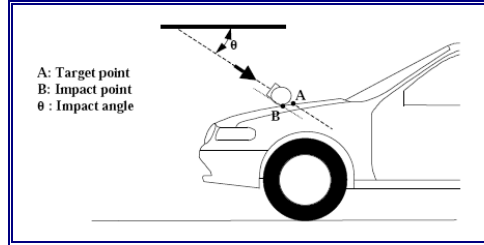


*FEA* Information <http://www.feainformation.com>  
Engineering Journal and Website Resource



ANSA Pedestrian Tool



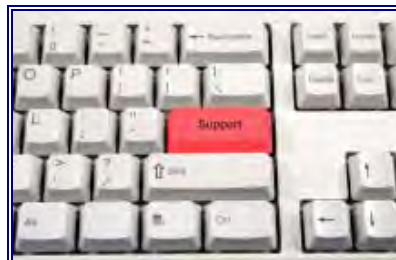
ETA Solutions



OASYS Bamboo Bridge



SGI Data Center



LS-DYNA Technical Support

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*Announcements  
For The Month of  
January 2010*

**Welcome to AEG joining our FEA Consultants Listing:**

American Engineering Group (AEG) is a leading manufacturing and rapid product development company with capability in product design, finite element analysis, development and manufacturing.

**FEA-Consultant Article:** CAE Associates – Bone Remodeling Predictions

**Publication Site News:** The LS-DYNA papers can be located for download on line:  
<http://www.dynalook.com>

**Engineering Technology Associates (ETA):** The Inventium Suite represents a complete evaluation and restructuring of their software product line-up.

**BETA CAE Systems SA:** The pedestrian tool of ANSA pre-processor enables the user to set up a complete simulation scenario of a pedestrian protection test.

**11<sup>th</sup> International LS-DYNA Users Conference Updates**

Starts next month with listing of accepted papers, booth exhibitors, sponsors.

Among the speakers will be KeyNote Speakers:

Thomas J.R Hughes, University of Texas at Austin

David J. Benson, University of California at San Diego

Thomas J. Lange, Procter & Gamble, Ohio

We have FEA Information Inc. participation open for Q1 2010. If you are interested in our consultant section and website listing, or other areas, please feel free to contact Anthony [agiac99@aol.com](mailto:agiac99@aol.com)

Sincerely, Marsha J. Victory, President, FEA Information Inc.  
Prinze Mueller, Quincy-Hua and Dusty



Global Leaders



## FEA Information

Platinum

Participants

**OASYS Ltd:**

<http://www.oasys-software.com/dyna/en/>

**JSOL Corporation:**

<http://www.jsol.co.jp/english/cae>

**HP:**

<http://www.hp.com/>

**ETA:**

<http://www.eta.com>

**INTEL:**

<http://www.intel.com>

**ESI Group:**

<http://www.esi-group.com>

**BETA CAE Systems S.A.:**

<http://www.beta-cae.com>

**LSTC:**

<http://www.lstc.com>

**SGI:**

<http://www.sgi.com>

**NEC:**

<http://www.nec.com>

**Voltaire:**

<http://www.voltaire.com>

**CRAY:**

<http://www.cray.com>



## Pre- & Post-Processing Tools

In

ANSA &  $\mu$ ETA

for Pedestrian Safety simulation

### Introduction

### Regulations

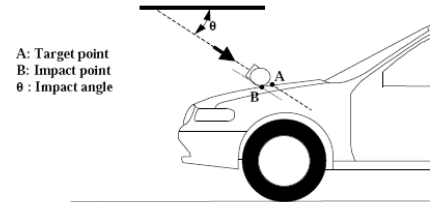
European regulations, for pedestrian safety, were introduced in the 90s to meet the goal of enhancing the pedestrian protection and reducing the number of pedestrian fatalities.

Since then, pedestrian friendly design has changed the styling and the engineering of the vehicle fronts. The aim was the protection of the pedestrians, a trade-off between safety and other vehicle performance requirements (i.e. aerodynamics).

Several regulations were introduced for the pedestrian safety, with most prevailing the EC Regulation and the EuroNCAP protocol.

The **EC regulation** sets out the basic requirements for the protection of pedestrians and other vulnerable road users in the form of test procedures and test limit values. These regulations are specific to the type of vehicle (i.e. size, platform) and for the frontal protection systems (i.e. bumper, bonnet) individually.

EuroNcap aims to encourage the improvement of vehicle performance, concerning the pedestrian safety, through leg-form, upper leg-form and child / adult head-form testing.



### ANSA Pedestrian tool

The Pedestrian Tool of ANSA pre-processor enables the user to set up a complete simulation scenario of a pedestrian protection test, according to the EC Regulation and EuroNcap protocols.



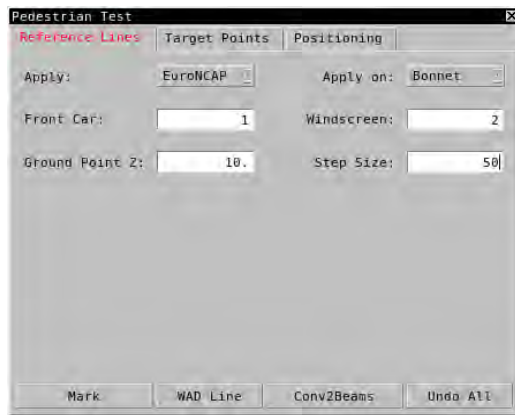
The ANSA Pedestrian Tool goes through the following steps:

- Creation of the **Reference Lines**
- Determination of **Target Points**
- **Positioning** of the Headform on the Target Points

The above steps can be applied both on FE-mesh and unmeshed geometric data.

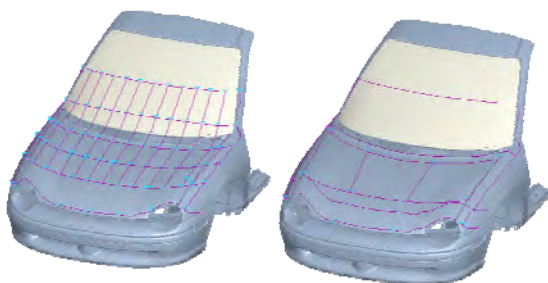
## Creation of Reference Lines

### Reference Lines



In the Reference Lines tab of the Pedestrian Tool window, the user selects the protocol type (EuroNCAP, EC), selects the part of the vehicle (bonnet, bumper or both) where the lines will be created and defines the height of the ground and the resolution of the curves for the creation of the respective WAD lines.

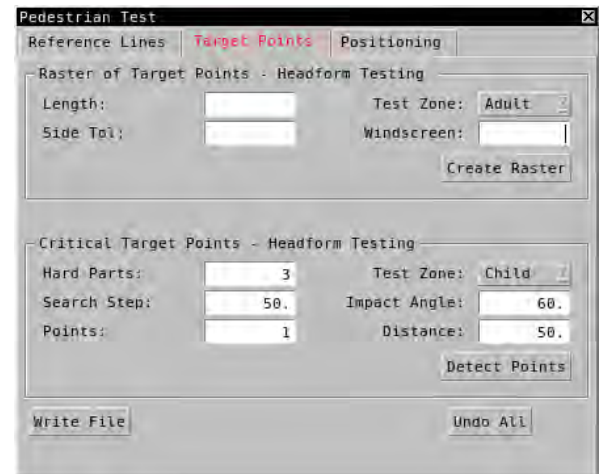
The EuroNCAP and EC Regulation propose slightly different ways of dividing the front area of the vehicle in crucial sub areas. The difference occurs in the distances that the WAD lines have from the ground in each case.



### Target Points Determination

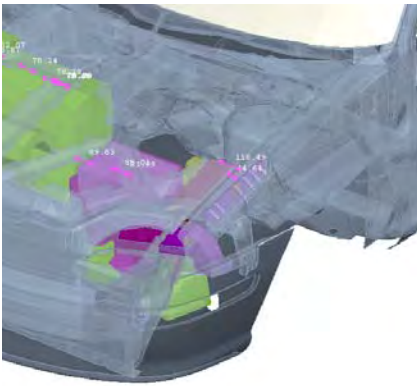
The creation of the WAD lines leads the user to the determination of the Target Points. These points illustrate the exact endangered positions for a pedestrian

through a crash. The Target Points tab of the Pedestrian Tool window enables the user to determine these points in two different ways: by creating a Raster of Target Points or by direct determination of Critical Target Points. The Critical Target Points are determined by providing a set of entities with the "Hard Parts" such as engine block, battery tray etc.



The position of the Raster and the Critical Target Points depends on the selection of the test zone: Child or Adult. The determined positions can be output in ASCII file and the user can use them directly in the post-processing phase with  $\mu$ ETA post processor.





