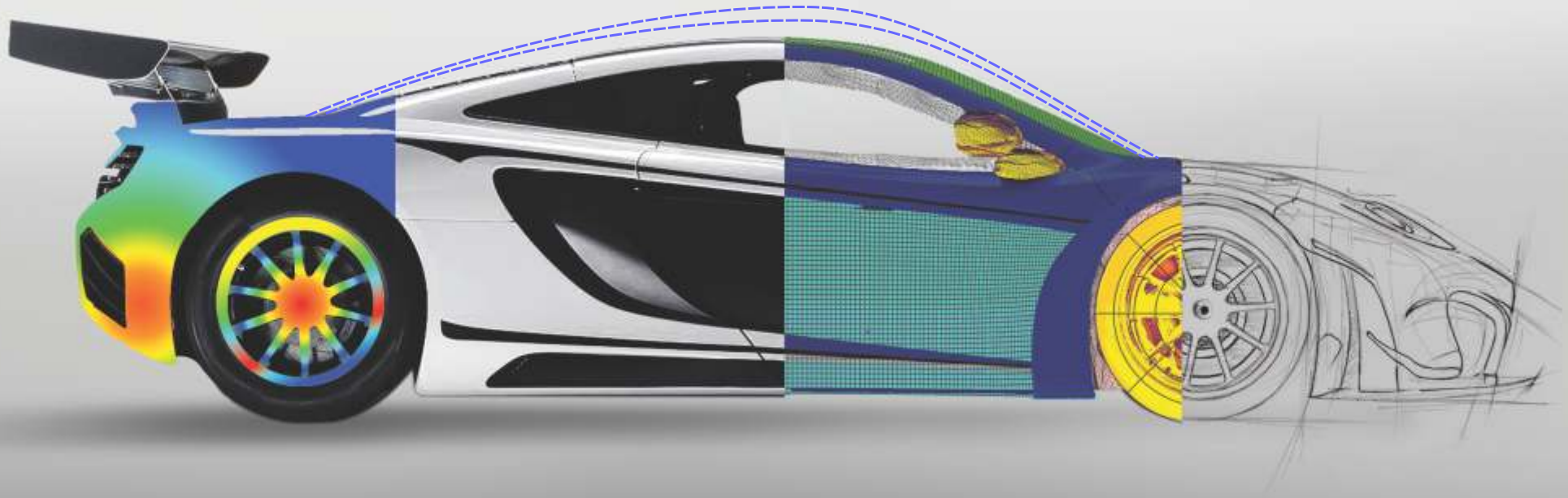
DEP MeshWorks

POWER TO ACCELERATE PRODUCT DEVELOPMENT

www.depusa.com



About DEP

Detroit Engineered Products (DEP) is an Engineering Solutions and Product Development company. Since its inception in 1998 in Troy, Michigan, USA, DEP is now a global company with footprint in Europe, China, Korea, Japan and India. DEP uses the accelerated and transformed product development process, accomplished by utilizing our proprietary platform, DEP MeshWorks, which rapidly reduces the development time of products for all segments.

Rapid time to market of new products across several industry sectors such as automotive, defense, aerospace, energy, oil & gas, consumer products and heavy equipment is a unique value proposition delivered to clients via DEPs world class engineers and the DEP MeshWorks platform.

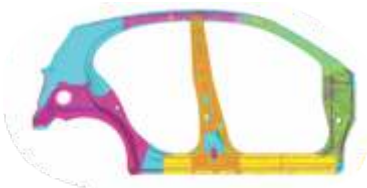
Smarter Solutions. Realized.

DEP MeshWorks technology transforms the product development process

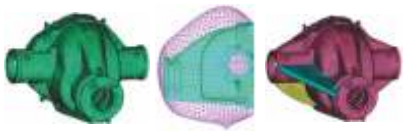
CAE Morphing Tools	Parametric CAE Technology	Non-Parametric CAE Models	CAD-Morpher Technology	Design Enablers
Reduces Finite Element (FE) & Computational Fluid Dynamics(CFD) model building time by 50 to 80%	Rapidly converts FE & CFD models to intelligent parametric CAE models, enabling fast design iterations & Design of Experiment (DOE) studies	Enables Multi-Disciplinary Optimization to meet design targets, minimize product weight and minimize manufacturing cost	Generates morphed CAD models representing optimized designs very rapidly and forms the main link between CAE & design teams	Enables creation and removal of ribs or such features directly in the FE model stage without CAD

Full Vehicle CAE Morphing

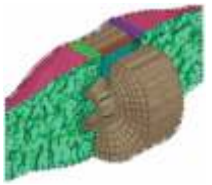
Axle Tube Dia Parameter



CAD Morphing



Non-Parametric Topology Optimization



CFD Morphing

CAE Morphing

DEP MeshWorks is a feature based morphing tool that can rapidly morph existing FE and CFD models to match new geometry and/or to new proportions.

