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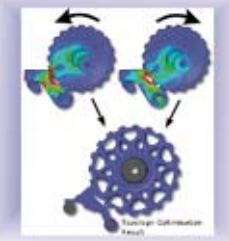
LS-DYNA Design Optimization Using VR&D GENESIS



Welcome to New FEA Information Particpants

Simpleware Ltd.

GRM Consulting

FEA Participants Present Papers at The 10th International LS-DYNA® Users Conference

FEA Information Announcements

This issue concentrates on Participant Publications from the 10th International Conference Pre/Post and Computing Technology Sessions.

New participants:

Simpleware:

Provides software solutions for robust, fast, and easy conversion of 3D images into high quality meshes which can be used for FEA, CFD, CAD, RP. The ease and accuracy with which models can be generated from 3d datasets such as MRI, CT and MicroCT, have eopened up image-based analysis to a variety of applications. For more information visit: www.simpleware.com

GRM:

A design optimization consultancy providing design and software solutions to the engineering community have developed a unique method for coupling 3rd party solver codes to VR&D GENESIS. Currently only LS-DYNA is supported, but other industry standard codes will follow. www.grm-consulting.co.uk

Class Announcement:

ALYOTECH TECHNOLOGIES
A half-day seminar offered to our customers to present "New Capabilities and Current Developments of LS-DYNA". September 11th afternoon from 2pm to 6pm. Contact: nima.edjtemai@alyotech.fr

Sincerely,

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Table of Contents

LS-DYNA® Impact Model Build-up: Process Automation With ANSA Data Management and Task Manager

I. Makropoulou, Y. Kolokythas, L. Rorris
BETA CAE Systems S.A., Thessaloniki, Greece

Read The Complete Paper

Abstract

In the presently CAE-driven vehicle design process a great number of discipline models must be built and analyzed for the validation of a new vehicle model design. The increasing number of vehicle model variants further increases the number of the load-cases that must be studied. This process introduces a great amount of disparate data that need to be handled by the CAE teams. However, due to the multiple sources and the diversity of the CAE data, the current level of organization and data management deployed does not account for them.

Setting as a target the reduction of the CAE turnaround cycle and cost, the pre-processing tools are required to streamline all “input” data and at the same time the simulation model build-up process itself, .this paper will present the means provided by BETA CAE Systems S.A. towards the development of realistic, repeatable and robust crash simulation models for LS-DYNA. ANSA Task Manager, using template processes, supervises the generation of the simulation models, while ANSA Data Management, in the background, facilitates the components management, ensuring that the engineering teams will always work with the most up-to-date data. The simulation model set-up becomes a repeatable and user-independent procedure, safeguarding the model quality and fidelity

Use of Simpleware Software for LS-DYNA® Analyses

Read The Complete Paper

Brian Walker *
Philippe Young **
Rajab Said **
* Arup
** Simpleware Ltd

Abstract

Simpleware have developed a suite of programs that are used to convert imaging data obtained from CT, microCT, MRI or Ultrasound scanning equipment into finite element meshes for use in LS-DYNA.
Simpleware provides what is effectively a 3D photocopier: three dimensional replicas can be generated automatically based on scans. In parallel, computer simulations can be used to assess the suitability or performance of objects in operation. Simpleware's technology has opened up FEA and RP manufacturing to a variety of applications and research fields including:

- Industrial reverse engineering
- Research in materials and composites
- Non-destructive evaluation (NDE)
- Biomechanical Research
- Implant design and manufacturing
- Surgery simulation and planning
- Forensics
- Biomimicry
- Archeology

ScanIP is used to import 3D imaging data from MRI, CT, Micro CT and Ultrasound scans. It provides a series of image processing and segmentation tools which allow the user to define areas of interest in the image based on grey scale values. The smoothing algorithms used by ScanIP are volume, topology and geometry preserving. This ensures the accuracy of both the generated surface reconstructions and mesh models is based on image accuracy alone. The segmented areas can then be exported as a 3D stereo lithography file or exported into +ScanFE for meshing. The stereo lithography files can either be used directly for producing rapid prototype parts or imported into CAD software.

