

SEPTEMBER  
2006

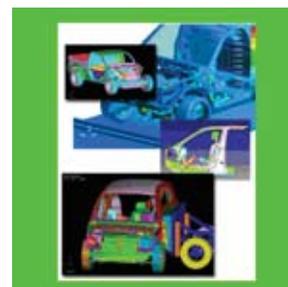
# *fea* INFORMATION

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## PRODUCT SPOTLIGHT

ETA

CAE-Centric Design Process(tm)



## PRODUCT SPOTLIGHT

HP

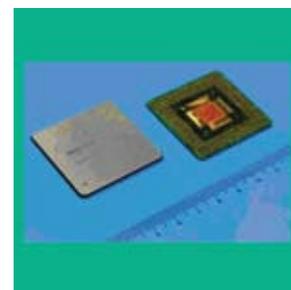
Unveils Revolutionary  
Wireless Chip



## PRODUCT SPOTLIGHT

NEC

IMAPCAR(R) Image Processor  
with Advanced Parallel  
Processing Capabilities



## FEA Information Worldwide Participants



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<p>Editor: Trent Eggleston</p> <p>Managing Editor: Marsha Victory</p> <p>Technical Editor: Art Shapiro</p> <p>Graphic Designer: Wayne L. Mindle</p>	<p>Technical Writers: Dr. David Benson Uli Franz Dr. Ala Tabiei Suri Bala</p> <p>Technical Consultants: Steve Pilz Reza Sadeghi</p>
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## FEA Information Announcements

### A jointly sponsored website.

[LS-DYNA Russia](#) - LSTC's direct distributor in Russia.  
[www.ls-dynarussia.com](http://www.ls-dynarussia.com)

### ARUP China News to keep you updated on information

Additionally Li YuQiang of Arup China, your LS-DYNA source, is pleased to announce information on pricing, training, consulting in China. Contact him at:

Name: Li YuQiang  
Email: [Yu-qiang.li@arup.com](mailto:Yu-qiang.li@arup.com)  
Tel 021 5396 6633 extn 151

**Sincerely, *Trent Eggleston & Marsha Victory***

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## Microsoft - PressPass convened a roundtable of customers who have been test driving Microsoft Windows Compute Cluster Server 2003

Reprinted with permission – full article can be read at:

<http://www.microsoft.com/windowsserver2003/ccs/default.msp>

Microsoft Windows Compute Cluster Server 2003 (CCS) brings the supercomputing power of high-performance computing (HPC) to the desktop and workgroup level in a familiar Windows-based development environment. CCS accelerates time-to-insight by providing an HPC platform that is simple to deploy, operate, and integrate with existing infrastructure and tools.



**Ron Elber, Professor of Computer Science at Cornell University** - Computational Biology Service Unit (CBSU) that's dedicated to computational biology and bioinformatics for Cornell researchers. Providing both research and computational support to biology groups

**REDMOND, Wash., Aug. 1, 2006 --** Today Microsoft announced the general availability of Microsoft Windows Compute Cluster Server 2003, the company's first product designed specifically for high-performance computing (HPC). With Windows Compute Cluster Server 2003, Microsoft aims to make it easier to create, integrate and operate HPC clusters within organizations, thereby expanding the technology beyond traditional supercomputing centers by bringing the value of computational clusters within reach of more people.

To understand the impact of today's milestone, PressPass convened a round-

table of customers who have been test driving Microsoft Windows Compute Cluster Server 2003 in demanding applications, including biomedical research and scientific modeling. Providing their insight are:

- Ron Elber, professor of computer science at Cornell University
- John Michalakes, senior software engineer at the National Center for Atmospheric Research (NCAR) in Boulder, Colo.
- Matt Wortman, director of computational biology and IT at the Genome Research Institute, University of Cincinnati

**PressPass: Would each of you begin by briefly describing the work you're doing as it relates to Microsoft Windows Compute Cluster Server?**

**Elber:** At Cornell, we have a core facility called the Computational Biology Service Unit (CBSU) that's dedicated to computational biology and bioinformatics for Cornell researchers. We provide both research and computational support to biology groups. The cluster serves as a platform for computational biology applications used in a range of research activities in bioinformatics. We support many popular applications for sequence-based datamining, population genetics and protein structure prediction. Many of the projects require lengthy calculations, and massively parallel computing helps shorten the clock time and obtain results in a reasonable period. We have developed a Web-based interface that allows biologists to access the applications without any prior knowledge of cluster computing.

