JANUARY
2007

fea INFORMATION

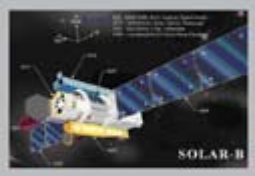
WWW.FEAINFORMATION.COM

DATA STORAGE

SGI

From 1,000 Years Ago

to the Day After Tomorrow



PRODUCT SPOTLIGHT

QLogic

InfiniPath

InfiniBand HCAs

TRAINING

LSTC

LS-PrePost®

Online Documentation

FEA Information Worldwide Participants

01	Index
02	FEA Announcements
03	HP – Benchmarks - Experience LS-DYNA By The Hour
06	BETA CAE Systems S.A
08	LS-DYNA Publication by Moisey B. Shkolnikov
09	SGI – From 1,000 years ago to the day after tomorrow
13	AVI - Impact-Contact Interaction between Rigid Ball and Woven Structure
14	Yahoo Yammerings
18	Qlogic – webpage showcase
19	AMD "Better by Design" Program Enables PC Manufacturers to Deliver Ultimate Solutions for Windows Vista™
21	CHINA News
22	LS-PrePost
23	LSTC 2007 Training Michigan and California
26	LS-DYNA Events
27	LS-DYNA Resource Page
33	Last Month's News Page Highlights
34	Hardware & Computing and Communication Products
35	Software Distributors
37	Consulting and Engineering Services
38	Educational & Contributing Participants
39	China Participants
41	Informational Websites

Editor:
Art Shapiro
Managing Editor:
Marsha Victory
Graphic Designer:
Wayne L. Mindle

Technical Writers:
Dr. David Benson
Uli Franz
Dr. Ala Tabiei
Suri Bala
Technical Consultants:
Steve Pilz - Reza Sadeghi

FEA Information Announcements

We would like to welcome:

BETA CAE Systems S.A Headquartered in Thessaloniki, Greece, is a private engineering software company specialized in the development of state of the art CAE pre- and post-processing software systems.

ANSA is an advanced CAE pre-processing tool for Finite Element Analysis 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 the users' favorite, due to its wide range of features and tools that meet their needs.

For Complete Information Visit BETA CAE

Sincerely,

Art Shapiro
art@feainformation.com

Marsha J. Victory
mv@feainformation.com

HP Benchmarks - TopCrunch

Courtesy of Yih-Yih Lin - HP

HP builds servers using all of the industry standard processors—Intel Xeon, Intel Itanium 2, and AMD Opteron—and using major industry standard operating systems—Linux, Microsoft Windows Compute Cluster Server 2003 (Windows CCS), and HP-UX. For distributed computing, like MPP LS-DYNA, HP also offers HP-MPI as a universal MPI to work fast and reliably on clusters of those servers and operating systems.

This week HP has submitted 4 complete sets of benchmarks to TopCrunch: (1) with *car2car*, (2) with *3-vehicle collision*, (3) with *neon_refined_revised*, and (4) with *neon_refined*.

The first three sets of benchmarks are obtained with an HP Cluster Portfolio 3000 (CP3000) system running RedHat Enterprise Linux. The system comprises 128 nodes of HP ProLiant DL140 G3 servers based on the Intel Dual-Core Xeon Processor 5160 (3.0 GHz), giving a total of 512 cores, and is interconnected with an InfiniBand switch with dual data rate (DDR) speed. The HP ProLiant DL140 G3 systems, available only recently, are dual-core and so provide lower cost per core with exceptional performance. They also provide 64-bit processing capability, which is most suitable for LS-DYNA. The InfiniBand DDR switch is the fastest InfiniBand switch that exists today; earlier InfiniBand switches are single data rate (SDR).

The last set of benchmarks is obtained with an HP Cluster Portfolio 4000 (CP4000) system running Windows CCS. The system comprises 64 nodes of HP ProLiant DL145 G2 servers based on AMD Dual-Core Opteron 285 Processor (2.2 GHz), giving a total of 256 cores, and is interconnected with a Voltaire InfiniBand SDR switch. The HP ProLiant DL145 G2 servers are also dual-core and provide 64-bit processing capability. The reported benchmark is the first one to appear on TopCrunch for Windows CCS. The result shows that a Windows CCS cluster is competitive with a Linux cluster. LSTC, Microsoft and HP are working together to further improve LS-DYNA performance on Windows CCS clusters.

Vendor / Submitter Org.	Computer / Interconnect	Processor	#Nodes x #Processors per Node x #Cores Per Processor = Total #CPU	Time (Sec)	Benchmark Problem	Submission Date
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	64 x 2 x 1 = **128**	329	neon_refined_revised	01/19/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	32 x 2 x 1 = **64**	358	neon_refined_revised	01/19/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	16 x 2 x 2 = **64**	457	neon_refined_revised	01/19/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	16 x 2 x 1 = **32**	463	neon_refined_revised	01/19/2007
HP/HP	CP4000/Windows CCS/Voltaire InfiniBand SDR	AMD Dualcore Opteron 2.2 GHz DL145	16 x 2 x 2 = **64**	579	neon_refined	01/18/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	8 x 2 x 2 = **32**	596	neon_refined_revised	01/19/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	8 x 2 x 1 = **16**	737	neon_refined_revised	01/19/2007
HP/HP	CP4000/Windows CCS/Voltaire InfiniBand SDR	AMD Dualcore Opteron 2.2 GHz DL145	8 x 2 x 2 = **32**	810	neon_refined	01/18/2007

HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	4 x 2 x 2 = **16**	953	neon_refined_revised	01/19/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	4 x 2 x 1 = **8**	1294	neon_refined_revised	01/19/2007
HP/HP	CP4000/Windows CCS/Voltaire InfiniBand SDR	AMD Dualcore Opteron 2.2 GHz DL145	4 x 2 x 2 = **16**	1377	neon_refined	01/18/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	2 x 2 x 2 = **8**	1714	neon_refined_revised	01/19/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	64 x 2 x 1 = **128**	2024	3 Vehicle Collision	01/18/2007
HP/HP	CP3000/Linux/InfiniBand	Intel Dualcore Xeon 3.0 GHz DL140	48 x 2 x 1 = **96**	2345	3 Vehicle Collision	01/17/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	2 x 2 x 1 = **4**	2434	neon_refined_revised	01/19/2007
HP/HP	CP4000/Windows CCS/Voltaire InfiniBand SDR	AMD Dualcore Opteron 2.2 GHz DL145	2 x 2 x 2 = **8**	2605	neon_refined	01/18/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	32 x 2 x 1 = **64**	2762	3 Vehicle Collision	01/17/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	32 x 2 x 2 = **128**	3210	3 Vehicle Collision	01/18/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	1 x 2 x 2 = **4**	3271	neon_refined_revised	01/19/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	24 x 2 x 1 = **48**	3463	3 Vehicle Collision	01/17/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	24 x 2 x 2 = **96**	3502	3 Vehicle Collision	01/17/2007
HP/HP	CP4000/Windows CCS/Voltaire InfiniBand SDR	AMD Dualcore Opteron 2.2 GHz DL145	1 x 2 x 2 = **4**	3891	neon_refined	01/18/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	16 x 2 x 2 = **64**	4118	3 Vehicle Collision	01/17/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	1 x 2 x 1 = **2**	4673	neon_refined_revised	01/19/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	16 x 2 x 1 = **32**	4693	3 Vehicle Collision	01/17/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	12 x 2 x 2 = **48**	4922	3 Vehicle Collision	01/17/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	12 x 2 x 1 = **24**	5894	3 Vehicle Collision	01/17/2007
HP/HP	CP4000/Windows CCS/Voltaire InfiniBand SDR	AMD Dualcore Opteron 2.2 GHz DL145	1 x 2 x 1 = **2**	6569	neon_refined	01/18/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	6 x 2 x 2 = **24**	8238	3 Vehicle Collision	01/17/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	1 x 1 x 1 = **1**	9005	neon_refined_revised	01/19/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	112 x 2 x 1 = **224**	11023	car2car	01/16/2007
HP/HP	CP4000/Windows CCS/Voltaire InfiniBand SDR	AMD Dualcore Opteron 2.2 GHz DL145	1 x 1 x 1 = **1**	11901	neon_refined	01/18/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	64 x 2 x 1 = **128**	14313	car2car	01/16/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	56 x 2 x 2 = **224**	15442	car2car	01/16/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	32 x 2 x 2 = **128**	20129	car2car	01/16/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	32 x 2 x 1 = **64**	23253	car2car	01/16/2007

HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	16 x 2 x 2 = **64**	31318	car2car	01/16/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	16 x 2 x 1 = **32**	42423	car2car	01/16/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	8 x 2 x 2 = **32**	56722	car2car	01/16/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	8 x 2 x 1 = **16**	81525	car2car	01/16/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	4 x 2 x 2 = **16**	107618	car2car	01/16/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	4 x 2 x 1 = **8**	158647	car2car	01/16/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	2 x 2 x 2 = **8**	208692	car2car	01/16/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	2 x 2 x 1 = **4**	309536	car2car	01/16/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	1 x 2 x 2 = **4**	393884	car2car	01/16/2007
HP/HP	CP3000/Linux/InfiniBand DDR	Intel Dualcore Xeon 3.0 GHz DL140	1 x 2 x 1 = **2**	565261	car2car	01/16/2007

Experience LS-DYNA® by the hour… FREE!!

A 5,000+ hour HP Flexible Computing Services utility computing trial to qualified LS-DYNA commercial customers

Flexible IT for your most demanding jobs

A $4,500 value, this offer includes:

- **16 Xeon 64-bit CPU's for 2 weeks (5,376 CPU-hours**
- **LS-DYNA MPP version 971**
- **Redhat Enterprise Linux**
- **HP MPI**
- **SSH connectivity**

Take advantage of this offer NOW to ensure your access to capacity!

About the LS-DYNA HP Flexible Computing Services Solution

Hewlett-Packard delivers a new, complete LS-DYNA Utility Computing Service under the HP Flexible Computing Services portfolio. This unique utility computing service offers LS-DYNA customers servers, networking, storage and LS-DYNA licensing, all hosted at a highly secure, HP-owned data center.

Pay As You Go Computing

The LS-DYNA HP Flexible Computing Service is a pay-as-you-go service. There is no long-term financial commitment necessary. You can use it once and pay only for the hours of service you reserved. It is designed to extend and complement your in-house LS-DYNA resources.

Terms of offer:
Offer is valid for North America-based LS-DYNA commercial customers and is subject to qualification. Agreement with HP Flexible Computing Services and LS-DYNA terms of use is required. Introductory session includes infrastructure, OS, and LS-DYNA software as described. Offer is subject to compute resources available at the time of request. Agreement with additional terms is required with the purchase of production-level LS-DYNA HP Flexible Computing Services.
For more information, or to sign up for this offer, go to
http://www.hp.com/services/flexiblecomputing

BETA CAE Systems S.A For Complete Information Visit BETA CAE

Headquartered in Thessaloniki, Greece, is a private engineering software company specialized in the development of state of the art CAE pre- and post-processing software systems.

ANSA is an advanced CAE pre-processing tool for Finite Element Analysis 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 the users' favorite, due to its wide range of features and tools that meet their needs.

CAD data Input - CAD geometry can be read in from neutral files (IGES, STEP, etc.) and manipulated by **ANSA**'s powerful built-in geometry engine. Additionally, data from CATIA V4, CATIA V5 and Unigraphics NX data files can be converted into ANSA files using the available translators.

ANSA Data Management - **ANSA** DM assures the effective and efficient data handling throughout projects, by streamlining updated model data to engineering teams, allowing the easy sharing of common data and offering the access to library items for the analysis dependant solution settings.

Task Manager - Integrated workflow manager. A tool where all individual tasks of the development of a vehicle simulation model are included. Tasks in Task Manager are built up from the CAE expert who sets the boundaries between distinct modeling actions and predetermines all modeling parameters that must be respected, leaving to the inexperienced user a minimum degree of interference and limited (or none) decision making.

Meshing - Following the versatile mesh area idealization, geometry can be meshed according to modeling requirements by its cutting edge, fully integrated surface and volume meshing algorithms. The numerous proprietary shell meshing algorithms, the high performance and quality Tetra meshing algorithms, the Hexa-Interior meshing algorithm and the Acoustic Cavity mesher create a unique mesh generation environment. Furthermore, the integrated batch meshing tool leads to controllable and effortless optimal meshing results.

Assembly - Powered with fully comprehensive parts and welding management tools, **ANSA** facilitates parts assembly, with alternative node-dependent or -independent connections types. The advanced exchange of connections data through vip, vip2 and xml files succeeds in the completion of a single stage parts connection. New concepts introduced, including model hierarchy input, multiple part instances handling, alternative part representations management, model assembly and build up using Generic Entities such as Connectors, Boundary Conditions and Output requests.

Preprocessing Decks - Preprocessing completion is achieved through the uniquely interoperating preprocessing decks for NASTRAN, LS-DYNA, PAM-CRASH, RADIOSS, ABAQUS Stan-

dard/Explicit and ANSYS, allowing direct model modification between solvers, including material synchronization. **ANSA** is multidisciplinary by design, in order to simultaneously handle models for Crash, Durability, NVH, CFD analysis etc., supporting all entities required by various solvers. Numerous quality and integrity checks and fixes assure model quality before output.

Models reusability - Legacy FE Models can also be read in various formats and optionally refined or coarsened by the automated mesh reconstruction functionality, which has incredible capabilities. The FE models can even be modified further with a wide range of preprocessing decks functions and tools.

Safety features - Crash and safety modeling is assisted by user friendly features for seatbelt fastening, positioning and articulation of crash test dummies and "headform" models for passenger and pedestrian safety simulation standard scenarios.

Laminates - The Laminate Tool is one more enhanced function that assists the modeling of complex parts made of composite materials.

Model integrity checks - Replicating the integrity and correctness checks performed by the solvers, **ANSA** reports potential modeling flaws and proceeds to model auto-correction actions.

Solution control - The above, along with the user-friendly solution case scenario definition leads to the output of a ready to solve model. Apart from the formats of the solvers for which complete preprocessing decks exist, i.e. NASTRAN, LS-DYNA, PAM-CRASH, RADIOSS, ABAQUS and ANSYS, numerous other file formats are supported, for structural, CFD and other solvers.

Tools - The core preprocessing functionality of **ANSA** is enhanced with a substantial number of other advanced tools that allow the user to complete specialized tasks without leaving the software environment. Such tools are the Cross Section Analysis Tool, the BiW Bath Traps Tool and the Fuel Tank Analysis Tool.

Morphing - One of the most advanced tools developed to meet the current needs for fast model modifications is the Morphing Tool. The **ANSA** Morphing Tool provides new boundaries to existing models by allowing the versatile production of alternative models based on a single master model. The tool may be used simply for evolutionary changes or sensitivity analysis.

Scripting Automation - The **ANSA** scripting language is an enhanced programming tool that boosts productivity providing the power to access data and perform custom operations in an automated way. The integrated **ANSA** environment, powered by the process automation of the scripting language, is a unique modeling solution.

Optimization - The scripting automation, combined with the Morphing Tool and other software feature allow the versatile coupling of **ANSA** with numerous optimization codes.

LS-DYNA Publication - Abstract & Introduction

The Complete Paper is found on FEA Publications Side Bar Link: "Featured"

Thin-Walled Beams Research and Development - Moisey B. Shkolnikov

Abstract: *An integrated warped FEM beam element has been implemented in LS-DYNA and is considered here as a very important beginning. Accounting for warping is a fundamental part of Thin-walled beam theory, having more than three quarters of century history of research and developments, which are still active. Information related to thin-walled beams looks to be very useful to LS-DYNA users, may define steps for further beam FEM elements implementations and wider usage, and therefore some of the information is presented in this paper. The principal idea of the Thin-walled beam theory to represent three-dimensional thin-walled cylindrical shell structures as one-dimensional thin-walled warping beams was very useful in the past and very important today taking advantage of that beams computational efficiency. So far, however, thin-walled beams are modeled mostly using shell FEM elements, which is computationally more expensive*

1. Introduction: Implementation of integrated warped beam element based on Thin-walled beam theory, Vlasov [1], by Borrval [2], in LS-DYNA is considered here as a very important beginning of wider usage computationally efficient beam FEM elements in FEM structure models.