+ScanCAD allows you to import a CAD model, position it interactively within the 3D imaging data and then generate a Scan IP mask. Scan CAD can be used to obtain patient specific models by positioning CAD models of different implants within a pre-operative scan. Post-operative performance can be simulated using the combined models and multiple scenarios can be tested easily.

The paper describes the software and illustrates its use in different fields of application.

Visual-Environment Integrated Pre and Post Environment for LS-DYNA®

Read The Complete Paper

Shivakumara H Shetty, Velayudham Ganesan, Suthy C Sivalingam
ESI Group
36800 Woodward Avenue, Suite 200
Bloomfield Hills, MI 48304
USA
Ph: (248) 203-0642
Email: info@esi-group-na.com
URL: www.esi-group.com

Abstract

Visual-Environment (VE) is an open collaborative engineering environment framework or platform called as Open VTOS (Virtual Try-Out Space). VE is an integrated suite of solutions, which has different contexts seamlessly linked for Crash and Safety, Durability, NVH and others. The applications of interest for supporting LS-DYNA based processes are: Visual-Crash DYNA (VCD)-a pre processor for LS-DYNA, Visual-SAFE-an advanced pre-processor for safety features, Visual-Mesh a general purpose mesher, Visual-Viewer (VVI)-a general purpose plotting and simulation application, Visual, Visual-Process Executive-an application for CAE process customization and repetitive tasks automation. These are some of the contexts available in VE but focused to support LS-DYNA.

Globalization, new regulations and changes in technologies are influencing the simulation life cycle. These changes are driving the pre and post processing environments for remarkable improvement in productivity, usability and innovative approaches. This paper describes the key features of Visual-Environment 4.0 for LS-DYNA and usefulness of these features in Crash and Safety simulation with productivity examples and process automation.

Key words: LS-DYNA, Visual-Environment, Simulation life cycle, Crash, Safety, Process, Productivity
.

Using LS-DYNA® from ANSYS Workbench Environment

Read The Complete Paper

Dr.-Ing. Matthias Hörmann
CADFEM GmbH, Grafing b. München, Germany
mhoermann@cadfem.de

Abstract

Numerical simulations as integral part in the virtual product development process exhibit a huge spectrum. Ranging from simple modal analyses over linear and nonlinear stiffness and strength based problems up to coupled multi-physic analyses, where different physical disciplines interact with each other. Thereby simulation tools in combination with preprocessors must enable users to perform product development tasks faster and therefore more efficient. One essential part is hereby the seamless model file transfer from and to 3D CAD systems. Additionally model and assembly handling in-between the different simulation disciplines in combination with an automatic mesh generation and automatic contact detection is also important to speed up development time. With the Workbench environment, ANSYS took a quantum leap into model analysis and handling different simulation disciplines in one standard user interface in combination with a tight interface from and to almost all common 3D CAD systems.

An interface between ANSYS Workbench and LS-DYNA therefore provides the opportunity to use Workbench preprocessing functionalities for LS-DYNA simulations. The German ANSYS and LS-DYNA distributor CADFEM has thus created a unidirectional, interactive graphic interface “Workbench LS-DYNA“ for the transfer of data from ANSYS Workbench to LS-DYNA. This not only enables users to transfer the pure structure in form of nodes and elements, but also sections, materials, contact definitions and boundary conditions, including prescribed motions and force loading. LS-DYNA specific control and database options are included from a template file, which can be customized by the user. Moreover any LS-DYNA keyword command can be defined within the Workbench GUI and will be added into the LS-DYNA input file.