**Michalakes:** About eight years ago, NCAR and a number of partner organizations involved in atmospheric research and operational forecasting began working on a next-generation community weather model and data assimilation system to eventually replace aging model codes in use for forecasting and research. This new model, called the Weather Research and Forecast (WRF) model, is basically all new software, designed from the outset for HPC systems. WRF is maintained and freely distributed as a community model and is being run at hundreds of institutions across the range of systems, from individual workstations to large supercomputers. Thus, portability and portable performance has been a key concern in the design and implementation of WRF.

**Wortman:** One of our key focus areas at the Genome Research Institute is drug discovery. Early in the drug-discovery process, millions of chemical compounds are screened against disease targets to identify classes of molecules whose properties and activities guide researchers toward the discovery of new drugs. Our research focuses on applying computational tools to this process to reduce costs and save time. Specifically, we perform virtual *in silico* screening experiments that simulate the interactions between a disease target and those millions of chemical compounds to predict which compounds participate in desired interactions. The compounds predicted to have the most favorable properties are selected from the chemical library, and then proceed to *in vitro* testing to confirm the computational predictions. This combination of *in silico* and *in vitro* screening is much faster and less expensive than *in vitro* screening alone because the number of chemicals that need to be tested is reduced by several orders of magnitude. A typical job on our cluster begins when the disease target is sent to the scheduler along with a list of chemicals to be used during the simulation. The head node sends a copy of the disease target and a portion of the chemicals to each node where simulations occur independently. The head node analyzes and ranks the results of each simulation.

**PressPass: What made you decide to use the Microsoft Windows Compute Cluster Server 2003, and what benefits do you think it offers to your organization and your work?**

**Michalakes:** We strive to maintain WRF [NCAR's Weather Research and Forecast model] on as many systems deployed in our user community as possible. Until now, that meant systems running some flavor of UNIX or Linux. With the emergence of Microsoft Windows as a viable

HPC operating system, and given that we receive on average one user request per month asking if WRF will work on Windows, we see Windows CCS as an opportunity for further broadening the range of computational resources available to the WRF user community.

**Wortman:** Our decision to use Windows Compute Cluster Server was motivated by the need to lower costs by reducing the complexity of our infrastructure. Windows Compute Cluster Server has several advantages to an organization like ours that uses Active Directory for identity management. First, our Windows technicians could apply their knowledge of Windows-based servers to it. This was evidenced by the fact that individuals with no HPC experience set up a Windows-based Compute Cluster Server HPC cluster without guidance or supervision. Second, using Active Directory and the Microsoft job scheduler enables our users to submit jobs from their workstations and reduces the number of user accounts.

**Elber:** Upgrading to Windows Compute Cluster Server was a natural step for us. We have been using a Windows-based HPC platform since the computational biology unit was started in 2001. Until recently, we used Windows-based systems adapted by the Cornell Theory Center (CTC) for HPC. We use Microsoft SQL Server for our database needs and Windows-based servers for hosting our Web interfaces. Therefore, Windows Compute Cluster Server allows for a homogeneous and easy-to-develop environment. Our experience with the CTC's Windows-based HPC systems is very positive, and we expect Windows Compute Cluster Server to be even better.

**PressPass: What business needs are you solving with high-performance computing?**

**Elber:** Due to high computational demands, many research projects are plainly impossible to pursue without an HPC platform, or they would take an unreasonable amount of time to complete. For example, a typical datamining operation with several thousand input sequences will take several hours to run on a parallel machine; otherwise, it will take several days. Preparing data for learning scoring functions for protein folding might take a month or two on a massively parallel machine of suitable size; otherwise, it would take several years, making the project impractical. An HPC machine is also a convenient tool for serving the computational needs of many small projects. It's an easy-to-manage and uniform platform, where installing the software, updating databases and other such tasks are much easier to do than they would be on a set of separate computers.

**Michalakes:** Although the WRF model is used primarily in public sector institutions -- atmospheric research departments and government-run research and forecast centers -- a growing number of commercial weather forecast companies use WRF as well. These companies make specialized weather forecast products for customers in construction, agriculture, energy and other businesses.