## Positioning of Headform

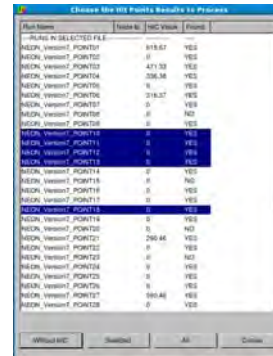
After the determination of the Target Points, the next step is to place the Headform on these locations. The user selects the impact angle of the Headform, picks the target position from screen and executes the function.



## Hit Points Post-Processing

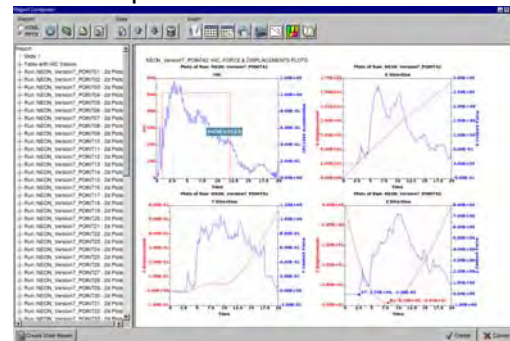
### Selection of Hit Points for post-processing

$\mu$ ETA post-processor offers a user-toolbar specially developed to facilitate the post-processing of pedestrian analysis. All available results are automatically traced and listed in an interface that allows their selection.



### 2D Post-Processing

The calculation of the HIC criterion of all hit points results files is offered. Then, the software automatically creates an HTML & PPTX report with a summary table and 2d plots of HIC values, displacements and contact forces for each hit point.



### 3D Post-Processing

Through the 3D post-processing, it is possible to have bonnet deformation visualized according to the maximum deformation from all hit points results, and to append to the generated report a table with the maximum displacements of head and bonnet. Additionally, .gif

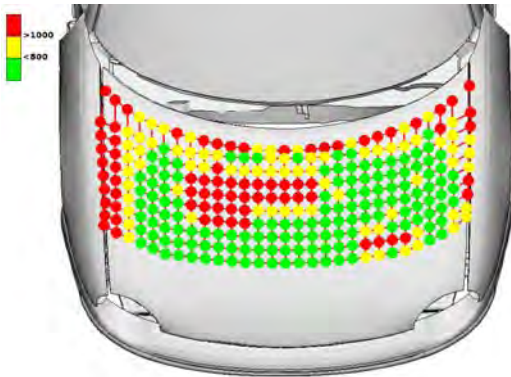
videos of the area around each hit during the impact can be generated.



### Creation of Annotations

#### Annotations with HIC values

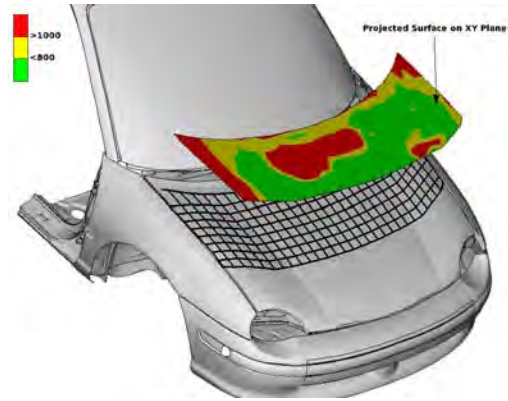
The user can create value-based colored annotations for the hit points, by reading the ASCII file containing stored results of the 2D post-processing analysis.



### Interpolation & Projected Surface

The HIC values can be interpolated on the bonnet model. A projection of the impacted area is automatically created.

Email: [ansa@beta-cae.gr](mailto:ansa@beta-cae.gr)



The area above a threshold HIC value is calculated, using the created projected area.  $\mu$ ETA variables are also created to store the relevant values.

```
Total Visible Area: 611430.014
Visible Area above 1000: 153410.515
Visible Area above 1000: 25.09 %
execution finished
```

### Conclusions – Benefits

ANSA &  $\mu$ ETA suite offers powerful and unique functionality that allows pedestrian safety simulation model setup and analysis under a single roof.

For more information contact BETA CAE Systems S.A.





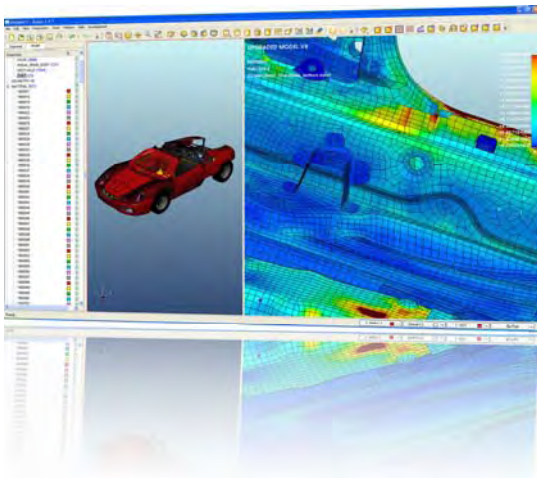
## ETA Introduces Inventium Suite

An Enterprise Level CAE Solution

“Concept to Product”

By Tim Palmer, Engineering Technology Associates, Inc.

The New Year is starting with a sense of renewed hope for many things, especially here at ETA, where we have been busy working on an extensive revitalization of our product line. I am pleased to be able to announce to you the introduction of the *Inventium Suite*, and the release of its first set of tools, *PreSys*.



The Inventium Suite represents a complete evaluation and restructuring of our software product line-up. While you will still hear familiar product names in Inventium, you will also see new and refocused products within the software, and branding that complements this restructuring. These products will be available from ETA and our Distributor Network, beginning in February, 2010.

### A Suite of Products

ETA's product offering has covered the FE modeling industry for some time. Our FEMB, VPG and DYNAFORM products all address certain vertical application markets in the product development community. FEMB and VPG/PrePost have addressed the general FE modeling segment. DYNAFORM has focused on the metalforming application segment. VPG/Structure, VPG/Safety, Drop Test and ALE-FSI modules each addressed specific applications of LS-DYNA.

The Inventium Suite allows ETA to introduce new software tools and retain legacy products, under a unified and streamlined product architecture, providing users access to all software tools. By design, Inventium products will meet the challenges of our user's needs for a high performance modeling and post-processing system, and still provide a path to integrate new tools and third party applications. Under this new architecture, users can easily access the tools that they need to do their jobs efficiently and quickly.

### Flexibility and Configurability

Each engineer has his or her own style – how they like the screen to appear, what shortcuts they use, favorite commands, etc.

My spell checker says that 'configurability' is not a word. I'd like to think it is, and offer this definition: the ability to define a configuration of a software tool which meets the needs of the tasks at hand, while streamlining the look and feel, to meet the users needs.

The Inventium architecture was developed with this in mind. It allows the user to change the way their software appears and behaves. New Menus or Toolbars may be created by the user to meet their specific needs. Pre-configured menus can be modified as desired. For instance, if the user is not creating models which use solid elements, they may deactivate all functions relating to that type of task in the user toolbars and menus, thereby simplifying the user interface.

Similarly, the user can create their own toolbar with their 'favorites' for frequently accessed functions.

Virtually every parameter one might think of can be modified, making this the most configurable product ETA has ever released.

### **From VPG/PrePost to PreSys**

The first product that will be released from the Inventium Suite is the core FE modeling toolset; PreSys. The name PreSys is somewhat literal, but was inspired by the word 'precise', and 'presis', the Greek word for development. These are words that are quite relevant to engineers, and convey the sense that precision is a fundamental objective of this new software.

The PreSys product will be the successor to the VPG/PrePost and FEMB products.

In fact, the last 3 VPG releases have been in preparation for this change. With the addition of over 150 new or improved features, it will now be packaged within this new user interface and software architecture. This combination of features and user interface immediately places PreSys in a top position in the FE pre/post processor market.

PreSys delivers a complete FE modeling toolset. It is designed to be solver-neutral, but with the legacy of its forerunners, having an exceptional level of LS-DYNA and NASTRAN support. Additional interfaces are being developed for other popular MCAE solvers, as well.

When the user opens PreSys for the first time, they will immediately notice the refreshed user interface, with drop-down menus and toolbars. They also quickly notice the graphics speed and added graphics capabilities of PreSys. The user interface also allows user to quickly find the tools they need, has fewer levels of menus and is easier to learn.

Developers focused not only on packaging the existing tools into the new user interface, but took the opportunity to streamline as many functions as possible. This means that fewer operation steps will be required, and that the users will have a minimum amount of data to enter.

