

# NEi Nastran

## NEi Advanced Optimization (Optimization Analysis)

### Overview

The NEi Advanced Optimization software (HEEDS - Hierarchical Evolutionary Engineering Design System) by Red Cedar Technology is a package for design automation. It performs process integration, automated design of experiments and optimization, sensitivity studies, reliability and robustness assessments on engineered products and processes. The software can be used to improve any engineering system (structural, thermal, fluid, acoustic, electrical). In structural design applications, for example, it can evolve designs that simultaneously satisfy objectives and meet constraints targets for durability, crashworthiness, stiffness, noise and vibration, mass and cost, manufacturability and reliability.

### Capabilities:

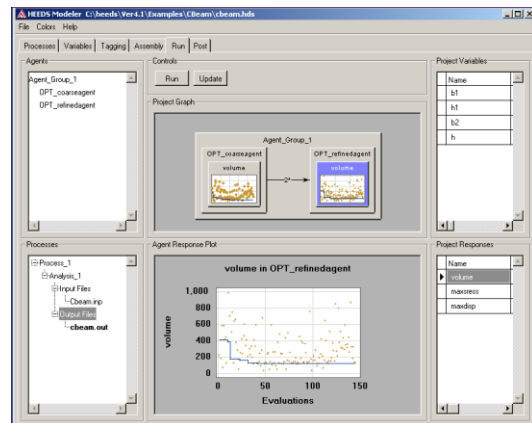
#### Parameter Optimization Methods and Strategies:

- SHERPA: Automated hybrid adaptive search that uses multiple search tools concurrently
- Multi-objective SHERPA (Pareto/tradeoff optimization)
- Global search methods
  - Genetic algorithm (hybrid, hierarchical, heterogeneous, mixed-variable)
  - Advanced proprietary evolutionary search algorithm
  - Simulated annealing
- Multi-start local search methods
- Surrogate-based methods (linear and quadratic response surfaces)
- User-defined methods via application programming interface (API)

#### Process Integration and Automation:

- Direct portals to common CAE tools for data extraction
- Automated execution of multiple simulation and analysis tools within a design evaluation process

- Integration and sharing of data among separate simulations
- Support for parallel processing on networks, clusters, and multiprocessors



#### Design of Experiments:

- Full factorial designs (2-level and 3-level)
- Fractional factorial designs (2-level and 3-level)
- Taguchi orthogonal arrays
- Plackett-Burman designs
- Latin hypercube designs
- Central composite designs
- D-optimal designs
- Taguchi robust parameter design (RPD)
- User-defined arrays
- User-defined response data

#### Quality Design Tools:

- Taguchi robust parameter design (RPD)
- Structured sampling
- Random (Monte Carlo) sampling

#### Response Surfaces:

- Linear and quadratic
- Multivariate adaptive regression splines (MARS)

### Solution Monitoring:

- Process control and run-time adjustment capability
- Real-time solution monitoring with user-controlled graphs and tables
- User-specified termination criteria

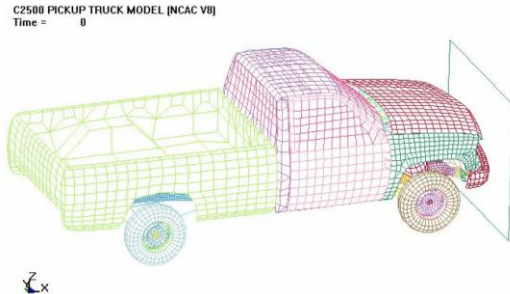


Figure 1. System Level Model (pickup truck)

### Unique Features and Capabilities:

- SHERPA: Simultaneous Hybrid Exploration that is Robust, Progressive, and Adaptive
  - Finds better solutions the first time, identifying the best method or tuning parameters for each problem
  - Enables non-experts to successfully apply automated optimization
  - Performs direct optimization based on actual model evaluations, rather than using approximate response surface models
  - Uses multiple strategies concurrently to effectively and efficiently search even the most complex design spaces
  - Adapts itself to each problem, eliminating the need for user-specified tuning parameters
  - Achieves both global and local search simultaneously
- MO-SHERPA: Multi-Objective SHERPA
  - Performs multi-objective Pareto search using a modified version of the SHERPA algorithm
  - Handles multiple objectives independently to provide a set of optimized solutions that represent trade-offs among the objectives
  - Uses multiple search strategies simultaneously to more effectively explore the Pareto front
  - Contains no tuning parameters, so non-experts can achieve success every time

### User Interface:

#### Graphical User Interface:

- Intuitive graphical interface:
  - Pre-processing
  - Run-time monitoring
  - Post-processing
- Simplified coupling of simulation and analysis tools
- Guided problem set-up procedure
- Detailed and global views of problem statement
- Platform independent

### Platforms:

#### Supported Platforms:

- Windows x86-32 (2000, XP, Vista)
- Windows x86-64 (XP, Vista)
- Linux x86-32 or x86-64 (RedHat Enterprise Linux v4 and v5, SuSE Linux Enterprise v9 and v10)

### Support:

#### Unparalleled support:

- Leader in outstanding customer support
- Onsite and offsite training courses taught by experienced professional engineers
- Phone and email support staffed by a team of FEA specialists
- Optional consulting services available

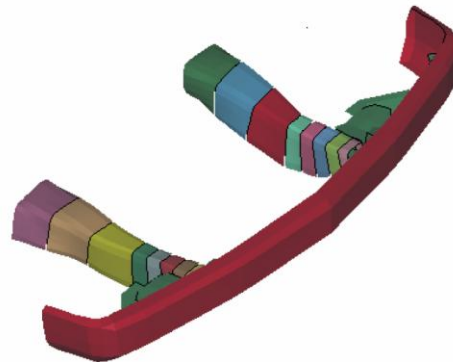


Figure 2. Reduced Subsystem Level Model

**NEi Software, Inc.** is aggressively focused on commitment to the customer. Detailed documentation, customized on-site training, and comprehensive technical support ensures that you will see immediate return on your investment.

**For more information about our company or our products, please contact:**

**Headquarters:**

**NEi Software, Inc.**

5555 Garden Grove Blvd., Suite 300

Westminster, CA 92683-1886

USA

Phone: +1.714.899.1220

Fax: +1.714.899.1369

Email: [info@neisoftware.com](mailto:info@neisoftware.com)

Website: [www.NEiSoftware.com](http://www.NEiSoftware.com)

**Europe:**

**NEi Software EMEA Office**

The Old Barrel Store

Draymans Lane, Marlow

Buckinghamshire, SL7 2FF

United Kingdom

Phone: +44.0.1628.400.645

Fax: +44.0.1628.891.701

E-mail: [emea@neisoftware.com](mailto:emea@neisoftware.com)

Website: [www.NEiSoftware.com/emea](http://www.NEiSoftware.com/emea)

**Asia:**

**NEi Software Asia Office**

Shinjuku Park Tower

N30th Floor 3-7-1 Nishi-Shinjuku

Shinjuku-ku, Tokyo, 163-1030

Japan

Phone: +81.03.5326.3062

Fax: +81.03.5326.3001

E-mail: [asia@neisoftware.com](mailto:asia@neisoftware.com)



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**From NEi Software, Inc.**