Besides using CAD interfaces, automatic mesh generation and contact detection of Workbench, LS-DYNA users will benefit from this interface. With an existing ANSYS Workbench license and LSTC’s free of charge LS-PrePost an additional preprocessor causing cost and training effort may no longer be necessary. Even more important, the interface enables easier data exchange with other analysis departments using already ANSYS Workbench. Moreover the CAD interfaces in ANSYS Workbench also allow a closer link to construction departments.

Automating Oasys PRIMER and Oasys D3PLOT using JavaScript

Read The Complete Paper

Miles Thornton
Arup

Abstract

Oasys PRIMER and Oasys D3PLOT now contain JavaScript interpreters.
Adding a scripting engine allows the user to automate both pre and post processing tasks.

Extensions to the core JavaScript language allow the user to interact with the programs, create and/or manipulate data, create user interfaces, read and write files and extend the functionality of PRIMER and D3PLOT.

The syntax is quick and easy to learn.

There are several advantages in using scripts:

- Quick turnaround – you do not have to wait for new version of PRIMER or D3PLOT
- You can keep your application confidential
- The script is under your control – you can do it yourself if you wish.

This paper describes the scripting technology, outlines possible applications and gives demonstrations in Oasys PRIMER and Oasys D3PLOT.

Novel HPC Technologies for Scalable CAE: The Case for Parallel I/O and File Systems

Read The Complete Paper

Stan Posey
Panasas, Inc., Fremont, CA, USA
510-608-4383, sposey@panasas.com

Abstract

As HPC continues its aggressive platform migration from proprietary supercomputers and Unix servers to HPC clusters, expectations grow for clusters to meet the I/O demands of increasing fidelity in CAE modeling and data management in the CAE workflow. Cluster deployments have increased as organizations seek ways to cost-effectively grow compute resources for CAE applications, and during this migration many also implemented conventional network attached storage (NAS) architectures to simplify IT administration and further reduce costs.

While legacy NAS implementations offer several advantages of shared file systems, most are too limited in scalability for effective management of I/O demands with parallel CAE applications. As such, a new storage migration is underway to replace legacy (serial) NAS with parallel NAS architectures and parallel file systems. This new class of parallel file system and shared storage technology was developed to scale I/O in order to extend the overall scalability of CAE simulations on clusters.

This paper examines CAE motivation for shared parallel file systems and storage, for requirements of multi-physics LS-DYNA® applications on conventional clusters with proper balance for I/O. Model parameters such as size, element types, schemes of implicit and explicit (and coupled), and a variety of simulation conditions can produce a wide range of computational behavior and I/O data management demands. The benefits of a Panasas storage implementation are introduced for such broad requirements, through examples of CAE workflows for a variety of production-level applications in industry.

The Performance of 10-Million Element Car Model by MPP Version of LS-DYNA® on Fujitsu PRIMEPOWER

Read The Complete Paper

Mitsuhiro Makino
Computational Science and Engineering Solution Center, Fujitsu Limited
9-3 Nakase 1Chome Mihama, Chiba, 261-8588, JAPAN
makino@strad.ssg.fujitsu.com

Abstract

In automotive industries, car crash analysis by finite element methods is a very important tool for reducing the development time and cost. In order to get the accurate results, in addition to the improvement of the finite element technology, such as full-integrated shell elements, smaller size of finite element mesh is used, because finer meshes represent the car geometry more accurately, and reduce the noise of contact force. The batch mesh generator, which is enhanced recently, also needs fine mesh. The use of these fine mesh model increases the computational time.

In this paper, we examine the performance of the fine mesh model. We developed a 10-million elements car model, which is 10 time larger than the current production car model. The performance of large number of CPU by Massively parallel processing(MPP) version of LS-DYNA, is measured on Fujitsu PRIMEPOWER.

Intel® Cluster Ready Support for LS-DYNA®/MPP

Read The Complete Paper

Tim Prince
Intel Corporation
Developer Relations Division

Abstract

The Intel® Cluster Ready program enables LS DYNA®/MPP users to buy, install, and use clusters more effectively. It includes a joint Intel and cluster supplier certification process to ensure the cluster the LS-DYNA user purchases is designed and built to specification. Intel supplied software tools support verification of initial and ongoing operation and performance of the cluster.

