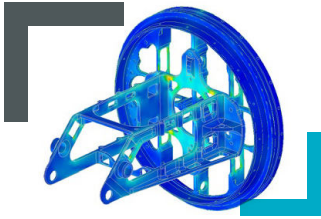
- Automated Physics-aware and part based meshing process
- Hexahedral and tetrahedral elements automatically created
- Mesh resolution slider bar to control fidelity in results
- Local mesh refinement
  - Body, face and edge sizing supported
- Global mesh size options (all with respective size values)
  - Curvature
  - Proximity
  - Fixed
- Shell definition and support
- Multiple beam sections and properties
  - Beam releases
- General specification of Beam Section
  - Orientation
  - Beam release
- Constant Stiffness Springs
  - 1D and 3D
  - Torsional and longitudinal
  - Optional Preload
  - Fix to ground
- Point Masses

## »»» Connections



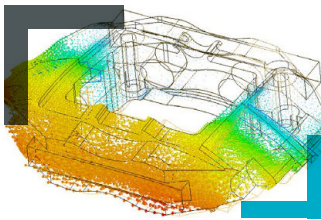
- Contact Interfaces
  - Automatic or manual contact definition
  - Surface-Surface Definition
  - Bonded or no separation types
- Joints
  - Geometry based definition (edges, points and surfaces)
  - References to ground
  - Multiple types
    - Fixed, hinge, translational, slot, cylindrical, universal, spherical and planar

## Results



- Basic and Advanced results
- Result Window Templates
- Full Results post-processing
  - On full model or selected geometry
  - Fringes, Contours, Iso-surfaces
  - Large variety of contour plots
  - Vector Plots
  - Animation
- Simulation Probes
  - At Point
  - Maximum/Minimum/Average/Sum over Model
  - Maximum/Minimum/Average/Sum over Selected Geometry
  - Control over units
  - Saved with results
  - Simulation tree support
- Update results after new result definitions
- Simulation Query
  - Active measuring based of legend selection
  - Save option
- Launch Results in Auxiliary window

## Process Tools

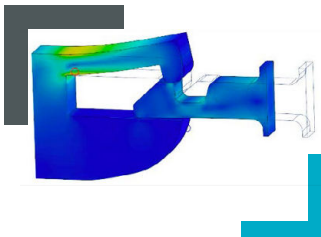


- Creo Ansys Model is an integral part of CAD model and fully supported by Windchill® (WC 12.1)
- Results optionally uploaded to Windchill and automatically associated to the model (WC 12.1)
- 4-Core parallel solution solver
- Export to Ansys Workbench/Mechanical
- Save APR format
  - Archive that contains the model and simulation data

# CREO ANSYS SIMULATION ADVANCED

Includes all features from Creo Ansys Simulation, and:

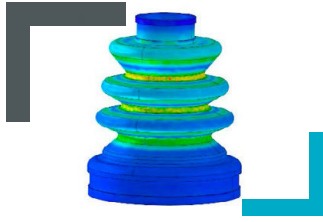
## Non-Linear Contact



- New contact types
  - Frictional, frictionless and rough
- Contact Behavior can be specified
  - Grouping of contacts
- Additional Settings
  - Formulation
  - Detect contacts by radius or factor
  - Stiffness factor and more
- Preview Simulation for all contact options
- Corresponding contact related results

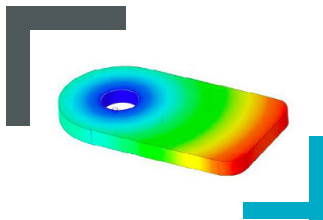


## Non-Linear Materials



- Neo-Hookean hyperelasticity
  - Usable for plastics and rubber materials
  - Non linear stress strain behavior with large deformations
- Linear orthotropic elasticity
  - Includes transverse isotropic material
  - Usable for woods, rolled materials and any material that depends on direction
- Bi-linear plasticity
  - Usable in large strain analysis
  - Defined using 'Linear Hardening' option in material definition