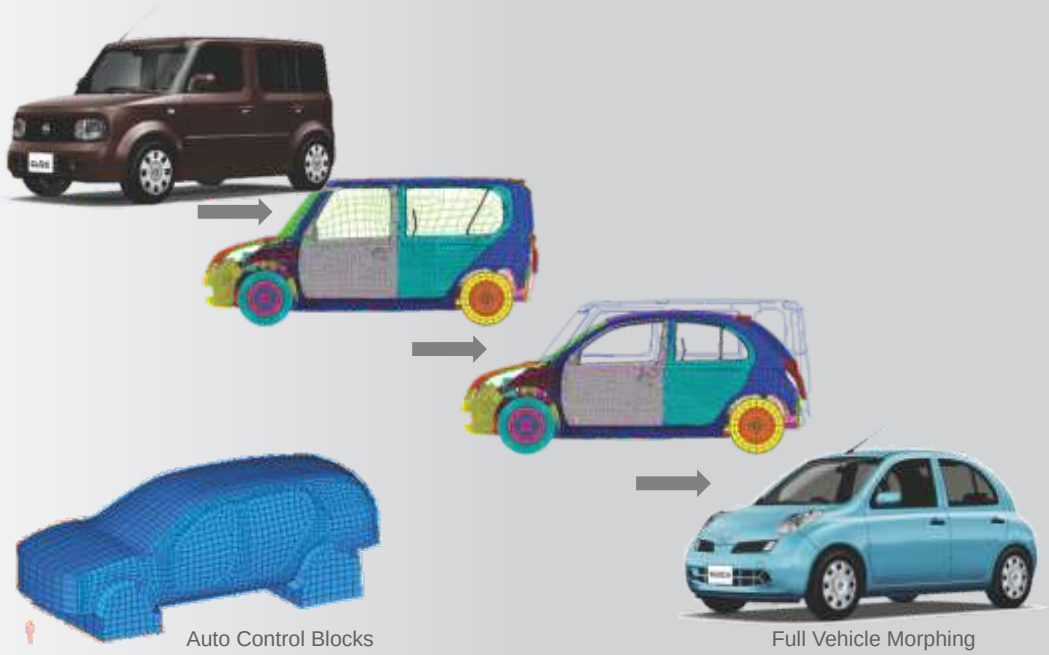
Component and full system level FE/CFD models (such as automotive vehicle Crash, NVH and durability models) can be morphed to fit target design features such as styling lines, sections, proportions etc. precisely.

A wide variety of morphing techniques such as control block (lower and higher order), direct parabolic, spherical, polycube and field based morphing are available to address varied applications.

An extensive set of automated and interactive tools to create 'control blocks' for assembly level morphing is available.

Specialized morphing such as fillet radius change, section change, pattern replication etc. are available.

Typical automotive morphing scenarios such as morphing to match styling, upper body to carry over under body matching, morphing sedan to station wagon or SUV etc. can be executed rapidly.