LS-DYNA® Performance Improvements with Multi-Rail MPI on SGI® Altix® ICE Clusters

Read The Complete Paper

Olivier Schreiber, Michael Raymond, Srinivas Kodiyalam
SGI
1140 East Arques Avenue, MS: 275
Sunnyvale, California 94085
(oliviers, mraymond, skodiyal@sgi.com)

Abstract

Multi-Rail networks can improve MPI communication performance by distributing the communication traffic to multiple independent networks (rails). Messages are divided into several chunks and sent out simultaneously using multiple rails. With the dual plane network topology of SGI Altix ICE clusters, MPI communication can hence utilize both the InfiniBand rails, including, ib0 and ib1 fabrics. The performance gains achievable with LS-DYNA for complex crashworthiness simulations through the use of MPT dual-rail over MPT singe-rail on an Altix ICE system are indeed significant.

TOP CRUNCH Participant Submission

www.topcrunch.org

June 30, 2008 SGI / Applications Engineering

Computer / Interconnect	Processor	#nodes x #Processors Per Node x #cores Per Processor = Total #CPU	Time (Sec)	Benchmark Problem
Altix XE1300 XE250 / XE320 / Mellanox InfiniHost III Lx HCA DDR Fabric OFED v1.3	Intel Xeon X5272 DC 3.4Ghz, 1600MHz FSB, 800MHz D	16 x 2 x 2 = 64	276	neon_refined_revised
Altix XE1300 XE250 / XE320 / Mellanox InfiniHost III Lx HCA DDR Fabric OFED v1.3	Intel Xeon X5272 DC 3.4Ghz, 1600MHz FSB, 800MHz D	8 x 2 x 2 = 32	383	neon_refined_revised
Altix XE1300 XE250 / XE320 / Mellanox InfiniHost III Lx HCA DDR Fabric OFED v1.3	Intel Xeon X5272 DC 3.4Ghz, 1600MHz FSB, 800MHz D	4 x 2 x 2 = 16	631	neon_refined_revised
Altix XE1300 XE250 / XE320 / Mellanox InfiniHost III Lx HCA DDR Fabric OFED v1.3	Intel Xeon X5272 DC 3.4Ghz, 1600MHz FSB, 800MHz D	2 x 2 x 2 = 8	1091	neon_refined_revised
Altix XE1300 XE250 / XE320 / Mellanox InfiniHost III Lx HCA DDR Fabric OFED v1.3	Intel Xeon X5272 DC 3.4Ghz, 1600MHz FSB, 800MHz D	1 x 2 x 2 = 4	2071	neon_refined_revised
Altix XE1300 XE250 / XE320 / Mellanox InfiniHost III Lx HCA DDR Fabric OFED v1.3	Intel Xeon X5272 DC 3.4Ghz, 1600MHz FSB, 800MHz D	16 x 2 x 2 = 64	2318	3 Vehicle Collision