**Wortman:** For us, the key business need was reducing costs by eliminating complexity. We did that by eliminating Linux support costs.

**PressPass:** A couple of you have brought up Linux. Based on your experience, how does a Windows-based HPC platform compare to Linux-based HPC clusters in areas like development, setup, maintenance, interoperability, scalability and applications?

**Wortman:** The setup and management of Windows Compute Cluster Server vs. a Linux cluster is worlds apart for us. The proof of this is the fact that a Windows technician with no HPC experience can set up a cluster from scratch in a matter of hours. Linux clusters simply take more care and feeding, and substantial knowledge of Linux, which nearly all biomedical researchers lack.

**Elber:** From our perspective, large-scale Linux clusters are difficult to set up and then to appropriately tune up, whereas a Windows-based cluster seems to be easier to set up, even considering the fact that we've been running a beta version of Windows Compute Cluster Server. Also, a Linux cluster is less friendly for an average user who is not computer-oriented, for example, a biologist who's in need of a computing environment. And, because we use the Windows platform for databases, file storage and Web interfacing, a Windows-based HPC cluster integrates much better, and it's easier to develop software with.

**PressPass:** As HPC becomes more of a mainstream technology, what key opportunities and challenges do you foresee for commercial and research application developers?

**Michalakes:** One shift we've seen as HPC has matured is from thinking about the performance-at-any-cost of HPC systems to thinking more about cost-performance of such systems. I believe operational numerical weather prediction

is solidly terascale, but it remains to be seen whether operational centers will move to petascale systems for their day-to-day, real-time forecasting production schedules. The issue will be cost -- the cost of petascale systems themselves, as well as the cost to operate such systems and the cost to retool and maintain modeling software to run on such systems, weighed against some hoped-for improvement in forecast quality. In the near term, I believe petascale computing will be used for non-real-time, very-high-resolution simulations for research to improve understanding of atmospheric processes that will, in turn, provide improvements to lower-resolution operational real-time prediction runs.

Having said all this about petascale computing, my sense in the context of this discussion is that Microsoft is not currently targeting frontier computing systems for Windows Compute Cluster Server, but focusing instead on small- to mid-level clusters more widely deployed in the research and commercial areas of weather modeling. From this perspective, the challenges and opportunities are efficient integration and management of computing and data systems to allow for more seamless coordination and management of workflows for end-to-end computing and analysis of weather and climate applications.

**Elber:** The biggest challenge -- and an opportunity -- is to develop easy-to-use solutions with intuitive interfaces that allow users to access software on an HPC cluster without prior knowledge of the cluster operating system or scheduling intricacies. Here at Cornell, we've developed an interface to computational biology applications that is very popular among biologists and separates them from our particular hardware/software implementation. This is especially true for small or medium-sized clusters that will be used in small research groups

whose members have no experience in HPC or parallel programming.

**Wortman:** I foresee HPC changing from a niche occupied by financial and scientific technical experts to a mainstream blackbox affair with many small group or department clusters outnumbering the large HPC centers. Application developers will provide plug-and-play devices that integrate into your infrastructure via USB or Ethernet. These devices will be

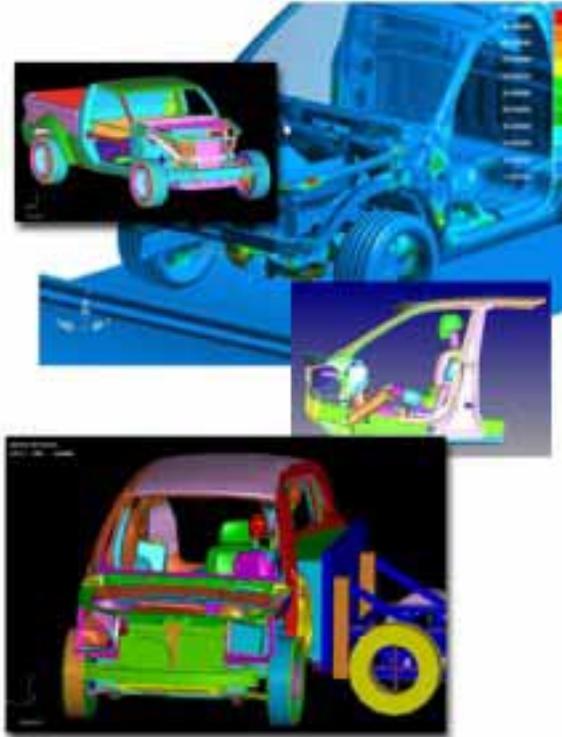
simple and capable of a small variety of very high-speed calculations. For example, a standalone bioinformatics server will store and analyze sequence data, or a drug discovery appliance will screen chemical compounds. These simple “uni-taskers” will be made and supported for integration into your existing Windows-based environment.