The basic idea of the Thin-walled beam theory is to represent mathematically three-dimensional cylindrical shell structures as one-dimensional thin-walled beams. That is similar to the computationally efficient Strength of Material theory mathematical representations three-dimensional structures as one-dimensional objects referred to as beams. Strength of Material theory is based on two hypotheses: hypothesis of rigid and hypothesis of plane (not warping) cross sections. The hypotheses are justified for beams with solid cross sections, which dimensions are significantly smaller then beams length.

Three-dimensional cylindrical thin-walled shell structures cross sections are designed to have insignificant deformations during normal applications. To make shells cross sections not deformable, sufficient shell thickness is selected for small cross sections and for large cross sections reinforcements are used. Vlasov [1] had confirmed theoretically and experimentally the applicability of rigid cross sections hypothesis in cylindrical open cross sections shells analyses. Therefore hypothesis of rigid cross sections is used in the Thin-walled beam theory.

However, during normal operations, even reinforced thin-walled shell structures cross sections not always remain plain, i.e. their cross sections might warp. Therefore Vlasov's Thin-walled beam theory does not accept the hypothesis of plane (not warping) cross sections. That makes the Thin-walled beam theory a generalization of the Strength of Material theory. Thin-walled beam theory uses additional generalized force referred to as bimoment B, Fig.1, which graphical representation comprises of two self-equilibrium moments. The distance between the two moments is considered to be infinitesimal. Bimoments create cross sections warping. Thin-walled beam theory, Fig.1, represents warping as longitudinal normal cross section deformation under torsion. The warping deformation is plane within each linear part of a cross section's profile.

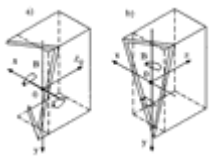


Fig.1. Bimoments B and warping of cross sections: a) open b) closed

SGI - From 1,000 Years Ago to the Day After Tomorrow

Complete Article can be found on http://www.sgi.com/features/2007/ral.html

Image of Solar B Satellite courtesy of Mullard Space Science Laboratory

The UK's largest e-Science center at Rutherford Appleton Laboratory (RAL) provides leading-edge IT services including high-performance computing and visualization, data storage and management, and Grid services. As a key component in this, the center's Petabyte Storage Group provides data storage and archive facilities at very large volumes and bandwidths to the global particle physics community, on-site facilities, the UK academic community etc.

One of the group's three major services is hierarchical storage management (HSM), which, since December 2005, has used SGI® InfiniteStorage Data Migration Facility (DMF) to manage a hierarchy of disk and tape storage based on user-defined policies. Chosen for its combination of capacity, cost, performance, reliability and ease of connection to RAL's existing infrastructure, DMF is being used by a variety of RAL's clients for projects including ISIS (the world's leading pulsed neutron and muon source), the British Atmospheric Data Center (for storing weather data), Solar-B (a new Japanese project studying the Sun) and the UK Solar System Data Center - for all of which it is simplifying and streamlining data access, administration and management.

"In terms of scalability, we were looking for an HSM solution that could take us to the 0.5 Petabyte level, which DMF achieves easily."
- Dr. David Corney, Head of the Petabyte Storage Group e-Science Center, Rutherford Appleton Laboratory

"The majority of our services are provided to the particle physics community, for which we are the Tier 1 Center for the UK," explains Dr. David Corney, head of the Petabyte Storage Group. "A typical example is the Large Hadron Collider in CERN, which is due to come online in 2007. When it does we'll be responsible

for receiving the data from it, storing this data safely, and cascading it to local Tier 2 Centers, then on down the chain to researchers, universities etc. For this we're looking at data volumes of 4-5 Petabytes within 2-3 years; and we're in the process of installing a 10Gbit/ second network linking us directly with CERN to help facilitate this. All our major services are essentially to do with storing data safely and securely, and using a variety of means based on Grid technology to get that data into and out of our systems. The first of these is the Atlas Data Store (ADS). This is our inhouse archiving system, which has been running for around 20 years, isn't scalable, and handles about a Petabyte of data and approximately 500,000 files. We're in the process of replacing ADS with CASTOR2 - the CERN Advanced Storage System. We've been collaborating with CERN to develop a special interface to this, which will give us scalability up to millions of files and tens of Petabytes of data."

Faster, Easier Access to Archived Files

"The third major service we offer is through the SGI DMF hierarchical storage management system. All three of our services back into a StorageTek SL8500 10,000 slot machine running 20 tape drives - ten 9940Bs and ten T10000s - which are the latest and fastest available. When we surveyed our users in 2005 it was clear that a lot of users wanted access to data storage facilities; and some of our users have a growing need for quick data access, and access through a file system, rather than through the virtual tape system we were using at the time. That was what prompted us to purchase DMF."

One example of the use of DMF is for Solar-B - a Japanese project involving a new satellite that was successfully launched in September 2006 to undertake a variety of studies of the Sun. Data from the satellite will be downloaded to the Institute for Space and Astronautical Science in Japan, stored and forwarded to a local tape cache at RAL. The project involves using Grid tools to facilitate data transfers between Japan and the UK; Grid FTP and certificates to ensure the data is secure; and using a Grid FTP server to manage the data transfers. AstroGrid tools (a Grid interface used by astronomers) are also being used to enable the Solar-B data to be accessed and analyzed. The project is being driven in the UK by the Mullard Space Science Laboratory, which is using the DMF system at RAL to store all the data involved.

"Some of our users have a growing need for quick data access, and access through a file system, rather than through the virtual tape system we were using at the time. That was what prompted us to purchase DMF."

- Dr. David Corney, Head of the Petabyte Storage Group e-Science Center, Rutherford Appleton Laboratory

A second example comes from the UK Solar System Data Center (UKSSDC), which incorporates the World Data Center for Solar Terrestrial Physics (WDC). The WDC has been running for almost 50 years, and the UKSSDC is a major archive for a variety of data associated with the study of

the solar terrestrial environment. This includes:

- 1,000 year-old naked eye observations of sunspots from China and Korea
- Records of sunspot activity dating back to the 1600s
- Geomagnetic measurements of changes in the Earth's magnetic field, starting in the 1800s
- Ground-based radar studies of the upper atmosphere, and particularly the ionosphere, beginning in the 1930s
- Satellite data from the 1960s onwards, including measurements of the interplanetary magnetic field, the solar wind, data from interplanetary missions etc.

"While the majority of the WDC data are indices of measurements taken with various types of instruments over the years, our solar data is primarily image-based, for which we receive large numbers of files on tape, which are then held in RAL's Atlas Data Store," explains Matthew Wild, Project Responsible Officer for the UK Solar System Data Center. "In the past, to enable people to access this data, we've had to create very large catalogues of the files that are held in the ADS, and then drag back the files the person was looking for - a process that could take several minutes, particularly if they needed to access a relatively large composite file within which they might only be interested in a small number of individual images.

"The ADS is good in the sense that it gives us security: we know that once files are in there they're secure, and that if we ever need to find an original file from NASA or wherever then we know exactly where it is. Adding DMF though means that rather than having to go back into the cartridge store, if someone wants a file then they can have a quick browse through a catalogue of working copies and simply select the images they need. We don't mind if our old files end up sitting on tape and need to be called back as and when somebody wants them; and for the more 'popular' images, DMF enables these to be accessed in a much faster and more user friendly way.

"As a free-to-access archive we have around 4,000 regular users ranging from academics to schoolchildren - and with web access to our solar images we expect this number to increase considerably. When we ran a website covering 1999's total solar eclipse over the UK, for example, we had 12 million hits in one day, so we know how much interest these images can create!

"Overall we're managing around 10TB of data, but looking to the future we have a project called STEREO which will generate around another 30TB over the next couple of years - all of which will be managed using DMF."
- Matthew Wild, Project Responsible Officer, UK Solar System Data Centre

Why SGI?