Auto Control Blocks

Full Vehicle Morphing

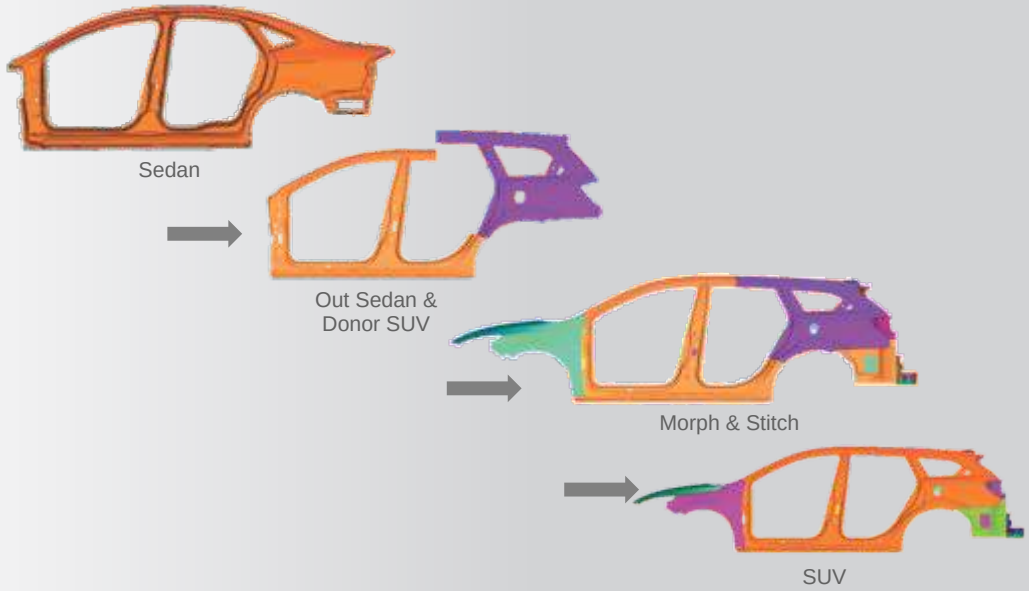
Concept Modeling

MeshWorks has advanced cutting, blending and stitching functions to create early stage concept FE and CFD models very rapidly.

Local regions from the donor FE or CFD model can be cut, morphed and stitched to the target FE/CFD model resulting in a new concept quickly.

Concept FE components can be created using sections and director lines.

Concept FE features such as ribs, gussets, holes etc. can be created rapidly on existing models.



Sedan

Out Sedan &
Donor SUV

Morph & Stitch

SUV

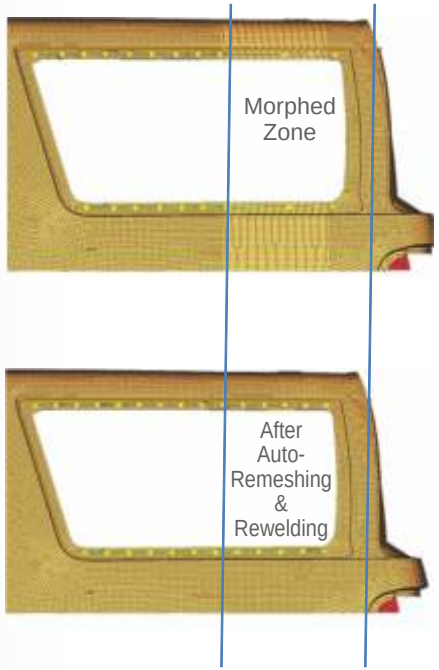
Remeshing & Re-assembly

DEP MeshWorks has automated remeshing and re-assembly tools that will produce good quality meshes from morphed models, complete with new connectors in the morphed/remeshed zones.

Automatic remeshing can be applied on shell meshes and solid terra meshes with preservation of features, connections, loads, boundary conditions, shape parameters and element size control.

Assembly connectors such as spot welds, seam welds, adhesives, bolts, etc. will be intelligently regenerated as per design requirements.

For example, if an original spot-welded FE model is morphed to reduce its length, accordingly the morph-compressed region will be remeshed to the original element size and the spot-welds in the morphed region will be regenerated with the original pitch.



CAE Parameterization

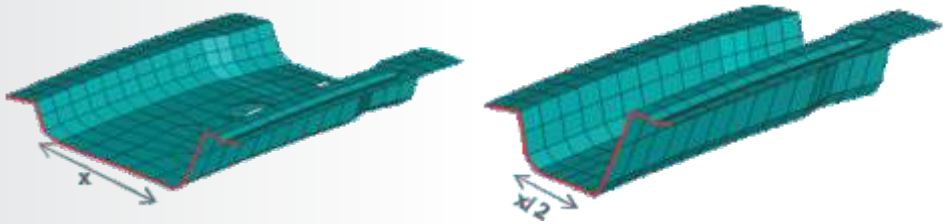
MeshWorks is a comprehensive CAE model parameterization engine with a broad range of categories of parameters that can be used at all stages of product development.

Categories of parameters include: gauge, shape, sections, spot weld pitch, seam-weld-spacing, adhesive length, topology (member repositioning), features (number of holes, ribs, bulkheads, crush-initiators etc. in a given space) and general parameters.