TOP CRUNCH Participant Submission

www.topcrunch.org

June 30, 2008 SGI / Applications Engineering

Computer / Interconnect	Processor	#nodes x #Processors Per Node x #cores Per Processor = Total #CPU	Time (Sec)	Benchmark Problem
Altix XE1300 XE250 / XE320 / Mellanox InfiniHost III Lx HCA DDR Fabric OFED v1.3	Intel Xeon X5272 DC 3.4Ghz, 1600MHz FSB, 800MHz D	8 x 2 x 2 = 32	4138	3 Vehicle Collision
Altix XE1300 XE250 / XE320 / Mellanox InfiniHost III Lx HCA DDR Fabric OFED v1.3	Intel Xeon X5272 DC 3.4Ghz, 1600MHz FSB, 800MHz D	4 x 2 x 2 = 16	7933	3 Vehicle Collision
Altix XE1300 XE250 / XE320 / Mellanox InfiniHost III Lx HCA DDR Fabric OFED v1.3	Intel Xeon X5272 DC 3.4Ghz, 1600MHz FSB, 800MHz D	2 x 2 x 2 = 8	15227	3 Vehicle Collision
Altix XE1300 XE250 / XE320 / Mellanox InfiniHost III Lx HCA DDR Fabric OFED v1.3	Intel Xeon X5272 DC 3.4Ghz, 1600MHz FSB, 800MHz D	1 x 2 x 2 = 4	30937	3 Vehicle Collision

LS-DYNA Design Optimization Using VR&D GENESIS

www.grm-consulting.co.uk/dyna-coupling.htm

GRM Consulting, a design optimization consultancy providing design and software solutions to the engineering community have developed a unique method for coupling 3rd party solver codes to VR&D GENESIS. Currently only LS-DYNA is supported, but other industry standard codes will follow.

Both linear and nonlinear LS-DYNA models can be optimized using Topology, Topometry, Topography, Sizing and Shape optimization. The advantage of this method over more traditional methods of Optimizing non-linear problems is the greatly reduced number of times the simulation needs to run.

To simplify the problem we have developed an interface allowing the problem to be defined using Design Studio.

LS-DYNA Design Optimization using VR&D GENESIS.

Due to the significant mass and cost targets of modern engineering design, optimisation techniques have become significantly more commonplace, offering engineers the opportunity to reduce develop cycle times and provide minimum mass solutions.

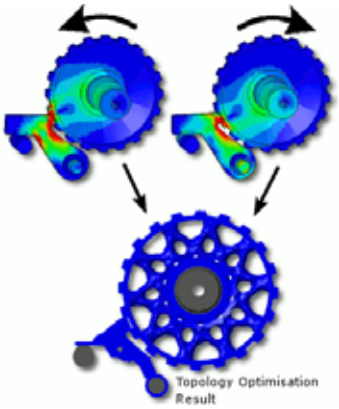
Supporting Topology, Sizing, Shape, Topometry & Topography optimisation, a new interface is available for VR&D GENESIS, allowing direct coupling to all aspects of LS-DYNA.

Examples of the new capability are shown here, considering both implicit and explicit LS-DYNA type solutions. Using T-Systems Medina & Oasys Primer, models have been constructed for both LS-DYNA and GENESIS (Nastran format) to allow the coupled optimisation studies to be performed.

Contact Based Optimization

Taking advantage of LS-DYNA's efficient implicit solver the gear and locking pin designs of a gearbox have been optimised by coupling to GENESIS' topology optimisation module.

Considering 42,000 design variables the coupled gear loading optimisation converged on the design shown below, taking only 7 LS-DYNA simulations (for each loading direction).