A significant change in the software is the addition of the Model Explorer. This essentially adds another dimension to the information available to the user at all times. The Model Explorer allows the user to manipulate all of the entities in the model, and also allows users to access non-graphical data through a

Keyword tab. The Keyword tab allows access to editable card images for virtually any entity in the model.

### **Multiple Models and Integrated Pre & Post**

As the needs of the CAE engineer expand, the software tools must expand along with them. Inventium's products allow users to open and operate on multiple models, as well as opening post-processing files along with pre-processing data. This feature provides a unique way for users to get the most out of their software and increase productivity.

### **Open Architecture / Scripting Access**

The Inventium architecture allows the user to capture the process, replay and modify it. This process capture is based on a fundamental capability of the software to execute any function through a scripting interface.

To be truly open and accessible for outside software tools and configurable for processes, each function within the software must be accessible through scripting access. Passing variables or

data between software products provides the foundation for parametric design optimization, where the FE iscreti software reacts to the results or direction dictated from external software, and automatically updates the model. In this case the design may be 'driven' by outside software.

This type of capability, combined with powerful, robust and accurate iscreti functions promises to change the way that engineers develop products, and will unlock the potential of optimization software for the use in everyday problems.

### **A New Start for ETA, A New Opportunity for Users**

We know that these tools must be focused on one thing; delivering productivity to the users. The Inventium family of products promises this in a personally configurable system.

For more information regarding the Inventium Suite, please visit [www.inventiumsuite.com](http://www.inventiumsuite.com).



GSA

Products Available

The OASYS GSA Software Programs

The Bamboo Bridge

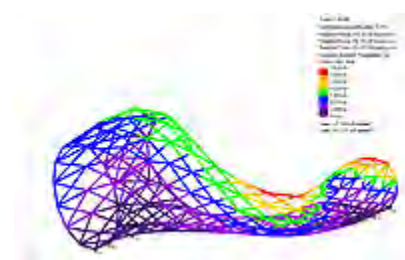
[http://www.oasys-software.com/information/case\\_studies/bamboo\\_bridge.shtml](http://www.oasys-software.com/information/case_studies/bamboo_bridge.shtml)

## Bamboo Bridge

Infranatural invited Bruce Danziger (Arup) to design a bamboo bridge for the Here There Be Monsters installation at the Materials and Applications Research Centre, Los Angeles. With the help of Moritz Freund, Shuchi Hsu and Mecky Reuss the bridge developed into a curved and partially cut-away tube functioning as the primary stage from which visitors can interact with the water and its creatures.

Bruce Danziger details the design and analyses process:

When I was invited to design a bamboo bridge to span over a fountain designed by others, I asked a former student, Shu-Chi Hsu and her friend Moritz Freund (young architects from Taiwan and Germany) to join me in designing the bridge setting up a relationship that is non-hierarchical in that I am not the leader and we share responsibility, decision making and hard work. We decided to call ourselves workshop: LEVITAS. Mecky Reuss, another young German architect, also joined our group



Taking as a starting point, the bending moment diagram of a propped cantilever, I made some sketches in Rhino of the scheme. Working with the fountain designers, we designed the bridge to become a platform or stage area to interact and view the fountain.

We transferred the geometry from Rhino to GSA retaining separate layers for different elements. This is a wonderful feature of GSA that the dxf file retains its separate layering when imported to GSA with the property card holding the layer names and the elements having the corresponding group and property numbers.

The first analysis runs showed some high stress levels adjacent to the supports. The support conditions and physical assumptions for these support details needed to be modified, which was easily achieved using the sculpt command.

We quickly went through several iterations of changing the geometry in

Rhino and transferring back to a “Skeleton” of a model in GSA. What I mean by “Skeleton” of a model, is not a skeletal model, but a process I use quite often with GSA that goes like this:

- Import dxf model with nodes, property names and numbers, element connectivity
- Create actual section properties using the wizard
- Create any special material properties (bamboo in this case)
- Create basic loadcase names
- Input loads based upon property numbers and/or group numbers

This creates the shell of a model, now the nodes can be deleted or just copied over from a separately imported DXF file or from a spreadsheet etc. The elements can also be deleted and replaced with a copy of another imported DXF file. So the “Skeleton” of a model is everything minus some or all of the topology (node and elements).

We had to revise the support conditions to avoid locked in stresses. The big break-through was the flexible support detailing that is reflected in the analysis model to effectively allow the structure to deform uniformly without concentrating stresses at the bamboo elements adjacent to the supports.

The temporary nature of the water installation prompted a raw, low-tech design approach to the bamboo bridge. Every piece of bamboo used was freshly-cut, green and untreated, allowing for natural wear and decay over the lifetime of the bridge. To further simplify the process, cable zip ties were selected as

the primary connective material, as opposed to traditional rope ties. Unlike the conventional design/construction process, the shape of the bridge thus adapts to the nature of the bamboo and is thereby liberated from the templates built by the computer. During the span of its lifetime, the woven bridge will remain in a constant state of flux, in both form and colour due to the inherent natural drying process of bamboo and its exposure to environmental forces.

“I think it turned out much better than the computer simulated model would have led us to imagine.” Bruce went on to say, “Although the bridge embodies the essence of the structural diagram, and the shape we created digitally, its expression of form and character in both materials and construction takes on another quality. It’s very exciting for us that the physical bridge is NOT an exact representation of the computer model (unlike most contemporary architecture, which tends to be). The bridge takes on the nature of bamboo, thus freeing itself from the computer model.”





SGI's award-winning

ICE Cube™

Data Center Solution

[http://www.sgi.com/products/data\\_center/ice\\_cube/](http://www.sgi.com/products/data_center/ice_cube/)

## Eco-Ready Program

Become a trusted data center deployment advisor with cube-ready and rack-ready partnership opportunities.

SGI's award-winning ICE Cube™ data center solution delivers extreme server and storage density in a self-contained, fully portable 20' or 40' container. Its advanced cooling design dramatically cuts ongoing operational expenses as does its easy serviceability. First deployed in March, 2007, the latest generation ICE Cube more than doubles the maximum density to 2800 independent servers per container — for up to 33,600 cores in a 40' x 8' container. For storage-focused deployments, the ICE Cube is capable of housing up to 14.2 Petabytes of data. Designed to augment or replace traditional brick-and-mortar data centers of any size, these high densities are achieved while offering a broader choice of container sizes and configurability of Rackable™ Eco-Logical™ servers and storage.

ICE Cube Data Sheet can be found online at SGI

### Key Features:

- High density: 1400U of available rack space with full compatibility

for Rackable™ half-depth rackmount servers

- Scales to to 33,600 processing cores or 14.2 Petabytes of storage
- Rackable™ ICE Cube optimized C2208 system maximizes core density without sacrificing local storage capabilities
- Sophisticated cooling technology enables up to 80% reduction in cooling costs vs traditional data center
- Easy serviceability with wide, central aisle for ample room to access systems
- Leverages DC Power and self-contained UPS technology for maximum power efficiency
- Easily deployed for immediate functionality
- Secure, nondescript, weather-tight ISO shipping container for easiest portability (air, land, water)
- Totally mobile container for easy location near inexpensive land and power options

Well suited for a broad range of deployment scenarios — from military applications to disaster recovery

scenarios to basic data center expansion — ICE Cube provides tremendous flexibility for expansion to areas in which traditional data center facilities are unavailable, cost prohibitive or cannot otherwise capitalize on alternative energy sources in remote locations. The ability to deploy ICE Cube rapidly and in any location helps enable business continuity, allowing for easy hardware migration and an expedited disaster recovery processes. Already in production, a fully populated ICE Cube can be designed, built and delivered in a matter of weeks.

Additional Information in pdf format can be located on the SGI website:

ICE Cube Modular Data Center (PDF 2.3M)

ICE Cube White Paper (PDF 1.6M)

Competitive Power Consumption and Power Efficiency Study (PDF 1.1M)  
From the Grid to the CPU: Minimizing Operational Expenses in Today's Data Centers (PDF 754K)



Stryker Hip Replacement

CAE Associates

Consulting

Bone Remodeling Predictions

Copyright CAE Associates – <http://caeai.com>

For Complete Graphics please visit CAE Associates [Case Study](#)

Bone remodeling is a natural, lifelong process in which old bone is absorbed and replenished by new bone. Ultimately, the long term density of bone is strongly influenced by the level of mechanical stimulus it receives. When the loads transmitted through bone are reduced over time, the bone responds with a gradual decrease in density. For example, astronauts who spend significant time in the weightless conditions of space are prone to experience a loss in bone density due to the reduction in mechanical stimulus. As a result, NASA has designed specialty exercise equipment to help counter this effect. On the contrary, an increase in mechanical stimulus offers the potential of bone apposition (i.e.; an increase in bone density). Professional weight lifters are typical of individuals with evidence of above average bone densities.