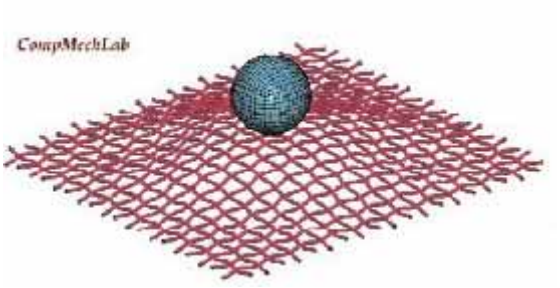
"When we went out to competitive tender for the HSM project, we wanted a combination of capacity, cost, performance, reliability (for connecting to our existing infrastructure), and compatibility with Storage Resource Broker, which we use for

data management," says Tim Folkes, Data Store Manager. "SARA in Amsterdam (who run similar sorts of activities at similar sorts of scale as we do) had done a lot of work on this, and also on Grid FTP, so we visited them to talk about their experiences with DMF. Our discussions were very positive, and also highlighted the low level of maintenance required by the system - it basically looks after itself - and its ease of administration."

The Petabyte Storage Group's HSM solution is based on SGI® InfiniteStorage NAS 2000 Gateway with DMF, and a two-brick SGI® Altix® 350 midrange server with four CPUs and 12GB of memory. The system was originally supplied with an SGI® InfiniteStorage 9300 disk array housing 28TB of SATA storage, to which an additional 16.8TB was added in December 2005. RAL also has a license enabling this to be extended to 500TB as required.

"In terms of scalability, we were looking for an HSM solution that could take us to the 0.5 Petabyte level, which DMF achieves easily," concludes David Corney. "And for our users, whereas our other systems require specialized skills in order to access them, DMF uses NFS as a file system, and you don't get a lot simpler than that!"

LS-DYNA January Featured AVI
Complete AVI's are located at:
www.feainformation.com top bar link "AVI Lib"



AVI's 601 – 606 are located in the AVI Library and on the application site 171HLS-DYNA

Impact-Contact Interaction between Rigid Ball and Woven Structure

Alexey I. Borovkov, Igor B. Voinov
ComMechLab

One of the most interesting problems is dynamic behavior of composite materials, including textile and woven materials under external transient action, in particular impact loading.

The important peculiarity of woven structures is the presence of contact interaction between separate fibers. Incidentally, fibers, being in contact interaction, may slide with regard to one another as well as adhere to each other. These peculiarities of material may substantially influence the dynamic behavior of a woven structure as a whole, e.g. in the process of collision with a flying object. It is clear that in order to detect these effects, fibers of a woven structure shall be modeled as three-dimensional elements with all their geometrical features, taking into account their possibility of coming into contact interaction with each other.

The presented AVI-files demonstrate the possibility of applying finite element simulation software LS-DYNA for analysis of three-dimensional contact interaction of a woven structure and a ball. With the use of LS-DYNA code the principally new mathematical and finite-element model of a woven structure has been created with subsequent direct simulation of dynamic behavior of each fiber separately and in their contact interaction.

One hundred periodicity unit cells have been used for modeling the analyzed woven structure, the number of interwoven fibers and, consequently, contact pairs coming to 361. The total number of elements comes to about 240.000, number of degrees of freedom (NDF) making about 920.000. The ball is modeled as absolutely rigid body.

The direction of initial velocity (angle of incidence α) of the ball is varied from 0° to 60° with regard to the normal of the interweaving.

Yahoo Group Yammerings

Note: LS-DYNA Yahoo Group is neither owned nor operated by LSTC, and LSTC has no control over the content.

Jim Kennedy
KBS2 Inc.
jmk@kbs2.com

Len Schwer
Schwer Engineering & Consulting Services
Len@Schwer.net

The LS-DYNA Yahoo Group archives contains a wealth of information that can be helpful to any LS-DYNA user. We suggest you review the archives when you are seeking help on any topic related to LS-DYNA. *NOTE: Questions and responses may have been edited for clarity & brevity.*

This installment of "Yahoo Yammerings" features three questions, with responses, from the past month of postings to the LS-DYNA Yahoo Group.

1. *Physical interpretation of the artificial bulk viscosity concept?*
2. *Mesh Size?*
3. *Hide Keyword file?*

Question: Physical interpretation of the artificial bulk viscosity concept?

I am trying to understand the physical interpretation of the artificial bulk viscosity concept.

From the LS-DYNA theory manual (my comments/questions in brackets):
Shock (sudden change in acceleration) waves can result from the property that speed of sound increases with increasing pressure. Speed of sound in solids is sqrt(Young's modulus/density) which does not change in LS-DYNA calculations for linear elastic material (since Young's modulus is constant and so is the density). A smooth pressure wave (does it mean stress wave for most cases) can gradually steepen (why would it steepen? increase?) until it propagates as a discontinuous disturbance (is it change of section or material properties) called a shock.

Can someone please spend some time and explain the physics of what happens to a mechanical stress wave propagation problem (as in an impact analysis) when this term is added to the solution. As per what I have understood, it decelerates the propagation of a stress wave (but why is it decelerating it is still not clear to me).

Reply by James Campbell

If you are intending to model shocks in solids you will need to use an equation of state model. With correct parameters this will give the increase in sound speed with density. Linear elastic bulk response is not a valid assumption for this type of problem.

Mathematically shocks are surfaces across which the solution (density, pressure, velocity, energy) is discontinuous, preventing the numerical solution of the equations if not treated appropriately in some manner.

The artificial bulk viscosity method was introduced solely to allow a numerical solution, it is not a model of a physical process. To quote from the original vonNeumann-Richtmyper paper: "The method utilizes the well-known effect on shocks of dissipative mechanisms, such as viscosity and heat conduction. When viscosity is taken into account, for example, the shocks are seen to be smeared out, so that the mathematical surfaces of discontinuity are replaced by thin layers in which pressure, density, temperature, etc. vary rapidly but continuously."

Bulk viscosity should not affect the propagation speed of a shock wave. In practice, the viscosity form in LS-DYNA can do so depending on the mesh orientation, the Saltzman piston problem is a demonstration of this.

Reply by Mark Wan

If you want to find out more about the basis behind the numerical procedure, I would recommend the book "Computational Fluid Dynamics" by John D. Anderson, McGraw-Hill 1995. Chapter 6.6 explains "aspects of numerical dissipation and dispersion; artificial viscosity." Although this text is for CFD rather than solids, I believe the technique applies to both.

Reply by Jim Kennedy

You might read the following paper (one of the references offered by LS-DYNA):
Wilkins, M.L., "Use of Artificial Viscosity in Multidimensional Fluid Dynamic Calculations," *Journal of Computational Physics*, Vol. 36, pp. 281-303, 1980.

Question: Mesh Size?

I am running an impact model using MAT 58 and have achieved reasonable results using a mesh size of 1 mm. I chose this element size by experience (not much!), and that the impact is very localized. I would like to justify this size. but it doesn't seem I can do this via the traditional sense of convergence of results since the failure and deletion of the elements is due to a prescribed failure strain, but this value changes depending on the mesh size (smaller size means a larger failure strain is needed). Any advice on how I can justify my element size? I know that in some sectors, like automotive, they provide recommendations for element size, but I would like some 'concrete' method that I could use.

Reply by Len Schwer

You have asked an excellent question -- How I can justify my mesh size/refinement when using a strain based failure/erosion criteria?

You have also provided the answer -- you cannot, since as you refine the mesh you improve the resolution of the strain field near the impactor, e.g. the local strains increase as the mesh is refined.

The problem you describe is identical with what happens in a simple uniaxial tensile test, i.e. the tensile specimen fails across a very narrow (necked) region that develops a crack. The strains in the vicinity of the crack are quite large, however, the reported experimental strain at failure is measured over a much larger length, i.e. the gauge length.

If one attempts to model this simple uniaxial tensile failure you can either attempt to resolve the crack width with a very fine mesh resolution, or simply declare the specimen failed when the gauge length failure strain is attained with a much coarser mesh.