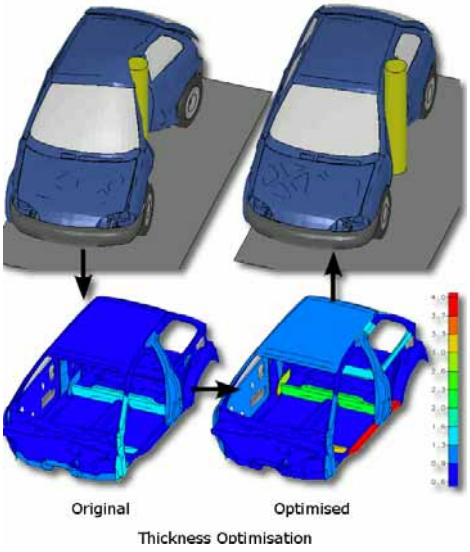


Implicit LS-DYNA Topology Optimization

Non-Linear Impact Optimization

Shape and Sizing

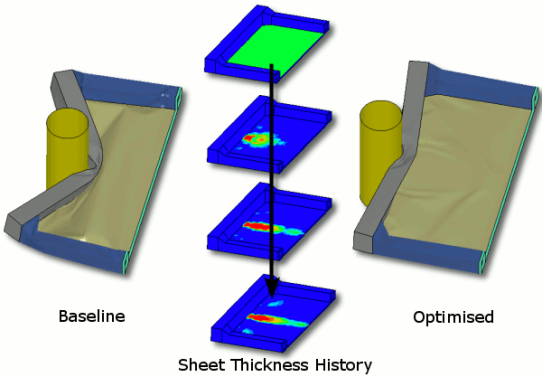
Utilising the efficiency of GENESIS' optimisation routines it is possible to consider both the linear loading requirements and multiple LS-DYNA explicit cases. To demonstrate this, a sizing optimisation has been performed to optimise the body panels of a small-car for both static body torsion and side pole impact. Requiring only 10 LS-DYNA simulations to design 59 component thicknesses, the optimisation minimised the mass of the BIW whilst satisfying both the stiffness and impact targets.



Coupled Body Torsion & Side Impact Optimisation

Topology

Supporting all LS-DYNA materials, material topology results can be obtained to determine optimal load paths for crashworthiness conditions. Below is an example demonstrating the automatic growth of a reinforcing member for an impact loading.



Topology Optimization to Support Pole Impact

For further information and case studies appropriate to your industry sector contact GRM Consulting

GRM Consulting Ltd is based in the UK, providing international software and consultancy services To contact us telephone, e-mail or write to the following:

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info@grm-consulting.co.uk

LS-PrePost® UPDATE 2008

http://www.lstc.com/lspp

LS-PrePost® was designed to provide the following core functionalities:

- Full LS-DYNA® keyword support
- LS-DYNA model visualization
- LS-DYNA model creation and editing
- Advanced post-processing

LS-PrePost's main post-processing capabilities include states result animation, fringe component plotting, and XY history plotting.

LS-PrePost is also capable of importing and exporting data in a number of common formats. The figure on the right illustrates a sampling of those that a typical user might find most useful.

29-May
Added Metal FormingApplication tutorial

26-May
Added Mass Tr Interface

26-Mar
Added visualization of *AIRBAG_REFERENCE_GEOMETRY on Page D

18-Mar
Updated the Trace Interface to make use of the General Selection panel

12-Mar
Updated the Toggle Menu with a more intuitive "check" system

29-Feb
Added coincident node picking and made node/element picking significantly faster and easier. More details...

23-Jan
Added *Split Solid* option to the ElEdit Interface to allow splitting of hex and penta elements

01-Jan
Started work on LS-PrePost 2.3. Version 2.2 will be updated with bug fixes, but new features will be added to 2.3 only.

Pre Post Processing Software

Livermore Software Technology Corporation

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

Engineering Technology Associates, Inc

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.

Japanese Research Institute, Ltd

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

Oasys, Ltd

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.

BETA CAE Systems S.A.

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.

Simpleware

Provides software solutions for robust, fast, and easy conversion of 3D images into high quality meshes which can be used for FEA, CFD, CAD, RP.

Participant LS-DYNA® Resource Page (alpha order)

Fully QA'd by Livermore Software Technology Corporation

SMP and MPP Hardware and OS

FUJITSU

FUJITSU Prime Power	SUN OS 5.8
FUJITSU VPP	Unix_System_V

HP

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

INTEL

INTEL IA32	Linux, Windows
INTEL IA64	Linux
INTEL Xeon EMT64	Linux, Windows 64

NEC

NEX SX6	Super-UX

SGI

SGI Mips	IRIX 6.5X
SGI IA64	SUSE 9 w/Propack 4 Red Hat w/ Propak 3

Participant LS-DYNA® Resource Page (alpha order)