### **LSTC's LS-DYNA Simulation Software on x64 Compute Clusters Boosts Performance, Reduces Costs**

Livermore Software Technology Corporation (LSTC) develops LS-DYNA® software, used to model the real-world behavior of physical objects and phenomena. LS-DYNA has been available for Microsoft® Windows Server™ 2003 (32-bit x86) in a version running on single system. However, some customers need to simulate larger problems. To meet this need, LSTC created a distributed memory version that runs on clusters of computers. The Distributed Memory (MPP) version of LS-DYNA scales to a large number of processors, especially as the size of the problem increases, and significantly reduces computation time. LSTC recently ported the MPP version of LS-DYNA to Microsoft Windows® Compute Cluster Server 2003. The company expects more customers to use the MPP Version of LS-DYNA now that it is available on the Windows platform.

## ETA –Engineering Technology Associates

[Visit ETA for complete information](#)



**ETA provides solutions to its global customers, by integrating CAE, design and development.**

Using ETA's CAE-Centric Design Process(tm) to drive the design through advanced simulations, ETA can access a network of global partners including EDAG, Ricardo, Mahindra and Roush Industries, ICRC and Advanced Vehicle Engineering. Working in the role of program manager, ETA is able to leverage its partner's expertise and consider all aspects of a product's development from the initial CAE and design through to the tool design and manufacturing considerations

### **Flexibility**

ETA can offer its clients complete flexibility in the type and way it provides its consulting services. Broadly speaking it is possible to think of it as being built-up from a combination of the following possible scenarios;

- **CAE Project Services**

ETA can support clients virtual product development activities on a scale ranging from a single simulation and design analysis to a complete engineering design scope, including engineering drawings and prototype parts. Project can make use of our offshore locations, in India and China.

- **On-site Project Team**

ETA can provide turnkey engineering teams, consisting of manpower, computing resources and facilities, to assist the client undertaking an engineering program. The ETA group would work as a member of the client's own engineering team, providing the flexibility and agility to meet any variation in its workload.

- **Technology Transfer**

The final technical recommendations based upon analysis form only part of the project's objectives. Running parallel to the analysis, ETA's team uses the project as a training tool to mentor the client's engineers.

- **CAE Process Consulting**

ETA has been uniquely placed to observe the many ways CAE has been integrated into the engineering process. Based upon this experience we are able to offer;

- CAE process-auditing aimed at optimizing process design and implementation
- Identification and introduction of new CAE technology trends
- Management and support of CAE facilities; software licences, hardware and networking
- Database creation and management of analysis models, material libraries and other support documentation
- Recruiting and contract staffing

**Skills & Expertise**

Over 20 years experience in the area of CAE has allowed ETA to develop special expertise in these areas:

- Full vehicle development program
  - Management, CAE and design
- Advanced crash & occupant safety simulations
  - Concept, development and correlation
- Durability and NVH solutions, using eta/VPG
- Concept, development and verification (load and fatigue life)
- Metal forming applications, using eta/DYNAFORM
  - Stamping effects, tool design & performance
- Pre-production performance evaluation and correlation

- Crash, NVH and durability
- Production support
  - Manufacturing process simulation

**Event-Based Simulations**

ETA's expertise is not limited to automotive applications but should be considered more generally as event-based simulations of dynamic non-linear systems. Applications that can show significant benefit from this type of analysis include;

- Trains
- Off-road & construction vehicles
- Material handling equipment such as conveyor systems
- Civil engineering
  - Road and airport runway structures
  - Bridge abutments
  - Crash barriers
- Consumer products
  - Helmets
  - Protective sports equipment
  - Child safety seats
- Law enforcement and military equipment
  - Bullet-proof vests
  - Riot equipment
- Drop and impact testing
  - Safety containers
  - Effect of load shifting during transportation
- Electronic equipment such as laptops and mobile phones