It is this latter technique that forms the basis of 'regularization' techniques in damage & failure mechanics. Some material models include the 'crack energy,' i.e. Mode I strain-energy, to introduce a local length scale (gauge length) for regularization. Another approach is called 'non-local' where a gauge length is specified independent of the mesh size to provide regularization.

For Mat 58, you might want to see if *MAT_NONLOCAL is applicable, as this model does not include a crack energy regularization option.

Reply by Jim Kennedy

You might find interesting the following papers that discuss regularization:

Feucht, M., Sun, D.-Z. Ehart, T., and Frank, T., "Recent Development and Applications of the Gurson Model," 5th German LS-DYNA Forum, Ulm, Germany, October, 2006.
http://www.dynamore.de/download/af06/papers/D-II-3.pdf

Du Bois, P., Feucht, M., Haufe, A., and Kolling, S., "A Generalized Damage and Failure Formulation for SAMP," 5th German LS-DYNA Forum, Ulm, Germany, October, 2006.
http://www.dynamore.de/download/af06/papers/A-II-3.pdf

Question: Hide Keyword file?

I would like to know if it is possible to send a file to someone that would allow them to run your simulation but does not allow them to see the details contained in the keyword file.

Reply by Chen Tsay

The next version of ls971 will provide encryption capability. The user can encrypt any portion of the input files using LSTC PGP key. This version will be released early next year. If you need a beta version, you can contact LSTC. sales@lstc.com

Reply by Mark Wan

The suggestions of sending only the D3PLOT, D3DUMP, files to hide the keyword file is not effective. Using MSC.Patran, I loaded ONLY the D3PLOT, and I was able to extract the finite element model! Then there is no problem in recreating the keyword file using MSC.Patran. The only details of the keyword that will not be captured are those that are not compatible with MSC.Patran, e.g. *CONSTRAINED_LAGRANGE_IN_SOLID, *MAT_72R3 etc).

LS-DYNA Yahoo Groups

There are over 2090 subscribers from all over the world, and this list seems to grow by a hundred new subscribers ever few months; no small testament to the rapidly growing popularity of LS-DYNA. The group currently averages about 200 message per month, i.e. about 7 message per day. You can subscribe to the group by sending an email request to LS-DYNA-subscribe@yahoogroups.com or by visiting the Yahoo Groups web site http://groups.yahoo.com

Generally, the quickest/best responses are to those questions posed with the most specifics. General questions such as "How do I use XXX feature?" either go unanswered, or are answered by Jim Kennedy with links to appropriate references in the growing LS-DYNA related literature, e.g. see the archive of LS-DYNA Conference proceedings at www.dynalook.com

Web Page Showcase From the website – Qlogic

InfiniPath™ InfiniBand™ Adapters

Introducing the InfiniPath 7000 Series

QLogic InfiniPath InfiniBand HCAs

The highest message rate. The hottest performance.

QLogic InfiniPath InfiniBand HCAs smoke the competition with the industry's highest message rate. Combined with the lowest MPI latency and highest effective bandwidth, this enables MPI and TCP applications to scale to thousands of nodes with unprecedented price-performance. You may know QLogic as the market share leader in high-performance Fibre Channel HBA sales. Now, we bring you InfiniPath InfiniBand HCAs that set new performance and scalability records on nearly every HPC application. Available for the first time with a PCI Express x8 interface.

Learn more about the InfiniPath interconnect

Includes performance results

Bus Type	Data Rate	Ports	RoHS	Model
HyperTransport	10 GB/s	Single	RoHS 6 (7/30/06)	QHT7140
PCI Express	10 GB/s	Single	RoHS 6	QLE7140

January Chosen Press Release

AMD "Better by Design" Program Enables PC Manufacturers to Deliver Ultimate Solutions for Windows Vista™

AMD "Better by Design" Program Enables PC Manufacturers to Deliver Ultimate Solutions for Windows Vista™

Industry-Leading Ecosystem Partners Team with AMD to deliver the ultimate Windows Vista experience through superior technologies —

SUNNYVALE, Calif. -- January 9, 2007 --At CES, AMD (NYSE: AMD) today announced the Better by Design program, a first-of-its kind initiative highlighting outstanding performance and superior technologies in desktop and notebook PCs designed by leading global OEMs. With the impending launch of Microsoft Windows Vista™, the world is moving to a new level of computing experience with increased emphasis on performance, graphics, and mobility. Desktop and notebook PC users today want better performance and a rich experience from their PCs, and the Better by Design program will help ensure that PC users have an added level of information to make a smarter choice.

AMD's leading-edge ecosystem, which includes graphics from ATI and NVIDIA and wireless solutions from Airgo, Atheros and Broadcom, will be incorporated in the Better by Design program.

"The Better by Design program represents our commitment to an open platform strategy, based on superior technologies that enable our OEM customers to design truly differentiated PC solutions and deliver premium features, performance and value to end-users," said Henri Richard, executive vice president, worldwide sales and marketing, AMD. "One of the reasons for AMD's continued success is that we listen to both our end-users' expectations and the needs of our OEM customers and respond with solutions to enable the best experiences in computing."

PC users today expect more from their computers and the Better by Design program features superior technologies and leading-edge performance buyers want for their ever expanding digital lifestyle. Beginning in January 2007, systems that feature the Better by Design label will incorporate high-performance and energy-efficient AMD64 dual-core processors, superior graphics and wireless network performance to help deliver on the promised rich visual capabilities and exciting new features of Windows Vista. Computer manufacturers supporting the Better by Design program include Acer, Dell, Gateway, HP, Lenovo, NEC, Tongfang and others.

"Acer is dedicated to bringing the best technology to empower our customers to achieve more than ever," said Campbell Kan, Head of Mobile Computing Business Unit, Acer Inc. "Our Ferrari 1000 and 5000 notebooks exemplify this commitment with their racecar-inspired design, championship-performance, optimized connectivity, and a multitude of media and productivity tools, that blend elegant design with enhanced efficiency. Acer and the Better by Design program share a similar goal; offering better technologies and performance designed around our customers' true needs."

"Dell has long believed in the power of standards-based technology and is 100 percent committed to standards-based

computing," said Neil Hand, vice president Dell Product Group. "Innovation around open industry standards means customers can easily do more in their computing environments and get more out of their technology dollars."

"HP strives to deliver the best experiences for our customers," said Mark Sanchez, vice president, Consumer Computing – North America, HP. "'Better by Design' embodies our strategy of integrating and optimizing key technologies to deliver the best price/performance across all our customer segments."

The Better by Design program is intended to provide key benefits directly to AMD's OEM and system builder customers and commercial and consumer PC users.

When consumers purchase a PC from their preferred PC brand they gain peace of mind knowing they get the performance and superior technologies needed to take advantage of the new features and capabilities of Windows Vista.

Businesses will benefit from the high performance multi-tasking and outstanding business value in AMD64 dual-core processors and leading graphics and wireless networking solutions.

OEM and system builder customers can reap the rewards of AMD's open platform strategy by choosing from the leading PC technologies in the industry to benefit from the innovation and performance that these solutions enable them to deliver to a competitive market place.

"We're excited about the tremendous support and enthusiasm AMD is providing for Windows Vista at this year's Consumer Electronics Show," said Brad Goldberg, general manager for Windows Client at Microsoft Corp. "By working closely together we are helping to provide technologies that will connect, entertain and hopefully surprise people by how easy this next generation of computing makes their lives."

"With the advent of Microsoft's new operating system, buyers in both the consumer and commercial segments want PCs that will deliver on the Windows Vista visual experience," said Roger Kay, president of Endpoint Technologies Associates. "With the Better by Design program, PC manufacturers can take advantage of premium, industry-standard technologies that enable them to rapidly develop differentiated, feature-rich products that meet Vista's performance requirements."

This program represents a truly unique partnering in the industry. As a leader in the industry, AMD has developed an open platform strategy that drives collaboration and competition among the leading technology companies around the world. It is open and fair competition that results in superior technologies, better choices for PC manufacturers, and better experiences for PC users, all for a better value. This program represents the efforts of companies that compete and now collaborate to bring greater innovation to PC buyers.