Fully QA'd by Livermore Software Technology Corporation

MPP and Interconnect MPI

FUJITSU

	O/S	HPC Interconnect	MPI Software
FUJITSU Prime Power	SUN OS 5.8		
FUJITSU VPP	Unix_System_V		

HP

	O/S	HPC Interconnect	MPI Software
HP PA8000	HPUX		
HPIA64	HPUX		
HP Alpha	True 64		

INTEL

	O/S	HPC Interconnect	MPI Software
INTEL IA32	Linux, Windows	InfiniBand (Voltaire), MyriCom	LAM/MPI, MPICH, HP MPI, SCALI
INTEL IA64	Linux		LAM/MPI, MPICH, HP MPI
INTEL Xeon EMT 64	Linux	InfiniBand(Topspin, Voltaire), MyriCom, PathScale InfiniPath	LAM/NPI, MPICH, HP MPI, INTEL MPI, SCALI

NEC

	O/S	HPC Interconnect	MPI Software
NEX SX6	Super-UX		

SGI

SGI Mips	IRIX 6.5 X	NUMAlink	MPT
SGI IA 64	SUSE 9 w/Propack 4 RedHat 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.

MSC.Software - MSC.Nastran/SOL 700

The MSC.NastranTM 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.

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.
Full capability to handle IGES, CATIA V4, CATIA V5, UG and NASTRAN files.

APTEK

The MMCD is a graphics-based and menu-driven program that interfaces with the LS-DYNA library of material models and the LS-OPT optimization code. The core of the MMCD is the driver, which calculates the stress-strain behavior of material models driven by combinations of strain increments and stress boundary conditions, i.e. pure shear stress, and combinations of uniaxial, biaxial, and triaxial compression and tension. MMCD input and output is accessed via pre- and post-processors; graphical user interfaces (GUIs) for easily selecting the material model parameters and load histories, and for plotting the output in both two (stress-strain curves) and three (yield surfaces) dimensions. The pre-processor, driver, and post-processor are combined into a web downloadable software package that operates seamlessly as a single code.

FEA Information Participants –

Company name takes you directly to Website

OASYS Ltd: Markets engineering software products. Consulting engineers, planners and project managers working in all areas of the built environment.

JRI Solutions Ltd.: Specializing in Research & Consulting; System Consulting, Frontier Business, System Integration and Science Consulting.

Hewelett Packard: Personal computing, mobile computing, network management, 3-D graphics and information storage.

ANSYS Inc.: Develops, markets, supports and delivers collaborative analysis optimization software tools.

SGI: Silicon Graphics, Inc., is a leader in high-performance computing, visualization, and storage.

MSC.Software: Information technology software and services provider.. Products & services used to enhance & automate the product design/manufacturing process.

NEC: A history of more than 100 years of leadership/innovation in the core high-technology sectors of communications, computers/electronic components

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INTEL: For more than three decades, Intel Corporation has developed technology enabling the computer and Internet revolution that has changed the world.

Engineering Technology Associates, Inc.: Provides engineering & IT services & has created the streamlined simulation software packages DYNAFORM and VPG

ESI Group: A software editor for the numerical simulation of prototype and manufacturing process engineering in applied mechanics.

Microsoft: For customers solving complex computational problems, Microsoft Windows Compute Cluster Server 2003 accelerates time-to-insight.

BETA CAE Systems S.A.: Specialized in the development of state of the art CAE pre- and post-processing software systems.

FEA Information Participants –

Company name takes you directly to Website

APTEK: Among the software developed APTEK develops and licenses an interactive program for driving LS-DYNA material models - the Mixed Mode Constitutive Driver (MMCD).

PANASAS: High performing Parallel Storage for scalable Linux clusters. Delivering exceptional scaling in capacity and performance for High Performance Computing (HPC) organizations.