In the case of total knee and hip replacements, introduction of the prosthesis has the potential to alter load paths. For total knee replacement (TKR) procedures (see Figure 1), the surgeon removes the damaged articular cartilage and nearby, adjoining bone from the joint. The remaining, underlying bone is subsequently resurfaced or “capped”

with prosthetic components which are typically manufactured out of metal, ceramic, and/or polyethylene.

In the case of a traditional hip replacement (see Figure 2), a long metal stem is inserted down the shaft of the proximal femur, while the acetabulum is resurfaced. The replacement of the pre-operative, adjoining bone at the joint with prosthetic components (which are typically stiffer than the cartilage and bone combination they replace) results in the potential of load path changes within the underlying bone. When prosthetic devices are designed, the potential for the underlying bone (which surrounds and supports the prosthesis) to be “stress shielded” by the prosthesis should be considered. Inordinate levels of stress shielding may, over time, result in a reduction of bone density, loss of fixation, and eventual loosening of the device.

Stryker Orthopedics, a global leader in the development, manufacture and sale of orthopedic products and services, sought to develop customized finite element simulations to evaluate long term, bone-implant interaction by characterizing bone density changes in



hip and knee replacement recipients over a period of years. Pre-operative bone shape and quality data are obtained from patient CT (computed tomography) and DEXA (dual energy x-ray absorptiometry) scans as "initial conditions". Designs to be evaluated can be existing designs or, more importantly, design concepts.

CAE Associates incorporated a bone remodeling algorithm into ANSYS via the USERMAT material model user-subroutine. This bone remodeling algorithm is a material law that characterizes how bone density changes over time as a result of load path changes between the pre-operative and post-operative stress/strain state in the bone. Bone remodeling is a slow progressing phenomenon with a typical time step in the order of weeks. This nonlinear, iterative approach uses a remodeling signal based on the strain energy density to predict changes in bone density as a function of position and time.

The output data generated by the bone remodeling analysis procedure include 3D bone FE model result plots of the bone density at time,  $t$ , as well as the incremental density change between time steps. The ability to perform "virtual DEXA" plots was also developed by CAE Associates to facilitate direct bone density comparisons to clinical data, which are typically presented in this form. Examples of the models and results are shown in Figures 3-5. Preliminary results obtained from this

approach compare favorably with published data.

CAE Associates worked closely with Walter Schmidt, Principal Research Engineer in the Modeling & Simulation, Reconstructive Technologies Group at Stryker Orthopaedics R&D to develop the finite element-based bone remodeling simulation system. Mr. Schmidt describes the contributions of CAE Associates as follows:

"CAE Associates welcomed the opportunity to provide consulting services in biomechanics-based scientific research, which many consider to be a novel and unique application of FEA. The development of a bone remodeling algorithm, which operates on mechanical stimulus changes between two, independently analyzed, finite element models (i.e.; a pre-operatively loaded bone and a post-operatively loaded one), represented a significant challenge.

CAE Associates integrated the ability to readily adjust bone loss rates, bone gain rates, and dead zone (i.e.; non-reactive) limits to facilitate our clinical validation efforts. CAE Associates was extremely responsive to our continuous requests for software enhancements as user feedback was supplied. Stryker has found a valuable and reliable resource in CAE Associates' experts for our customized software development needs."



LS-DYNA

Support Site

LSTC – DYNAmore

<http://www.dynasupport.com/>

Recently Changed January 08, 2010

### What is the difference between \*CONTACT\_AUTOMATIC\_SINGLE\_SURFACE and \*CONTACT\_AUTOMATIC\_GENERAL ?

\*CONTACT\_AUTOMATIC\_SINGLE\_SURFACE, \*CONTACT\_AUTOMATIC\_GENERAL is a single surface contact, that is, the contact is defined wholly by the slave side. Both contact types consider shell thickness and beam thickness, that is, the contact surface is offset from the shell midplane and from the beam centerline. The beam cross section, for contact purposes only, is idealized as circular. At shell edges, the contact surface wraps around in a circular arc thus joining the contact surface on one side of the shell to the contact surface on the opposite side.

One important way in which an \*CONTACT\_AUTOMATIC\_GENERAL contact differs from an \*CONTACT\_AUTOMATIC\_SINGLE\_SURFACE contact is the way in which beam contact and shell edge contact is handled. The \*CONTACT\_AUTOMATIC\_GENERAL contact checks for penetration along the full length of beam elements, not just at the nodes of the beams. Similarly, \*CONTACT\_AUTOMATIC\_GENERAL contact checks for penetration along the entire length of free (unshared) shell edges. By adding the option \_INTERIOR

to \*CONTACT\_AUTOMATIC\_GENERAL in v. 960, edges of interior shells are also taken into account.

Another distinction is in the value of penetration that triggers release of the penetrating node from contact consideration (see Table 6.1 in the Keyword User's Manual). For \*CONTACT\_AUTOMATIC\_GENERAL contact, that value is effectively unlimited whereas \*CONTACT\_AUTOMATIC\_SINGLE\_SURFACE contact will release the penetrating node after it penetrates approximately half an element thickness.

Yet another distinction is that, by default, \*CONTACT\_AUTOMATIC\_GENERAL contact checks for nodal penetration through the three closest segments ("search depth" = 3) whereas \*CONTACT\_AUTOMATIC\_SINGLE\_SURFACE checks only two segments. The three segment check is more expensive but may be more robust for contact in corners. The default "search depth" for any automatic contact may be

overridden on optional card A of  
**\*CONTACT\_**.

The segment-based alternate penalty  
formulation (invoked by setting SOFT =  
2 on optional card A of **\*CONTACT\_**) is  
available for  
**\*CONTACT\_AUTOMATIC\_SINGLE\_SURFACE**  
but not for  
**\*CONTACT\_AUTOMATIC\_GENERAL**.

Setting SOFT=2 in an  
**\*CONTACT\_AUTOMATIC\_SINGLE\_SURFACE**

contact changes the contact algorithm  
altogether. (See separate notes on  
SOFT=2 contact)

To write contact forces produced by any  
single surface contact to the RCFORC  
file, one must define a  
**\*CONTACT\_FORCE\_TRANSDUCER\_PENALTY**.

jpd 12/2002



## d3VIEW & LS-DYNA Blog

By Suri Bala

<http://blog.d3view.com/>

Posted on January 13, 2010

### Modeling rigid bodies

LS-DYNA allows the modeling of rigid-bodies by assigning any part with the MAT\_RIGID material law (MAT\_020). This is by far the most easiest method available when compared with all finite element codes. When using MAT\_RIGID, there are three distinct ways to model a rigid part and they are briefly explained below.

#### 1. Finite Element based rigid bodies

In this method, we first Discretized the geometry using nodes and elements and use this information in LS-DYNA. The mass, inertia tensor and the center-of-gravity is then computed based on the density in MAT\_RIGID keyword and the finite elements description.

#### 2. Coupling based rigid bodies

In this method, the rigid body is coupled to a third party software such as CAL3D or MADYMO. The parameter N allows the coupling between LS-DYNA and the third part software. When  $N = 0$  (default), normal LS-DYNA rigid body updates are used. Using  $N > 0$ ,  $\text{abs}(N)$  refers to an ellipsoid while  $N < 0$ ,  $\text{abs}(N)$  refers to a plane. Further to this input, the

parameter COUPLE, can be used to specify the reference coordinate system the nodal positions refer to. The parameter M is the actual number that links this LS-DYNA part to the part in the third-party software. When  $M > 0$ , all rigid body updates are assumed to be done by the third part software such as Madymo or CAL3D.

#### 3. VDA Surfaces based rigid bodies

This last method allows the direct input of VDA originally defined by the German automotive industry, to describe surface information. The VDA file describes the surface or a collection of surfaces by a alias name that refer to that surface. The first step would be to use the parameter COUPLE = -1 to inform LS-DYNA that the rigid body is represented by a VDA surface. The second step is to use the parameter ALIAS to specify the alias name as defined inside the VDA file. The third step is to provide the VDA surface to LS-DYNA which is accomplished by using  $\text{vda} = \text{vda\_file\_name.vda}$  at the execution command line when launching LS-DYNA.

## Mass, Inertia Tensor and Center-of-Gravity (MIC)

In finite element based rigid bodies, the MIC is computed based on the density and discretization information. In Coupling based rigid bodies, the MIC is governed by the third-party software. In VDA rigid bodies, the MIC is computed based on the internal discretization of the surfaces.