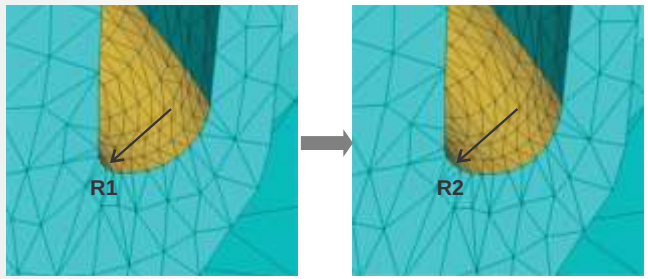
Regular FE/CFD models can be converted to intelligent parametric FE/CFD models.

The parameters can be exercised as one-time execution or linked to Design of Experiments (DOE) and Multi-Disciplinary Optimization (MDO) schemes.

Multiple runnable CAE models (literally hundreds of them) can be generated automatically by exercising the parametric CAE models.



Depth & Width Parameter Changed



Fillet Radius Parameter Changed

CAD Morphing

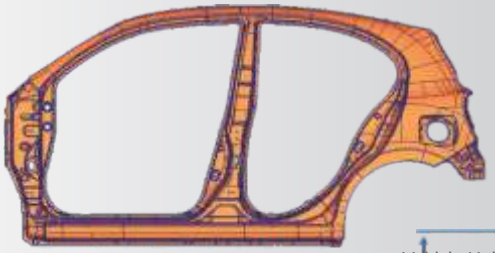
CAD Morpher is a transformational software from DEP which allows users to morph existing CAD data (Body structures, Powertrain and Chassis parts) directly to new shapes rapidly.

For example, the complete BIW CAD data of an existing production vehicle can be morphed and made to fit a new vehicle's styling data and/or proportions. Several months of CAD development can be reduced using DEP's patented CAD morphing technology.

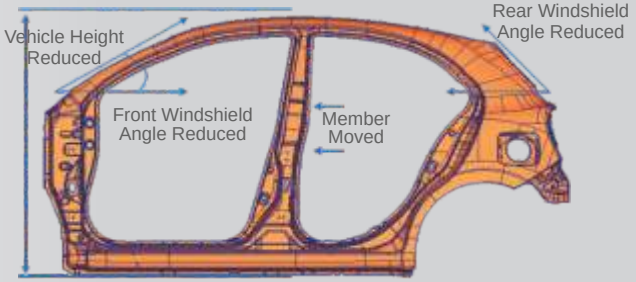
CAD morphing can be carried out at all different stages of product development:

A) Early concept stage: Existing donor CAD data can be morphed to target new styling data and vehicle proportions
B) Vehicle architecture development: Existing BIW CAD data can be automatically updated to fit new sections as determined by architecture team
C) Vehicle optimization: Existing CAD data can be updated to match optimized results obtained by the CAE team

Morphed CAD data thus obtained can be used for studies involving packaging, formability, styling, human factors, ergonomics, CAE, supplier sourcing etc. very early on in the program.



Original CAD



Morphed CAD

Design Enablers

MeshWorks has a powerful Design Enablers module that will allow users to automatically create typical design solutions required to improve Structural and CFD performance and reduce weight.

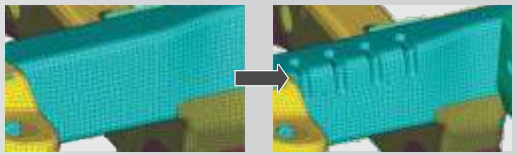
Typical Design Enablers available as automated 'ready-to-use' CAE solutions include: a) Beads, b) Darts, c) Bulk-Heads, d) Reinforcements, e) Holes/Slots, f) Part Extension/Contraction, g) Shell Rib, h) Tetra-Rib, i) Tailor Welded & Rolled Blank – TWB/TRB etc.

All of the above can be created very easily without the user having to manually create geometry, mesh or connections – sufficient to provide inputs at a high level as if a design engineer would do.

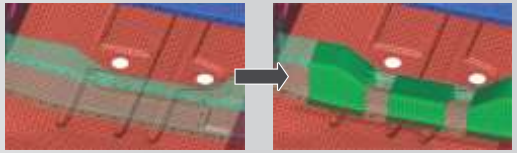
The Design Enablers can be executed as an integrated solution complete with properties, materials, connectors etc.

The Design Enablers can be executed as a single instance or as a parameter with multiple instances.