## Combined Structural and Thermal



- Combined physics of Thermal and Structural
  - Thermal expansion use case
- Primary study can be thermal or structural
  - Then add additional physics
  - Additional physics are added to ribbon
  - Can be switched off and return to primary physics
- Only available as steady-state thermal study

## PTC CREO SIMULATION EXTENSION AND PTC CREO SIMULATION ADVANCED EXTENSION

Using digital prototypes to understand how your designs perform in real-world conditions is vital to your product development process. Creo Simulation Extension and Creo Simulation Advanced Extension are designed uniquely for the engineer. Both come complete with structural, thermal, and vibration analysis solutions and a comprehensive set of finite elements analysis (FEA) capabilities. With Creo Simulation Extension and Creo Simulation Advanced Extension, you can analyze and validate the performance of your 3D virtual prototypes before you make the first part.

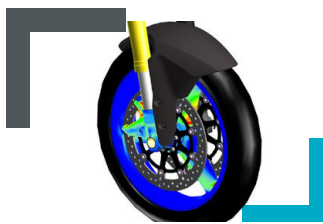
### CREO SIMULATION EXTENSION

#### »» Finite Element Analysis for Parts & Assemblies



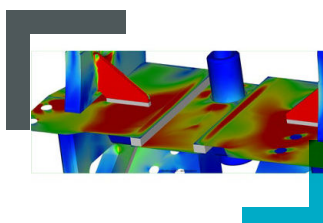
- Understand the response of your design when subjected to various loading conditions
- Integrated seamlessly with the Creo 3D CAD environment
- Automatic checks to ensure robust and reliable analysis results
- Comprehensive materials library provided
- Fully automatic mesh generation directly on 3D CAD geometry
- Units of measurement are managed consistently throughout the application

#### »» Static Structural Analysis



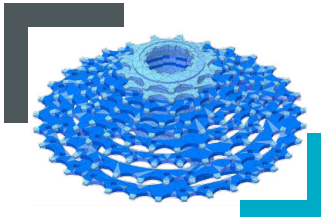
- Determine accurate stresses, strains and displacements in your product
- Conduct linear static analyses
- Loads and boundary conditions are easily applied and use engineering terminology

#### »» Finite Element Modeling Idealizations



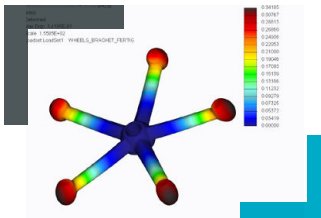
- Solids, Shells and Beams
- Springs and Masses
- Welds and Fasteners
- Rigid Links

## Automatic Meshing



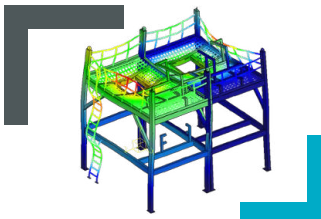
- Create accurate meshes directly on 3D CAD geometry
- Meshes follow highly detailed and curved geometry precisely
- Automatically update and refine meshes to ensure accurate simulations
- Supports solid (tetrahedron, wedge, hex), shell (triangle, quad), beam, spring, mass elements
- Flexibility to define element sizes, distribution and shapes (mapped meshing, thin solids)

## Results Display & Reporting



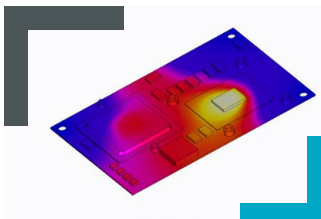
- Full results post-processing including contour, isosurface, cross section plots, and 2D graphs
- Create and save animated plots (deformed shape)
- Linearized stress report
- Multiple result window display
- Create templates for results window definitions
- Export reports as common formats: VRML, MPG, AVI, Graph Tables, Microsoft Excel

## Modal and Buckling Analysis



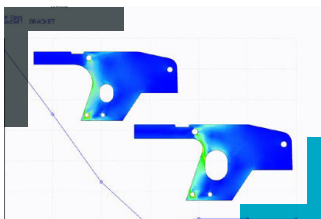
- Determine natural frequency modes of vibration
- Automatically handle rigid mode (unconstrained) cases
- Determine buckling loads or solve unstable snap-through problems