All three methods allow overriding the MIC values by using the `_INERTIA` option in PART and specifying user defined MIC values.

## Contact

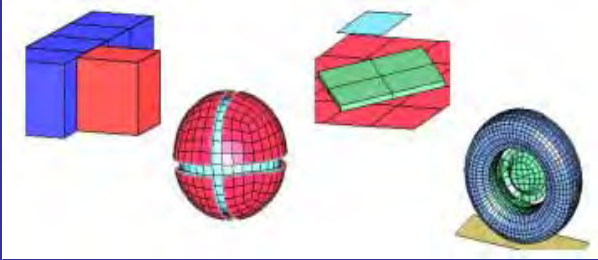
All general purpose contacts handle rigid bodies using penalty contact treatment. The Young's modulus,  $E$  specified in the MAT\_RIGID keyword and the thickness offsets (if the rigid body is discretized using shells) are used in contact treatment and must be chosen so they closely represent the physical part. When using Coupling or VDA based rigid bodies, instead of using nodes and elements in contact, the user can also use surface based contact such as CONTACT\_ENTITY where the rigid bodies are defined as master and the impacting parts are defined as slave.

LS-DYNA

EXAMPLES

Website

<http://www.dynaexamples.com/>



The site presents approximately 200 LS-DYNA examples from various training classes. The input files and several class notes are available for download. The download is free of charge, a login is not required. The majority of content has been contributed by LSTC. All examples are presented with a brief description. You may find an example by checking a specific class or by using the search functionality of the site.

The content is prepared for educational purposes. Hence, material properties and other parameters might be non-physic for simplification.

**January Examples – for complete explanation visit DYNAExamples**

### **Thermal Stress**

This problem demonstrates using LS-DYNA to solve for the unconstrained expansion of a block due to heating. The model consists of one 8 node brick element at an initial temperature of 10. The brick material is given a volumetric thermal generation rate. Explicit time integration is used for the structural calculations and implicit time integration is used for the thermal calculations. Implicit time integration is unconditionally stable and, therefore, a larger thermal time step can be taken

### **Welding**

This problem models a hot block sliding along a colder block. This is a way to model welding. The hot block is set at a fixed temperature to model a heat source. Explicit time integration is used for the structural calculations and implicit time integration is used for the thermal calculations. Implicit time integration is much more stable and, therefore, a larger thermal time step can be taken. A thermal-mechanical slide surface between the blocks is defined using \*CONTACT\_SURFACE\_TO\_SURFACE\_THERMAL command.



JANUARY

## FEATURED PAPERS

Available On Line  
Courtesy of  
LSTC & DYNAmore

The site presents papers from European and International LS-DYNA User Conferences and papers provided by other users. More than 950 papers are available. The papers are accessible via a search functionality. <http://www.dynalook.com>

### **A Real World Approach for using LS-DYNA to Achieve True Springback Compensation on SS Components During Forming**

M. Clarke - Continental Tool and Die  
J. He - Engineering Technology Associates, Inc.  
X. Zhu – LSTC

“Springback is every tool designer’s nightmare. A tool designer can make a die adjustable for some areas that need to be over-hit. Most parts are sprung throughout their entire surface. In these cases the entire part would need

adjustment. Almost every time the die always requires a re-cut/re-work to put the part in spec. This re-work and re-cut is a time consuming, trial and error method that takes shop resources which typically are not...”

<http://www.dynalook.com/european-conf-2009/C-I-03.pdf>

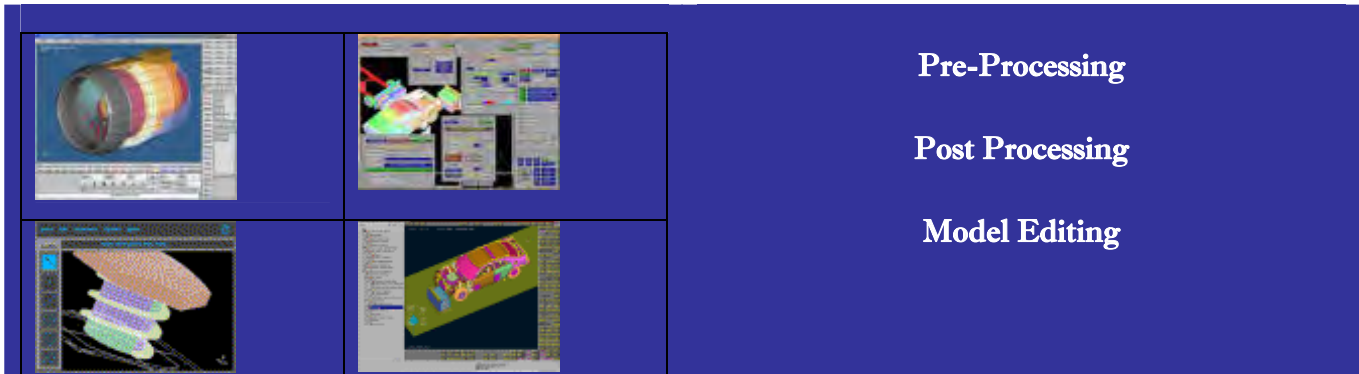
### **New Features in LS-DYNA EFG Method for Solids and Structures Analysis**

C. T. Wu – LSTC

“In this presentation, an update on LS-DYNA EFG method for solids and structures analysis will be given. Several features were developed in the past two years to solve specific challenging problems as well as to improve the

efficiency. This talk will emphasize on three new features including an adaptive Meshfree scheme based on a local Maximum Entropy approximation for metal forging and extrusion analysis, a semi-Lagrangian formulation in ... ”

<http://www.dynalook.com/european-conf-2009/I-I-01.pdf>



Pre-Processing

Post Processing

Model Editing

A preprocessor is a program that processes its input data to produce output. This data is then used as input to another program.

### BETA CAE Systems S.A.

<http://www.beta-cae.gr/>

Provides complete CAE pre- and post-processing solutions. ANSA, the world wide standard pre-processor and full product modeler for LS-DYNA, with integrated Data Management and Task Automation.  $\mu$ ETA, a thriving innovative software with special features for the high performance and effortless 3D & 2D post-processing of LS-DYNA results.

### Engineering Technology Associates, Inc.

<http://www.eta.com>

FEMB - Engineering Technology Associates' Finite Element Model Builder (FEMB) is a finite element pre- and post-processor for use with all major analysis codes and CAD Software.

### Oasys, Ltd

<http://www.oasys-software.com/dyna/en/>

Oasys Primer is a model editor for preparation of LS-DYNA input decks. - Oasys D3Plot is a 3D visualization package for post-processing LS-DYNA analyses using OpenGL® (SGI) graphics.

### JSOL Corporation

<http://www.jsol.co.jp/english/cae/>

JVISION is a general purpose pre-post processor for FEM software. Designed to prepare data for, as well as support, various types of analyses, and to facilitate the display of the subsequent results.

### Livermore Software Technology Corporation

<http://www.lstc.com>

LS-PrePost is an advanced interactive program for preparing input data for LS-DYNA and processing the results from LS-DYNA analyses.





**LS-DYNA Distributors**

**LS-DYNA is delivered with  
LS-OPT**

**LS-PrePost**

**LSTC Dummy & Barrier Models**

Alpha Order by Country

<b>Australia</b>	Leading Eng. Analysis Providers - LEAP <a href="http://www.leapaust.com.au/">http://www.leapaust.com.au/</a> <a href="mailto:info@leapaust.com.au">info@leapaust.com.au</a>
<b>CANADA</b>	Metal Forming Analysis Corp - MFAC <a href="http://www.mfac.com/">http://www.mfac.com/</a> <a href="mailto:galb@mfac.com">galb@mfac.com</a>
<b>CHINA</b>	OASYS Ltd. (software house of Arup) <a href="http://www.oasys-software.com/dyna/en">http://www.oasys-software.com/dyna/en</a> <a href="mailto:stephen.zhao@arup.com">stephen.zhao@arup.com</a>
<b>FRANCE</b>	ALYOTECH TECH. <a href="http://www.alyotech.fr">http://www.alyotech.fr</a> <a href="mailto:nima.edjtemai@alyotech.fr">nima.edjtemai@alyotech.fr</a>
<b>FRANCE</b>	ALLIANCE SVCE. PLUS - AS+ <a href="http://www.asplus.fr/ls-dyna">http://www.asplus.fr/ls-dyna</a> <a href="mailto:v.lapoujade@asplus.fr">v.lapoujade@asplus.fr</a>
<b>GERMANY</b>	CADFEM <a href="http://www.cadfem.de/en">http://www.cadfem.de/en</a> <a href="mailto:lsdyna@cadfem.de">lsdyna@cadfem.de</a>
<b>GERMANY</b>	DYNAmore <a href="http://www.dynamore.de/">http://www.dynamore.de/</a> <a href="mailto:uli.franz@dynamore.de">uli.franz@dynamore.de</a>