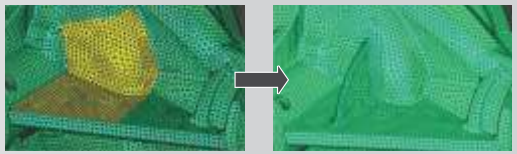
Auto Bead Creation



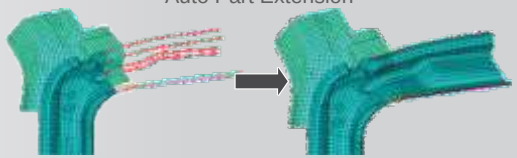
Auto Reinforcement Creation



Auto Tetra Rib Creation

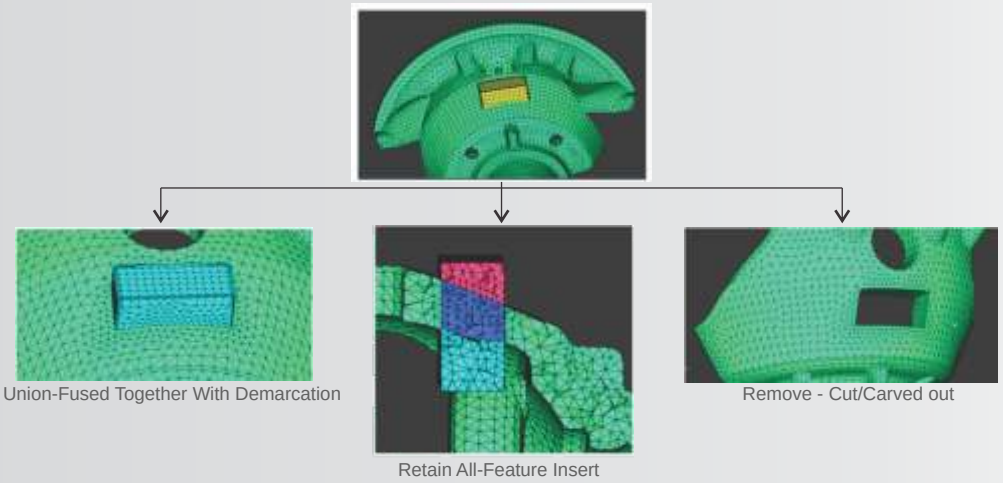


Auto Part Extension



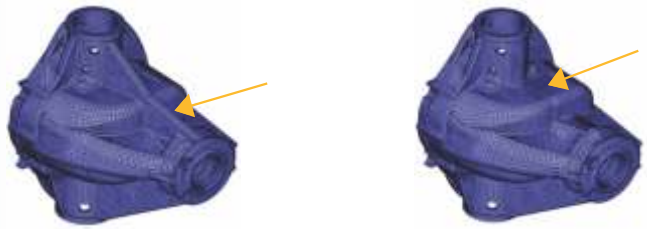
Advanced Meshing

Using the advanced meshing capabilities of DEP MeshWorks, one can perform advanced meshing operations such as ‘Tetra-Boolean’ operations, acoustic cavity meshing, auto-rib creation etc. typically not found in other pre-processors.



Tetra Rib Creation

Feature Removal



Engineering Software Wizards

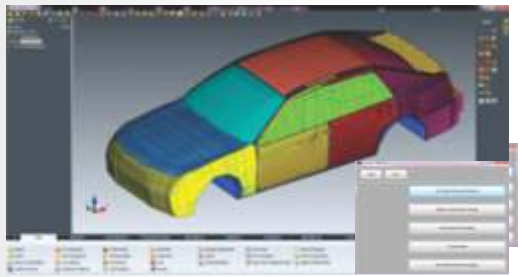
DEP’s custom software wizards offer the following benefits:

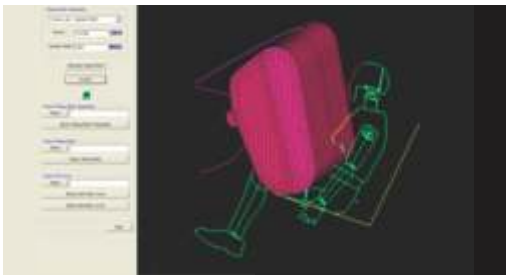
- Automate standard CAE processes
- Significant productivity gains
- Institutionalize standard processes
- Reduce training time spent on new hires
- Produce consistent results

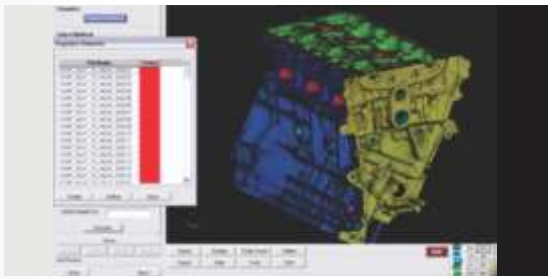
Full Vehicle Morphing Wizard: This Wizard automates full vehicle morphing process by automating control block creation and mapping them to target styling data.