About AMD

Advanced Micro Devices (NYSE: AMD) is a leading global provider of innovative processing solutions in the computing, graphics and consumer electronics markets. AMD is dedicated to driving open innovation, choice and industry growth by delivering superior customer-centric solutions that empower consumers and businesses worldwide.

China News

STEPHEN ZHAO joins Arup in Shanghai
Chinese Website is now up and running

Kimbal Virdi - Arup China

Starting January 4th we are pleased to announce that Stephen Zhao has joined Arup in Shanghai.

Stephen will join Arup as Marketing Manager to promote Arup's CAE services, LS-DYNA and related products. Stephen has 7 years experience working in computer simulation in China and wrote the first Chinese technical manual using LS-DYNA. Arup's CAE team in Shanghai is looking forward to working with Stephen in 2007 and bringing you information and news on LS-DYNA.

Stephen's contact details are:
Stephen.zhao@arup.com
TelL 021 6126 2876

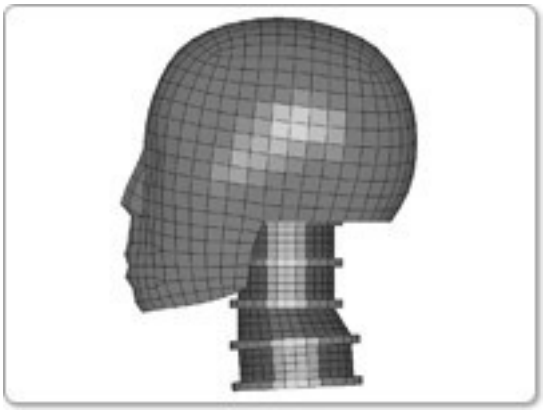
Chinese language website is up and running with information on software, models, china training courses and more.

Go to Arup then click on the Chinese flag.

LS-PrePost® Online Documentation News Update

www.lstc.com/lspp © Copyright LSTC

Online documentation is provided by the developers of LS-PrePost and is continually updated. LS-PrePost, as well as LS-OPT are delivered with LS-DYNA at no additional fees. LS-PrePost is an advanced pre and post-processor. The user interface is designed to be both efficient and intuitive. LS-PrePost runs on Windows, Linux, and Unix utilizing OpenGL graphics to achieve fast rendering and XY plotting.



What's New in LS-PrePost

10-Dec - Added *Delete Degenerated Elem* option to DupNod Interface to allow control over deletion of degenerated elements

01-Dec - Added a few Animated Demos to the Tutorials section

26-Nov - Added scroll wheel zooming as a standard Mouse Operation

22-Nov - Added some Mini Tutorials to address specific topics

16-Nov - Added *asksave* option to Configuration File

LSTC Michigan Training Class News - Troy, Michigan

by: Cathie Walton, LSTC Michigan Office Manager

"This will save anybody a lot of time learning a complex code like LS-DYNA on their own. I tried it on my own for 2-3 months. I've learned much more in 3.5 days." "The course covers some good analysis methods; how the model should be set up to avoid instabilities." -- survey comments by students who attended "Introduction to LS-DYNA" in July 2006.

Training classes at LSTC's office in Troy, Michigan, are a welcome opportunity for LS-DYNA users in the eastern United States and Canada. Our facility can accommodate 12 students with individual computer seating in a relaxed environment, with expert instruction and hands-on exercises.

Universities and automotive companies sent the largest number of participants to the seven sessions in 2006.

Introduction to LS-DYNA was offered five times and all classes were full. The next ***Introduction to LS-DYNA*** class at our Michigan location is March 13-16. Our March class is already filling up - please make your reservation ASAP to reserve a place in the class

Additionally, we also presented ***Advanced Options in LS-DYNA*** and ***Contact.***

Course offerings for 2007 are now posted on www.lstc.com. Please contact jane@lstc.com to register or ask questions. Don't see the class you need scheduled for a Michigan date? Let us know and we'll try to add it!

Currently Scheduled Michigan Training Classes

Training Classes 2007 alpha order	US$	Detroit, MI
Advanced Options	$750	Sept 06-07
Contact	$750	Dec 10-11
Implicit	$750	Dec 12-13
Introduction to LS-DYNA	$750	March 13-16 June 05-08 Sept 11-14

LSTC Training Classes: 2007 Classes

The California office training center accommodates 23 students. The Michigan office has capacity for 12 students.

Classes are scheduled throughout the year at both locations. For the most current schedule visit 172Hwww.lstc.com

Onsite training is also available.

We are in the process of scheduling all the classes. As of today we have:

Training Classes	US $	California	Michigan
Advanced LS-DYNA for Impact Analysis	$950	June 26-29 Sept 18-21	
Advanced Options in LS-DYNA	$750	March 20-21	Sept 06-07
ALE/Eulerian & Fluid/Structure Interaction in LS-DYNA	$750	Feb 14-16	
Composite Materials	$750	June 14-15	
Concrete and Geomaterial Modeling with LS-DYNA	$1,000	Nov 01-02	
Contact in LS-DYNA	$750	Jan 15-16 June 12-13	Dec 10-11
Heat Transfer & Thermal-Stress Problems	$500		
Implicit	$750	March 22-23	Dec 12-13
Introduction to LS-DYNA	$750	Feb 06-09 May 01-04	March 13-16 June 05-08 Sept 11-14

Classes are continued on Next Page

LSTC Training Classes: 2007 Classes Continued

Introduction to LS-OPT	$750		
LS-DYNA Composite Materials	$750		
LS-DYNA Implicit	$750		
LS-DYNA for Heat Transfer & Thermal-Stress Problems	$500		
Material Modeling Using LS-DYNA User Defined Options	$750	June 18-19	
MESH Free Methods in LS-DYNA (SPH and EFG)	$750		

EVENTS – 2007

If you want your event listed please send the information to: mv@feainformation.com

LS-DYNA Events

2007 **May 29-30**	**6th European, Sweden**
October 11-12	**LS-DYNA Users Meeting - Germany - hosted by DYNAmore**
October 30-31	**Japan LS-DYNA Users Conference 2007 - hosted by JRI**
2008 **June 8-10**	**8th International Users Conference, Dearborn, MI, US**

Other Events

2007	
June 01-08	**International Conference on Computational Ballistics** Held at Ashurst Lodge, which is the home of the Wessex Institute, Rachel Swinburn - Conference Manager - rswinburn@wessex.ac.uk
July 23-26	**Ninth US National Congress on Computational Mechanics**, San Francisco, CA

LS-DYNA Resource Page

Interface - Hardware - OS And General Information

Participant Hardware / OS that run LS-DYNA (alphabetical order).

LS-DYNA has been fully QA'd by Livermore Software Technology Corporation for All Hardware and OS listed below.

TABLE 1: SMP
TABLE 2: MPP Interconnect and MPI

TABLE 1: SMP - Fully QA'd by LSTC	
AMD Opteron	Linux
FUJITSU Prime Power	SUN OS 5.8
FUJITSU VPP	Unix_System_V
HP PA-8x00	HP-UX 11.11 and above
HP IA-64	HP-UX 11.22 and above
HP Opteron	Linux CP4000/XC
HP Alpha	True 64
IBM Power 4/5	AIX 5.1, 5.2, 5.3
IBM Power 5	SUSE 9.0
INTEL IA32	Linux, Windows
INTEL IA64	Linux
INTEL Xeon EMT64	Linux
NEC SX6	Super-UX
SGI Mips	IRIX 6.5 X
SGI IA64	SUSE 9 with ProPack 4 Red Hat 3 with ProPack 3

LS-DYNA Resource Page

MPP Interconnect and MPI

FEA Information Inc. Participant's (alphabetical order)