**LS-DYNA Distributors**  
**LS-DYNA is delivered with**  
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**LS-PrePost**  
**LSTC Dummy & Barrier Models**

<b>INDIA</b>	OASYS Ltd. (software house of Arup) <a href="http://www.oasys-software.com/dyna/en">http://www.oasys-software.com/dyna/en</a> <a href="mailto:lavendra.singh@arup.com">lavendra.singh@arup.com</a>
<b>INDIA</b>	EASi Engineering <a href="http://www.easi.com/">http://www.easi.com/</a> <a href="mailto:rvenkate@easi.com">rvenkate@easi.com</a>
<b>INDIA</b>	CADFEM Eng. Svce India <a href="http://www.cadfem.in/">http://www.cadfem.in/</a> <a href="mailto:info@cadfem.in">info@cadfem.in</a>
<b>Italy</b>	EnginSoft SpA <a href="http://www.enginsoft.it/">http://www.enginsoft.it/</a> <a href="mailto:info@enginsoft.it">info@enginsoft.it</a>
<b>Italy</b>	DYNAMore <a href="http://www.dynamore.de/">http://www.dynamore.de/</a> <a href="mailto:uli.franz@dynamore.de">uli.franz@dynamore.de</a>
<b>JAPAN</b>	JSOL Corporation <a href="http://www.jsol.co.jp/english/cae">http://www.jsol.co.jp/english/cae</a> <a href="mailto:cae-info@sci.jsol.co.jp">cae-info@sci.jsol.co.jp</a>
<b>JAPAN</b>	ITOCHU Techno-Solutions Corp. <a href="http://www.engineering-eye.com/">http://www.engineering-eye.com/</a> <a href="mailto:ls-dyna@ctc-g.co.jp">ls-dyna@ctc-g.co.jp</a>
<b>JAPAN</b>	FUJITSU <a href="http://jp.fujitsu.com/solutions/hpc/app/lldyna/">http://jp.fujitsu.com/solutions/hpc/app/lldyna/</a>



## LS-DYNA Distributors

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LSTC Dummy & Barrier Models

<b>KOREA</b>	Theme Engineering <a href="http://www.lsdyna.co.kr/">http://www.lsdyna.co.kr/</a> <a href="mailto:wschung@kornet.com">wschung@kornet.com</a>
<b>KOREA</b>	Korean Simulation Tech. <a href="http://www.kostech.co.kr">http://www.kostech.co.kr</a> <a href="mailto:young@kostech.co.kr">young@kostech.co.kr</a>
<b>Netherlands</b>	Infinite Simulation Systems, BV <a href="http://www.infinite.nl/">http://www.infinite.nl/</a> <a href="mailto:j.mathjissen@infinite.nl">j.mathjissen@infinite.nl</a>
<b>SWEDEN</b>	Engineering Research AB <a href="http://www.erab.se/">http://www.erab.se/</a> <a href="mailto:sales@erab.se">sales@erab.se</a>
<b>TAIWAN</b>	Flotrend Corporation <a href="http://www.flotrend.com.tw/">http://www.flotrend.com.tw/</a> <a href="mailto:gary@flotrend.tw">gary@flotrend.tw</a>
<b>RUSSIA</b>	State Unitary Enterprise –STRELA <a href="mailto:info@ls-dynarussia.com">info@ls-dynarussia.com</a>



**LS-DYNA Distributors**  
**LS-DYNA is delivered with**  
**LS-OPT**  
**LS-PrePost**  
**LSTC Dummy & Barrier Models**

<b>United Kingdom</b>	<p>OVE ARUP &amp; PARTNERS  <a href="http://www.oasys-software.com/dyna/en/">http://www.oasys-software.com/dyna/en/</a>    <a href="mailto:dyna.sales@arup.com">dyna.sales@arup.com</a></p>
<b>USA</b>	<p>Livermore Software Tech. Corp. - LSTC  <a href="http://www.lstc.com/">http://www.lstc.com/</a>    <a href="mailto:sales@lstc.com">sales@lstc.com</a></p>
<b>USA</b>	<p>Engineering Tech. Assc. Inc. – ETA  <a href="http://www.eta.com/">http://www.eta.com/</a>    <a href="mailto:sales@eta.com">sales@eta.com</a></p>
<b>USA</b>	<p>DYNAMAX  <a href="http://www.dynamax-inc.com/">http://www.dynamax-inc.com/</a>    <a href="mailto:sales@dynamax-inc.com">sales@dynamax-inc.com</a></p>



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**&**  
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FEA Consultants use a wide range of software simulation programs. Their expertise using specific programs for their customers offers the ability for controlling the modeling and analysis of structures, systems, products and many other applications. Consultants and Engineering Services are used by government, homeland security, court trials, and a number of industries needing to have outside sources for expertise in FEA

<http://www.fea-consulting.com>

**North America**

<p><b>Located: California'</b></p> <p><b>Karagozian &amp; Case - (K&amp;C)</b>  <a href="http://www.kcse.com">http://www.kcse.com</a></p> <p>Shangrui Lan            (818) 303-1268</p>	<p><b>Located: Connecticut</b></p> <p><b>CAE Associates</b>  <a href="http://www.caeai.com">http://www.caeai.com</a></p> <p>(203) 758-2914</p>
<p><b>Located: Oregon</b></p> <p><b>Predictive Engineering</b>  <a href="http://predictiveengineering.com">http://predictiveengineering.com</a></p> <p>George Laird            (800) 345-4671</p>	<p><b>Located: California</b></p> <p><b>Schwer Engineering</b>  <a href="http://schwer.net">http://schwer.net</a></p> <p>Len Schwer            (707) 837-0559</p>
<p><b>Located: Texas</b></p> <p><b>KBEC</b>  <b>Khan Bui</b></p> <p>(512) 363-2739</p>	<p><b>Located: Ohio</b></p> <p><b>AEG Product Engineering Svce.</b></p> <p><a href="http://engineering-group.com">http://engineering-group.com</a>  <a href="mailto:support@engineering-group.com">support@engineering-group.com</a></p>



## Software & Hardware Alliances

### Software Solutions

### SMP/MPP Hardware & OS

### MPP & Interconnect MPI

#### ETA – DYNAFORM & VPG

<http://www.eta.com>

Includes a complete CAD interface capable of importing, modeling and analyzing, any die design. Available for PC, LINUX and UNIX, DYNAFORM couples affordable software with today's high-end, low-cost hardware for a complete and affordable metal forming solution.

#### ETA – VPG

<http://www.eta.com>

Streamlined CAE software package provides an event-based simulation solution of nonlinear, dynamic problems. eta/VPG's single software package overcomes the limitations of existing CAE analysis methods. It is designed to analyze the behavior of mechanical and structural systems as simple as linkages, and as complex as full vehicles.

#### OASYS software for LS-DYNA

<http://www.oasys-software.com/dyna/en/>

Oasys software is custom-written for 100% compatibility with LS-DYNA. Oasys PRIMER offers model creation, editing and error removal, together with many

specialist functions for rapid generation of error-free models. Oasys also offers post-processing software for in-depth analysis of results and automatic report generation.



## Software & Hardware Alliances

### Software Solutions

### SMP/MPP Hardware & OS

### MPP & Interconnect MPI

#### ESI Group Visual-CRASH For DYNA

<http://www.esi-group.com>

Visual-Crash for LS-DYNA helps engineers perform crash and safety simulations in the smoothest and fastest possible way by offering an intuitive windows-based graphical interface with customizable toolbars and complete session support. Being integrated in ESI

Group's Open VTOS, an open collaborative multi-disciplinary engineering framework, Visual-Crash for DYNA allows users to focus and rely on high quality digital models from start to finish. Leveraging this state of the art environment, Visual Viewer, visualization and plotting solution, helps analyze LS-DYNA results within a single user interface.

#### BETA CAE Systems S.A.– ANSA

<http://www.beta-cae.gr>

Is an advanced multidisciplinary CAE pre-processing tool that provides all the necessary functionality for full-model build up, from CAD data to ready-to-run solver input file, in a single integrated environment. ANSA is a full product modeler for LS-DYNA, with integrated Data Management and Process Automation. ANSA can also be directly coupled with LS-OPT of LSTC to provide an integrated solution in the field of optimization.