Engine Durability Wizard: This Wizard automates the complete engine durability process starting from CAD clean-up, meshing, assembly and automated report generation.

Air Bag Modeling Wizard: This Wizard automates the creation of Passenger Air Bag FE models taking basic dimensions of the bag, number of tethers, number of holes etc. as inputs.





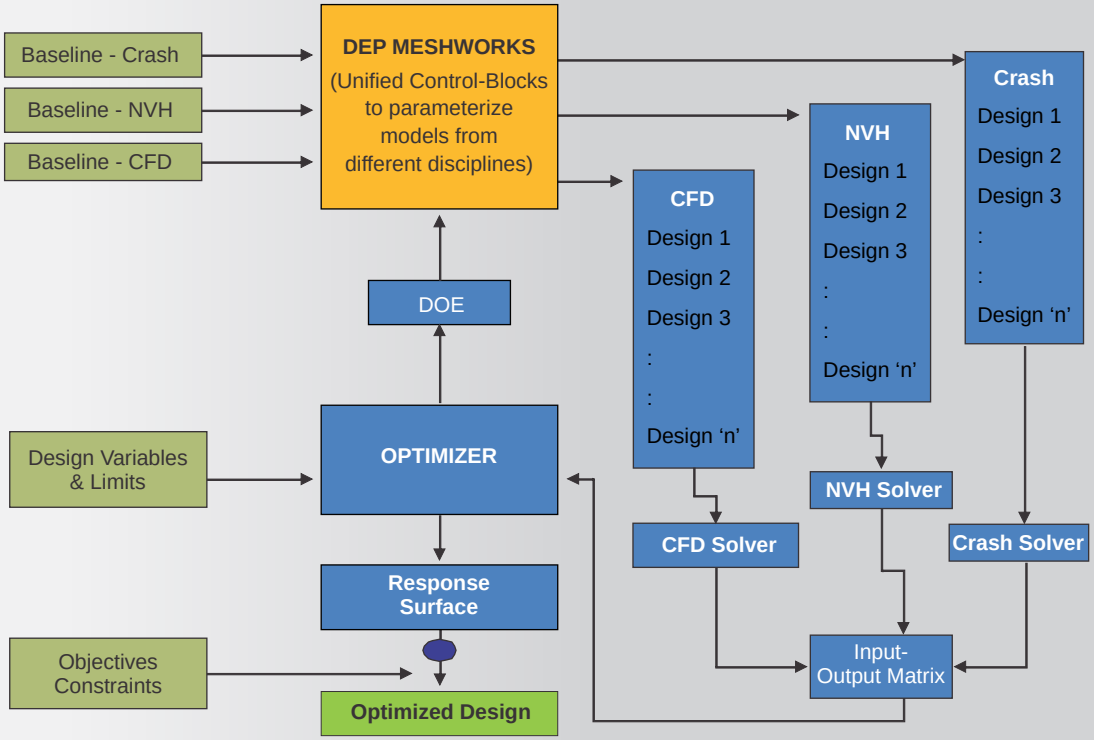


Multi- Disciplinary Optimization

DEP MeshWorks based Parametric and Non-Parametric CAE models enable Multi-Disciplinary Optimization to meet design targets, minimize product weight and minimize manufacturing cost.

Meshworks parametric models can robustly generate multiple runnable analysis data sets given a Design of Experiments (DOE) matrix. It can be executed in a batch mode and can be integrated within automated work flows.

Ready interface is available to major optimization software such as Isight, ModeFrontier, Heeds, Optimus, LSOPT, etc.



Supporting Platforms

- Windows 64 Bit (XP, 7, Windows Server 2008 SP2)
- Linux 64 Bit (Redhat Linux, SUSE Enterprise Linux)

CAD and Solver Interface

ParaSolid	CatiaV4&V5	Nastran	LS-Dyna	Fluent
STEP	JT	Abaqus	Pam-Crash	Sctetra
IGES	UG/MX	Ansys	Radioss	Star CD
				Converge

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