Fully QA'd by Livermore Software Technology Corporation

TABLE 1: SMP - Fully QA'd by LSTC	
AMD Opteron	Linux
FUJITSU Prime Power	SUN OS 5.8
FUJITSU VPP	Unix_System_V
HP PA-8x00	HP-UX 11.11 and above
HP IA-64	HP-UX 11.22 and above
HP Opteron	Linux CP4000/XC
HP Alpha	True 64
IBM Power 4/5	AIX 5.1, 5.2, 5.3
IBM Power 5	SUSE 9.0
INTEL IA32	Linux, Windows
INTEL IA64	Linux
INTEL Xeon EMT64	Linux
NEC SX6	Super-UX
SGI Mips	IRIX 6.5 X
SGI IA64	SUSE 9 with ProPack 4 Red Hat 3 with ProPack 3

TABLE 2: MPP Interconnect and MPI			
Vendor	**O/S**	**HPC Intereconnect**	**MPI Software**
AMD Opteron	Linux	InfiniBand (SilverStorm), MyriCom, QLogic InfiniPath	LAM/MPI, MPICH, HP MPI, SCALI
FUJITSU Prime Power	SUN OS 5.8		
FUJITSU VPP	Unix_System_V		
HP PA8000	HPUX		
HPIA64	HPUX		
HP Alpha	True 64		
IBM Power 4/5	AIX 5.1, 5.2, 5.3		
IBM Power 5	SUSE 9.0		LAM/MPI
INTEL IA32	Linux, Windows	InfiniBand (Voltaire), MyriCom	LAM/MPI, MPICH, HP MPI, SCALI
INTEL IA64	Linux		LAM/MPI, MPICH, HP MPI
INTEL Xeon EMT64	Linux	InfiniBand (Topspin, Voltaire), MyriCom, QLogic InfiniPath	LAM/MPI, MPICH, HP MPI, INTEL MPI, SCALI
NEC SX6	Super-UX		
SGI Mips	IRIX 6.5	NUMAlink	MPT
SGI IA64	SUSE 9 w/ProPack 4 RedHat 3 w/ProPack 3	NUMAlink, InfiniBand, (Voltaire)	MPT, Intel MPI, MPICH

LS-DYNA Resource Page - Participant Software
Interfacing or Embedding LS-DYNA

Each software program can interface to all, or a very specific and limited segment of the other software program. The following list are software programs interfacing to or having the LS-DYNA solver embedded within their product. For complete information on the software products visit the corporate website.

ANSYS - ANSYS/LS-DYNA

ANSYS/LS-DYNA - Built upon the successful ANSYS interface, ANSYS/LS-DYNA is an integrated pre and postprocessor for the worlds most respected explicit dynamics solver, LS-DYNA. The combination makes it possible to solve combined explicit/implicit simulations in a very efficient manner, as well as perform extensive coupled simulations in Robust Design by using mature structural, thermal, electromagnetic and CFD technologies.

AI*Environment: A high end pre and post processor for LS-DYNA, AI*Environment is a powerful tool for advanced modeling of complex structures found in automotive, aerospace, electronic and medical fields. Solid, Shell, Beam, Fluid and Electromagnetic meshing and mesh editing tools are included under a single interface, making AI*Environement highly capable, yet easy to use for advanced modeling needs.

ETA – DYNAFORM

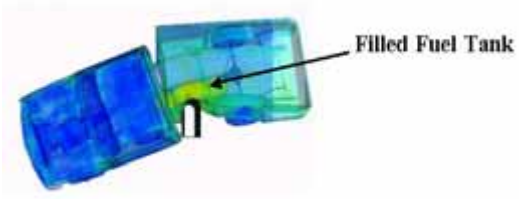
Includes a complete CAD interface capable of importing, modeling and analyzing, any die design. Available for PC, LINUX and UNIX, DYNAFORM couples affordable software with today's high-end, low-cost hardware for a complete and affordable metal forming solution.

ETA – VPG

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

MSC.Software - MSC.Dytran LS-DYNA

Tightly-integrated solution that combines MSC.Dytran's advanced fluid-structure interaction capabilities with LS-DYNA's high-performance structural DMP within a common simulation environment. Innovative explicit nonlinear technology enables extreme, short-duration dynamic events to be simulated for a variety of industrial and commercial applications on UNIX, Linux, and Windows platforms. Joint solution can also be used in conjunction with a full suite of Virtual Product Development tools via a flexible, cost-effective MSC.MasterKey License System.



Side Impact With Fuel Oil Inside

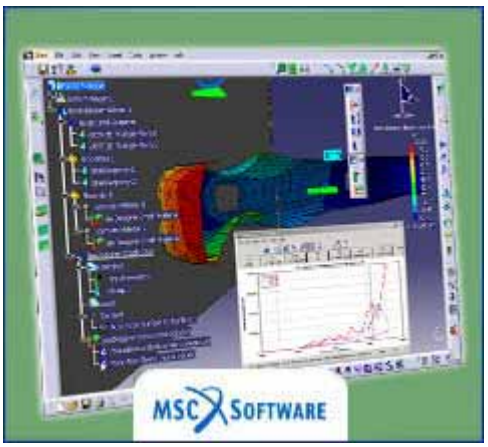
MSC.Software - MSC.Nastran / SOL 700

The MSC.Nastran™ Explicit Nonlinear product module (SOL 700) provides MSC.Nastran users the ability access the explicit nonlinear structural simulation capabilities of the MSC.Dytran LS-DYNA solver using the MSC.Nastran Bulk Data input format. This product module offers unprecedented capabilities to analyze a variety of problems involving short duration, highly dynamic events with severe geometric and material nonlinearities.

MSC.Nastran Explicit Nonlinear will allow users to work within one common modeling environment using the same Bulk Data interface. NVH, linear, and nonlinear models can be used for explicit applications such as crash, crush, and drop test simulations. This reduces the time required to build additional models for another analysis programs, lowers risk due to information transfer or translation issues, and eliminates the need for additional software training.

MSC.Software – Gateway for LS-DYNA

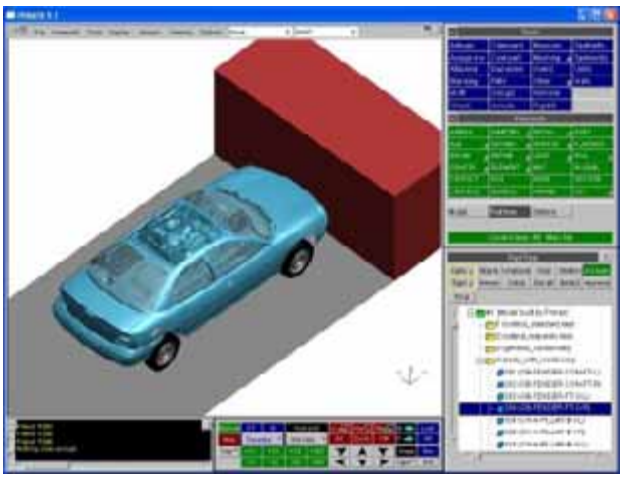
Gateway for LS-DYNA provides you with the ability to access basic LS-DYNA simulation capabilities in a fully integrated and generative way. Accessed via a specific Crash workbench on the GPS workspace, the application enhances CATIA V5 to allow finite element analysis models to be output to LS-DYNA and then results to be displayed back in CATIA. Gateway for LS-DYNA supports explicit nonlinear analysis such as crash, drop test, and rigid wall analysis.



Gateway products provide CATIA V5 users with the ability to directly interface with their existing corporate simulation resources, and exchange and archive associated simulation data.

Oasys software for LS-DYNA

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.



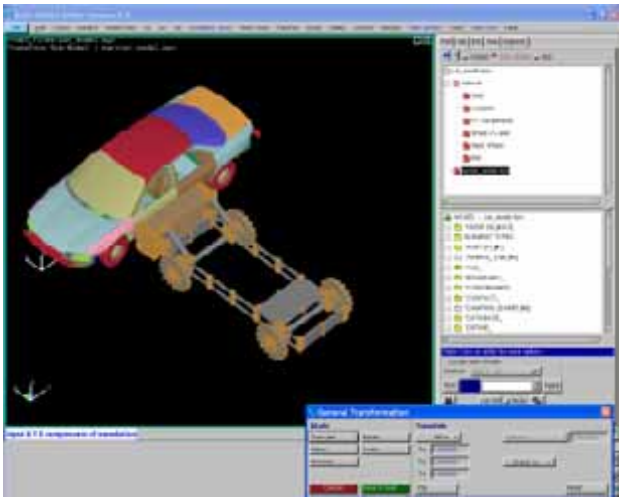
EASi-CRASH DYNA

EASi-CRASH DYNA is the first fully integrated environment for crashworthiness and occupant safety simulations with LS-DYNA, and covers the complete CAE-process from model building and dataset preparation to result evaluation and design comparisons.