#### BETA CAE Systems S.A.– μETA

<http://www.beta-cae.gr>

Is a multi-purpose post-processor meeting diverging needs from various CAE disciplines. It owes its success to its impressive performance, innovative features and capabilities of interaction between animations, plots, videos, reports and other objects. It offers extensive support and handling of LS-DYNA 2D and 3D results, including those compressed with SCAI's FEMZIP software



## SMP & MPP Hardware & OS Listing

### Specifically for LS-DYNA

#### *SMP & MPP Hardware an OS*

##### **FUJITSU**

Prime Power

Sun OS 5.8

##### **SGI**

LINUX

WINDOWS

##### **INTEL**

IA 32

Linux, Windows

##### **INTEL**

IA64

Linux

##### **INTEL**

Xeon EMT64

Linux, Windows 64

##### **HP**

PA-8X00

HP-UX 11.11.  
and above

##### **HP**

Opteron

Linux

##### **HP**

Alpha

True 64

##### **HP**

IA-64

HP-UX 11.22  
and above





**MPP And Interconnect MPI**  
**Specifically for LS-DYNA**

*MPP and Interconnect MPI*

<b>Company</b>	<b>O/S</b>	<b>HPC Interconnect</b>	<b>MPI Software</b>
<b>CRAY</b>			
CX1	Linux Windows HPC Server 2008,	InfiniBand	MSMPI, HP MPI, INTEL MPI
XT5	Linux	SeaStar2	Cray MPI
XT5M	Linux	SeaStar1	Cray MPI
<b>FUJITSU</b>			
Prime Power	SUN OS 5.8		
<b>HP</b>			
PA8000	HPUX		
IA64	HPUX		

**Continued on next Page**



## MPP And Interconnect MPI

### Specifically for LS-DYNA

#### *MPP and Interconnect MPI*

<b>INTEL</b>			
IA32	Linux, Windows	InfiniBand (Voltaire), MyriCom	MPICH, HP MPI, OpenMPI
IA64	Linux		MPICH, HP MPI, OpenMPI
Xeon EMT 64	Linux	InfiniBand (Voltaire), MyriCom, PathScale InfiniPath	MPICH, HP MPI, OpenMPI, INTEL MPI

<b>SGI</b>			
Altix 4700, 450	Linux	NUMalink 4	SGI MPT, OpenMPI, Intel MPI, MPICH, Platform MPI 7 (HP-MPI)
Altix UV	Linux	NUMalink 5	SGI MPT, OpenMPI, Intel MPI, MPICH, Platform MPI 5.6 (Scali MPI), 7 (HP-MPI)
Altix ICE	Linux	GigE QDR Mellanox Infiniband	SGI MPT, OpenMPI, Intel MPI, MPICH, Platform MPI 5.6 (Scali MPI), 7 (HP-MPI)
Altix XE	Linux & Windows	GigE QDR Mellanox Infiniband	SGI MPT, OpenMPI, Intel MPI, MPICH, Platform MPI 5.6 (Scali MPI), 7 (HP-MPI), MSMPI
CloudRack X2	Linux & Windows	GigE	SGI MPT, OpenMPI, Intel MPI, MPICH, Platform MPI 5.6 (Scali MPI), 7 (HP-MPI), MSMPI
Octane III	Linux & Windows	GigE QDR Mellanox Infiniband	SGI MPT, OpenMPI, Intel MPI, MPICH, Platform MPI 5.6 (Scali MPI), 7 (HP-MPI), MSMPI

Training Classes



Training Courses

Held at LSTC Offices

CA or MI Location

Advanced - Impact Analysis	CA July 12-15, 2010 CA Sept 28 - Oct 01, 2010
_Advanced Options	CA Dec 09-10, 2010
ALE/Eulerian & Fluid/Structure Interaction	CA Feb 17-19, 2010
ALE Advanced Applications	MI March 30 – Apr 01
Composite Materials	CA June 24-25, 2010
Concrete and Geomaterial Modeling (min 3 students)	CA Sept 14-15, 2010
Contact	CA June 22-23, 2010 MI Sept 20-21 2010
Implicit	MI March 25-26, 2010 CA June 30-July 01, 2010
Introduction to LS-DYNA LS-PrePost is no fee and the day prior to start date	CA Feb 02-05, 2010 CA May 04-07, 2010 CA Aug 03-06, 2010 CA Nov 09-12, 2010
Introduction to LS-DYNA LS-PrePost is no fee and the day prior to start date	MI March 16-19, 2010 MI June 15-18, 2010 MI Sept 14-17, 2010 MI Dec 14-17, 2010
Material Modeling Using User Defined Options	CA June 28-29, 2010
<b>Courses by Len Schwer/Paul Dubois</b>	
Blast Modeling	CA Sept 21-22, 2010
<u>Penetration</u> Modeling	CA Sept 23-24, 2010
Modeling & Simulation	CA Sept 16-17, 2010



**VOLTAIRE Full Press Release can be located at:**

[http://www.voltaire.com/NewsAndEvents/Press\\_Releases/press2010/IT\\_Survey\\_Finds\\_Executives\\_Planning\\_Converged\\_Network\\_Strategy](http://www.voltaire.com/NewsAndEvents/Press_Releases/press2010/IT_Survey_Finds_Executives_Planning_Converged_Network_Strategy)

IT Survey Finds Executives Planning Converged Network Strategy: Using Both InfiniBand and Ethernet Fabric Performance Key to Making Data Centers Operate More Efficiently

CHELMSFORD, Mass. and RA'ANANA, Israel – January 12, 2010 – A new survey by Voltaire (NASDAQ: VOLT) reveals that IT executives plan to use InfiniBand and Ethernet technologies together as they refresh or build new data centers. They're choosing a converged network strategy to improve fabric performance which in turn furthers their infrastructure consolidation and efficiency objectives.

Voltaire queried more than 120 members of the Global CIO & Executive IT Group, which includes CIOs, senior IT executives, and others in the field that attended the 2009 MIT Sloan CIO Symposium. The survey explored their data center networking needs, their choice of interconnect technologies (fabrics) for the enterprise, and criteria for making technology purchasing decisions.

"Increasingly, InfiniBand and Ethernet share the ability to address key networking requirements of virtualized, scale-out data centers, such as performance, efficiency, and scalability," noted Asaf Somekh, vice president of marketing, Voltaire. "By adopting a converged network strategy, IT executives can build on their pre-existing investments, and leverage the best of both technologies."

When asked about their fabric choices, 45 percent of the respondents said they planned to implement both InfiniBand with Ethernet as they made future data center enhancements. Another 54 percent intended to rely on Ethernet alone.

**Among additional survey results:**

When asked to rank the most important characteristics for their data center fabric, the largest number (31 percent) cited high bandwidth. Twenty-two percent cited low latency, and 17 percent said scalability.

When asked about their top data center networking priorities for the next two

years, 34 percent again cited performance. Twenty-seven percent mentioned reducing costs, and 16 percent cited improving service levels. A majority (nearly 60 percent) favored a fabric/network that is supported or backed by a global server manufacturer. InfiniBand and Ethernet interconnect technologies are widely used in today's data centers to speed up and make the most of computing applications, and to enable faster sharing of data among storage and server networks. Voltaire's server and storage fabric switches leverage both technologies for optimum efficiency. The company provides InfiniBand products used in supercomputers, high-performance computing, and enterprise environments, as well as its Ethernet products to help a broad array of enterprise data centers meet their performance requirements and consolidation plans.

#### About Voltaire

Voltaire (NASDAQ: VOLT) is a leading provider of scale-out computing fabrics for data centers, high performance computing and cloud environments. Voltaire's family of server and storage fabric switches and advanced management software improve performance of mission-critical applications, increase efficiency and reduce costs through infrastructure consolidation and lower power consumption. Used by more than 30 percent of the Fortune 100 and other premier organizations across many industries, including many of the TOP500 supercomputers, Voltaire products are included in server and blade offerings from Bull, HP, IBM, NEC and Sun. Founded in 1997, Voltaire is headquartered in Ra'anana, Israel and Chelmsford, Massachusetts. More information is available at [www.voltaire.com](http://www.voltaire.com) or by calling 1-800-865-8247.



## Press Release - Intel

### Three-Hundred Young Scientists to be Honored as Semifinalists in the Intel Science Talent Search 2010

High School Seniors Selected from Largest Applicant Pool since 1996

Three-hundred seniors from 175 high schools across the country will be named semifinalists in the Intel Science Talent Search 2010, a program of Society for Science & the Public. As America's oldest and most prestigious pre-college science competition, the Intel Science Talent Search brings together the best and brightest young scientific minds in America to compete for \$1.25 million in awards. Each semifinalist receives a \$1,000 award from the Intel Foundation with an additional \$1,000 going to his or her respective school, resulting in \$600,000 in total semifinalist awards.