## Steady State Thermal Analysis



- Simulate the effects of temperature on a product
- Analyze conduction and convection heat transfer
- Use highly configurable distributions to apply loads to geometry
- Transfer Thermal Analysis results to Structural Analysis to understand impact of thermal load

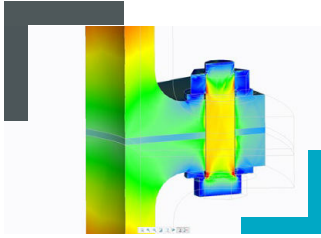
## Design Optimization



- Benefit from a powerful, automated, and structured approach to design optimization
- Reduce product costs by optimizing your design to meet multiple objectives, such as maintaining a product's strength while reducing its weight
- Save time by automatically iterating your design to meet your design requirements
- Reduce errors by using the results from external tools to drive your design directly, without manually transferring data



### »»» Contact Analysis in Creo

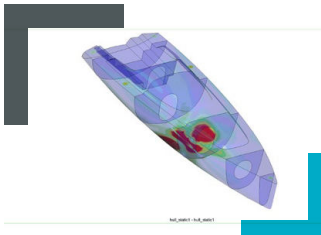


- Simulate the forces transferred between components when they come into contact
- Automatic contact interface detection
- Simulate shrink-fit or snap-fit situations

## CREO ADVANCED SIMULATION EXTENSION

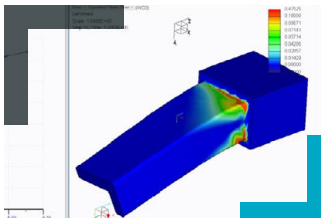
Includes all features from Creo Simulation Extension, and:

### »»» Advanced Finite Element Idealizations



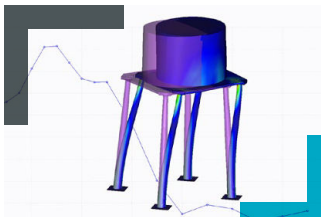
- Composite shells (laminate layup)
- Non-linear springs (force-deflection curve)
- Cracks, fracture mechanics
- Weighted links

### »»» Nonlinear Analysis & Large Deformation



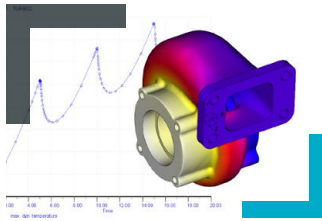
- Easily define elasto-plastic materials and hyper-elastic materials
- Perform nonlinear static structural analysis
- Time varying loads
- Understand residual stresses in the model
- Large deformation of thin/slender products
- Non-linear contact including finite and infinite friction

### »»» Dynamic and Pre-stress Analysis



- Dynamic structural analysis of time response, frequency response, random response, and response spectrum
- Utilize previous static analysis results to determine effects of pre-stress on modal or structural analysis
- Display full results at any frequency or time intervals

## Transient and Nonlinear Thermal Analysis



- Temperature dependent convections
- Radiation heat transfer
- Temperature dependent material properties
- Time dependent boundary conditions

PLEASE NOTE: Ansys-powered products are not eligible for Remix or Restack.

## >>> THE CREO ADVANTAGE:

Creo is the 3D CAD solution that helps you accelerate product innovation to build better products faster. Easy-to-learn Creo uses a model-based approach to seamlessly take you from the earliest phases of product design to manufacturing and beyond. Combining powerful, proven functionality with new technologies including generative design, real-time simulation, advanced manufacturing, IIoT and augmented reality, Creo helps you iterate faster, reduce costs and improve product quality. Creo is also available as a SaaS product, providing innovative cloud-based tools for real-time collaboration and streamlined license management and deployment. The world of product development moves quickly, and only Creo delivers the transformative tools you need to build competitive advantage and gain market share.

Please visit the [PTC support page](#) for the most up-to-date platform support and system requirements.

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Language Support English, German, French, Japanese, Russian, and Simplified Chinese

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