EASi-CRASH DYNA can be used for concept crash, FE crash and coupled rigid body/FE crash simulations in conjunction with MADYMO.

EASi-CRASH DYNA's main features include:

- Support of all keywords of LS-DYNA 970/971
- Powerful mesh editing features, such as automesh and remesh
- LS-DYNA/MADYMO coupling capabilities for pre- and post processing
- Model Assembler for organizing the model through sub assembly/sub models and included files
- Enhanced Weld tools for manipulation of connections and Weld comparison
- Simple dummy positing and seat belt routing
- Pre and Post processing in same environment
- Superpose and merge multiple models
- Animation and plotting
- Process compatible
- Full capability to handle IGES, CATIA V4, CATIA V5, UG and NASTRAN files



Previous Month – December
Weekly News Page Highlights Review

Complete Product/Service Information can be found on the respective company websites.

Oasys, Ltd: Oasys and Arup have been distributing LS-DYNA and working closely with Livermore Software Technology Corporation (LSTC) for over fifteen years. In our website you will find details of the Oasys pre and post processing software for LS-DYNA as well as FE models available for purchase and the training courses we offer.

NEC Corporation NEC vector supercomputers have been at the forefront of the world latest and best improvements in scientific research and engineering development. The SX-8 Series, that implements an eight-way SMP system in a very compact node module and uses an enhanced version of the single chip vector processor that was introduced with the SX-6, is NEC's latest and most powerful supercomputer. Its amazingly compact body allows the SX-8 series to achieve a new level of price performance.

ESI Group: EASi-CRASH DYNA is the first fully integrated package for crash simulation which covers the CAE-process from start to finish. It achieves this by integrating all aspects of model building, dataset preparation, result evaluation and design comparisons. EASi-CRASH DYNA can be used for concept crash, FE crash and coupled rigid body/FE crash simulations in conjunction with solvers like LS-DYNA

IBM Why IBM for Deep Computing - IBM delivers innovative, powerful, open High Performance Computing (HPC) solutions to address your demands for intense computation, visualization, or manipulation and management of massive amounts of data

Hardware - Computing - Communication Products

Logo's hyperlink to company's website

Software Distributors

Alphabetical order by Country

Australia	**Leading Engineering Analysis Providers**
Canada	**Metal Forming Analysis Corporation**
China	**ANSYS China**
China	**Arup**
China	**MSC. Software – China**
Germany	**CAD-FEM**
Germany	**Dyna*More***
India	**Altair Engineering India**
Italy	**EnginSoft Spa**
Japan	**Fujitsu Limited**
Japan	**The Japan Research Institute**
Japan	**ITOCHU Techno-Solutions Corporation**
Korea	**Korean Simulation Technologies**
Korea	**Theme Engineering**

Software Distributors (cont.)

Alphabetical order by Country

Netherlands	**Infinite Simulations Systems B.V.**
Russia	**State Unitary Enterprise - STRELA**
Sweden	**Engineering Research AB**
Taiwan	**Flotrend Corporation**
USA	**Engineering Technology Associates, Inc.**
USA	**Dynamax**
USA	**Livermore Software Technology Corp.**
UK	**ARUP**

Consulting and Engineering Services

Alphabetical Order By Country

(direct links will be completed October)

Australia Manly, NSW	**Leading Engineering Analysis Providers** (LEAP) Greg Horner info@leapaust.com.au 02 8966 7888
Canada Kingston, Ontario	**Metal Forming Analysis Corp.** Chris Galbraith galb@mfac.com (613) 547-5395
India Bangalore	**Altair Engineering India** Nelson Dias info-in@altair.com 91 (0)80 2658-8540
Italy Firenze	**EnginSoft Spa** info@enginsoft.it 39 055 432010
UK Solihull, West Midlands	**ARUP** Brian Walker brian.walker@arup.com 44 (0) 121 213 3317
USA Austin, TX	**KBEC L.C** Khanh Bui kdbui@sbcglobal.net (512) 363-2739
USA Windsor, CA	**SE&CS** Len Schwer len@schwer.net (707) 837-0559
USA Corvallis, OR	**Predictive Engineering** George Laird (1-800) 345-4671 george.laird@predictiveengineering.com
USA Neenah, WI www.structuretechnology.com	**Structure Incorporated** Todd L. Peters (920) 722 7060 info@structuretechnology.com

Educational & Contributing Participants

Alphabetical Order By Country

China	Dr. Qing Zhou	Tsinghua University
India	Dr. Anindya Deb	Indian Institute of Science
Italy	Professor Gennaro Monacelli	Prode – Elasis & Univ. of Napoli, Frederico II
Russia	Dr. Alexey I. Borovkov	St. Petersburg State Tech. University
USA	Dr. Ted Belytschko	Northwestern University
USA	Dr. David Benson	University of California – San Diego
USA	Dr. Bhavin V. Mehta	Ohio University
USA	Dr. Taylan Altan	The Ohio State U – ERC/NSM
USA	Dr. Ala Tabiei	University of Cincinnati

FEA Information China Participants

Software, Hardware, Training, Consulting, Services

Arup China: LS-DYNA sales, support, training	Name: Li YuQiang Email: Yu-qiang.li@arup.com Tel 021 5396 6633 extn 151

Ansys-China, Inc.	Tel: 86-10-84085558 Website: www.ansys.com.cn Contact: China@ansys.com.cn
Arup	Kimbal Virdi Tel: +86 21 5396 6633 Contact: Kimbal.virdi@arup.com Website: www.arup.com/dyna
Beijing Yuntong Forever CPC. Co. Ltd.	Tel: +86-10-82561200/01/03 Website: http://cpc.ytforever.com Sole Distributor of LINUX NETWORX, INC. (USA) in China Contact: service@ytforever.com
Engineering Technology Associates (China) Inc.	Martin Ma Tel: + 86-21-64385725 Contact: support@eta.com.cn
Hewlett-Packard Asia Pacific Ltd.	Jerry Huang Tel: +86-10-65645261 Contact: J.Huang@hp.com
IBM China	Ms. Ling WANG - Tel: +86-10-6539-1188 x4463 (T/L:901-4463) Website: http://www.ibm.com/cn/ Contact: wangling@cn.ibm.com
MSC. Software Corp.	Tel: +86-10-6849-2777 Website: www.mscsoftware.com.cn Contact: mscprc.contact@mscsoftware.com

FEA Information China Participants

Software, Hardware, Training, Consulting, Services

SGI China	Carl Zhang Tel: +86 -10 - 65228868 Ext. 3362 Contact: carl@sgi.com
Tsinghua University	Qing Zhou, PhD. - Professor Department of Automotive Engineering Beijing, 100084, China
Zhongfang Information Technology Ltd	Larry Liang Tel: +86-21-54973162 Website: http://www.cntech.com.cn Contact: info@cntech.com.cn
Zhong Guo ESI Co., Ltd	Yang Xiaojum Phone: +86 (020) 8235 6272 Contact : Yang Xiaojun

Informational Websites

The LSTC LS-DYNA Support site: www.dynasupport.com

LSTC LS-DYNA Support Site	**www.dynasupport.com**
FEA Informationwebsites	**www.feainformation.com**
TopCrunch – Benchmarks	**www.topcrunch.org**
LS-DYNA Examples (more than 100 Examples)	**www.dynaexamples.com**
LS-DYNA Conference Site	**www.ls-dynaconferences.com**
LS-DYNA Publications to Download On Line	**www.dynalook.com**
LS-DYNA Publications	**www.feapublications.com**
LS-DYNA CADFEM Portal	**www.lsdyna-portal.com .**