Intelligent Light: A a world leader in the development and delivery of software for computational fluid dynamics (CFD) users. We help the world's best engineering and research organizations maximize the productivity and impact of their CFD capabilities

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LS-DYNA® Software Distributors - Alphabetical order by Country

Australia	Leading Engineering Analysis Providers
Canada	Metal Forming Analysis Corporation
China	Arup
France	Alyotech
Germany	CAD-FEM
Germany	DynaMore
India	Oasys, Ltd.
Italy	DynaMore
Japan	The Japan Research Institute
Japan	ITOCHU Techno-Solutions Corporation
Japan	Fujitsu
Korea	Theme Engineering
Netherlands	Infinite Simulation Systems BV
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

Australia	Leading Engineering Analysis Providers (LEAP) Greg Horner info@leapaust.com.au 02 8966 7888
Canada	Metal Forming Analysis Corp. - (613) 547-5395 Chris Galbraith galb@mfac.com
Canada	ROI Engineering Inc. (416)249-1471
France	Alyotech 33 (0)1 30 67 23 44 Nima Edjetemai nima.edjtemai@alyotech.fr
Netherlands	Infinite Simulation Systems BV Jurgen Mathijssen j.mathijssen@infinite.nl
UK	ARUP - 44 (0) 121 213 3317 Brian Walker brian.walker@arup.com
UK	GRM +44 (0) 1926 889300 info@grm-consulting.co.uk
USA	KBEC L.C - (512) 363-2739 Khanh Bui kdbui@sbcglobal.net
USA	SE&CS - (707) 837-0559 Len Schwer len@schwer.net
USA	Engineering Technology Associates, Inc: (248) 729-3010
USA	Predictive Engineering - (1-800) 345-4671 George Laird george.laird@predictiveengineering.com
USA	Detroit Engineered Products (248) 269-7130
USA	Friedman Research Corporation (805) 683-1300
USA	Structure Technology (920).722.7060
USA	CAE Associates, Inc (203) 758-2914

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
USA	Prof. John D. Reid	University of Nebraska

Informational Websites

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

LS-DYNA Support Site	FEA Informationwebsites
LS-DYNA Examples (more than 100 Examples)	LS-DYNA Conference Site
TopCrunch – Benchmarks	LS-DYNA Publications to Download On Line
LS-DYNA Publications	LSTC LS-PrePost Tutorials
CADFEM GmbH Portal	LS-OPT Support Site

LSTC Training Classes in California & Michigan

	California	Michigan
Advanced Impact	**Aug 5-8**	
Advanced Option		**Dec 15-16**
ALE/Eulerian & FSI	**8**	
Blast & Penetration	**Aug 18-19**	
Composite Materials		
Concrete & Geomaterial Modeling	**Sept 25-26**	
Contact	**Aug 14-15**	**Sept 16-17**
Heat Transfer & Thermal-Stress		
Implicit	**Aug 12-13**	
Intro to LS-DYNA® **LS-PrePost® (no fee)**	LS-PrePost Nov 10 **Nov 11-14**	LS-PrePost Sept 08 **Sept 09-12** LS-PrePost Dec 08 **Dec 09-12**
Intro to LS-OPT®	**Nov 18-21**	
Material Modeling Using User Defined Options		
Mesh Free Methods (SPH & EFG)		

EVENTS & CLASS Announcements

2008

September 30 – October 1st
7th GERMAN LS-DYNA FORUM
BAMBERG, GERMANY

October 2
The Nordic LS-DYNA Users' Forum
Gothenburg, Sweden

October 7 - October 8
JAPAN LS-DYNA Users Conference 2008
JRI Solutions, Ltd
Tokyo, Japan

October 22nd - 24th
ANSYS Conference & 26th CADFEM Users´ Meeting
Darmstadt, Germany

2009

May 14-15,
7th European LS-DYNA Conference
Salzburg, Austria

Class Announcement:

September 11th,2008 afternoon from 2pm to 6pm

A half-day seminar to our customers to present "New Capabilities and Current Developments of LS-DYNA".

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