The Intel Science Talent Search encourages students to tackle challenging scientific questions and develop the skills to solve the problems of tomorrow. Projects submitted for consideration cover all disciplines of science, including biochemistry, chemistry, physics, mathematics, engineering, behavioral science, and medicine and health.

**WHO:** Semifinalists were selected from 1,736 entrants, up from 1,608 last year, and hail from 37 states and the District of Columbia. To learn about specific semifinalists and view a state-by-state breakdown, visit

[www.societyforscience.org](http://www.societyforscience.org)

after 4 p.m. EST.

**NEXT STEPS:** On Jan. 27, 40 of the 300 semifinalists will be named finalists and will gather in Washington, D.C. from March 11-16 to compete for more than \$630,000 in awards from the Intel Foundation. The winners will be selected based on rigorous judging sessions and announced at a black-tie gala award ceremony at the National Building Museum on March 16. The grand prize is a \$100,000 award; the remaining top 10 will receive awards totaling \$305,000.

**QUOTES:** "We believe that fostering a passion for math and science in today's youth is imperative for America's future success as a leader in innovation," said Shelly Esque, vice president of Intel's Corporate Affairs Group. "The 300 Intel Science Talent Search semifinalists recognized today exemplify what is possible when young people are encouraged to apply math and science to solving today's most challenging problems."

"Each year we continue to be impressed by the caliber of the semifinalists and inspired by their mastery of math and science in addressing extraordinarily

complex medical, technological and environmental challenges," said Elizabeth Marincola, president of Society for Science & the Public, the nonprofit organization dedicated to public engagement in scientific research and education that has owned and administered the Science Talent Search since its inception in 1942. "We join with Intel to congratulate these exceptional young minds and commend the mentors, teachers, schools, parents and communities that have contributed to their success."

**WHY:** Intel believes that young people are the key to solving global challenges, and that a solid math and science foundation coupled with skills such as critical thinking, collaboration and digital literacy are crucial for their success. Over the past decade alone, Intel has invested more than \$1 billion, and its employees have donated more than 2.5 million hours toward improving education in 50 countries.

Over the past 69 years, more than 140,000 students from U.S. high schools in all 50 states, the District of Columbia, and U.S. territories have submitted independent research projects for the Science Talent Search. The young innovators chosen to participate in the Science Talent Search have gone on to receive some of the world's most prestigious honors, including the Nobel Prize, the Fields Medal, the National Medal of Science and the MacArthur Foundation Fellowship.

## **2010 marks Intel's 12th year sponsoring the Science Talent Search.**

**MORE INFO:** To view ongoing updates about the Intel Science Talent Search 2010, join the Facebook group at [www.facebook.com/pages/Inspired-by-Education/32855637280](http://www.facebook.com/pages/Inspired-by-Education/32855637280) and follow Twitter updates at [www.twitter.com/intelinspire](http://www.twitter.com/intelinspire).

To learn more about the Intel Education Initiative, visit [www.intel.com/education](http://www.intel.com/education) and the CSR@Intel blog at [blogs.intel.com/csr](http://blogs.intel.com/csr). To join Intel's community of people sharing their voices for change in global education, visit [www.inspiredbyeducation.com](http://www.inspiredbyeducation.com).

To learn more about Society for Science & the Public, visit [www.societyforscience.org](http://www.societyforscience.org).

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## HP Computers Usher in New Levels of Design Innovation on Season Seven of Lifetime Television's Hit Series "Project Runway"

TV show designers to create fashion using technology from HP and Intel

<http://www.hp.com/hpinfo/newsroom/press/2010/100113xb.html>

NEW YORK, Jan. 13, 2010

Fusing the worlds of fashion and technology, HP today announced with Intel a product integration with Lifetime Television's hit show "Project Runway" that makes HP's touch-enabled PCs and notebooks an integral part of the creative process throughout the show's new season.

Contestants will, for the first time in the history of the series, have the option to use computers to sketch designs and inspire their work. "Project Runway" season seven will premiere Jan. 14 at 10 p.m. ET/PT on Lifetime.

"Technology is what's next in fashion design. Forward-thinking designers are exploring new ways to use technology in the design process," said Barbara Schneeweiss, vice president of Production and Development for TV and Feature Film at The Weinstein Company.

"We are excited about HP's new technology and think it will add a great new element to this season of Project Runway," said JoAnn Alfano, executive vice president of Entertainment at Lifetime Networks.

Throughout Project Runway's seventh season, viewers can expect to see some designers trade in traditional sketchpads and pens for HP PCs with Intel® processors that give them greater freedom to experiment with design mock-ups for each challenge.

HP has been at the forefront of fusing fashion and technology since unveiling the HP Mini Vivienne Tam "digital clutch" notebook on the catwalk of Tam's 2008 fashion show at New York Fashion Week in Bryant Park. Models walked down the runway with the peony-adorned Minis at hand, a first on an American runway.

Last September, HP and Tam collaborated again to create the new look in digital clutch chic. The design reflects Tam's Spring 2010 collection, inspired by the classic Chinese love story, "Butterfly Lovers," a beautiful tale of freedom, romance and inspiration. The Butterfly Lovers digital clutch is expected to be available this spring with the rest of Tam's collection.



**Technology on the show** - The "Project Runway" designers will have the opportunity to unleash their creativity using HP TouchSmart PCs and HP TouchSmart tm2 notebooks, both powered with Intel processors. The screen of the tm2 can be rotated around and converted to slate mode, morphing it into a sketchpad with digital pen. This allows the designers to draw, sketch and take notes with near limitless options for colors, brushes and effects.

The winning designer of season seven will receive a \$50,000 prize package from HP and Intel to create, design and run his or her own business.

**Getting involved** - "Project Runway" fans will have the chance to enter the Judge Your Way to a New Notebook contest by visiting [www.projectrunway.com/hp](http://www.projectrunway.com/hp), which goes live on Jan. 14. Entrants can predict the final top three designers that will show their collections at New York's Fashion Week; those that guess correctly will be entered to win a premium HP Envy 15 notebook PC powered by the latest Intel processor.

Visitors to the website also can find information on the technology being used on the show's new season and get a behind-the-scenes look at the sketching process and final sketches.

**About Project Runway** - Hosted by supermodel and fashion maven Heidi Klum, the hit series Project Runway provides budding designers with an opportunity to launch their careers in fashion, under the watchful eye of mentor and Liz Claiborne Chief Creative Officer Tim Gunn. The wildly successful competition reality series has proven to

be one of television's most talked about shows and, during its first season on Lifetime, was cable's most watched reality program in 2009 among Women 18+, Women 25-54 and in Households.

Models of the Runway, an exciting new companion series to Project Runway, gives fans a behind-the-scenes look at the reality competition – from the models' perspective. Viewers experience the drama, anxiety, joys, tears and frustrations as the models themselves face elimination each week and compete for a cash prize and photo spread in Marie Claire magazine.

Project Runway and Models of the Runway will be in high definition, where available, for the first time ever this season.

Project Runway and Models of the Runway are produced by The Weinstein Company, Miramax Films, Bunim-Murray Productions and Full Picture. Executive producers include Bob and Harvey Weinstein (Co-Chairmen of The Weinstein Company), Jon Murray and Sara Rea of Bunim-Murray Productions, Heidi Klum, and Jane Cha and Desiree Gruber of Full Picture. Barbara Schneeweiss oversees the production on behalf of The Weinstein Company.

About The Weinstein Company

The Weinstein Company (TWC) was created by Bob and Harvey Weinstein, the brothers who founded Miramax Films Corporation in 1979. TWC is a multimedia company that officially launched on Oct. 1, 2005.

About Lifetime

Lifetime Networks is a diverse, multimedia company committed to offering the highest quality entertainment and information programming that celebrates, entertains and supports women. Through its award-winning public affairs initiatives, the company also advocates a wide range of issues affecting women and their families. Lifetime Television®, Lifetime Movie Network®, Lifetime Real Women® and Lifetime Digital™ (which includes myLifetime.com, LMN.tv, Lifetime Games, Roiworld.com, DressUpChallenge.com, MothersClick.com and LifetimeMoms.com) are part of Lifetime Entertainment Services, LLC, a subsidiary of A&E Television Networks, LLC. A&E Television Networks is a joint venture of the Disney-ABC Television Group, Hearst Corporation and NBC Universal.

#### About HP

HP creates new possibilities for technology to have a meaningful impact on people, businesses, governments and society. The world's largest technology company, HP brings together a portfolio that spans printing, personal computing, software, services and IT infrastructure to solve customer problems. More information about HP (NYSE: HPO) is available at <http://www.hp.com>.

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