Engineering Services Contact: Akbar Farahani

Tel: +1 (248) 729-3010 Ext 243

FAX: +1 (248) 729-3020

Email: [akbar@eta.com](mailto:akbar@eta.com)

## HP Unveils Revolutionary Wireless Chip that Links the Digital and Physical Worlds Grain-sized chip could be attached to almost any object, making information more ubiquitous

<http://www.hpl.hp.com/news/2006/jul-sept/memoryspot.html>

PALO ALTO, Calif., Jul 17, 2006



**HP today announced that its researchers have developed a miniature wireless data chip that could provide broad access to digital content in the physical world.**

With no equal in terms of its combination of size, memory capacity and data access speed, the tiny chip could be stuck on or embedded in almost any object and make available information and content now found mostly on electronic devices or the Internet.

Some of the potential applications include storing medical records on a hospital patient's wristband; providing audio-visual supplements to postcards and photos; helping fight counterfeiting in the pharmaceutical industry; adding security to identity cards and passports; and supplying additional information for printed documents.

The experimental chip, developed by the "Memory Spot" research team at HP Labs, is a memory device based on CMOS (a widely used, low-power integrated circuit design) and about the size of a grain of rice or smaller (2 mm to 4 mm square), with a built-in antenna. The chips could be embedded in a sheet of paper or stuck to any surface, and could

eventually be available in a booklet as self-adhesive dots.

"The Memory Spot chip frees digital content from the electronic world of the PC and the Internet and arranges it all around us in our physical world," said Ed McDonnell, Memory Spot project manager, HP Labs.

The chip has a 10 megabits-per-second data transfer rate – 10 times faster than Bluetooth™ wireless technology and comparable to Wi-Fi speeds – effectively giving users instant retrieval of information in audio, video, photo or document form. With a storage capacity ranging from 256 kilobits to 4 megabits in working prototypes, it could store a very short video clip, several images or dozens of pages of text. Future versions could have larger capacities.



### Actual Memory Spot chip

Information can be accessed by a read-write device that could be incorporated into a cell phone, PDA, camera, printer or other implement. To access information, the read-write device is positioned closely over the chip, which is then powered so that the stored data is transferred instantly to the display of the phone, camera or PDA or printed out by the printer. Users could also add information to the chip using the various devices.

"We are actively exploring a range of exciting new applications for Memory Spot chips and believe the technology could have a significant impact on our consumer businesses, from printing to imaging, as well as providing solutions in a number of vertical markets," said Howard Taub, HP vice president and associate director, HP Labs.

The chip incorporates a built-in antenna and is completely self-contained, with no need for a battery or external electronics. It receives power through inductive coupling from a special read-write device, which can then extract content from the memory on the chip. Inductive coupling is the transfer of energy from one circuit component to another through a shared electromagnetic field. A change in current flow through one device induces current flow in the other device.

Memory Spot chips have numerous possible consumer and business-based applications.

### Some examples are:

**Medical records:** Embed a Memory Spot chip into a hospital patient's wrist band and full medical and drug records can be kept securely available.

**Audio photo:** Attach a chip to the prints of photographs and add music, commentary or ambient sound to enhance the enjoyment of viewing photos.

**Digital postcards:** Send a traditional holiday postcard to family and friends with a chip containing digital pictures of a vacation, plus sounds and even video clips.

**Document notes:** A Memory Spot chip attached to a paper document can include a history of all the corrections and additions made to the text, as well as voice notes and graphical images.

**Perfect photocopies:** A Memory Spot chip attached to a cover sheet eliminates the need to copy the original document. Just read the perfect digital version into the photocopier and the result will be sharp output every time, no matter how many copies are needed, and avoiding any possibility of the originals jamming in the feeder.

**Security passes:** Add a chip to an identity card or security pass for the best of both worlds --- a handy card with secure, relevant digital information included.

**Anti-counterfeit tags:** Counterfeit drugs are a significant problem globally. Memory Spot chips can contain secure information about the manufacture and quality of pharmaceuticals. When added to a drug container, this can prove their authenticity. A similar process could be

used to verify high-value engineering and aviation components.

### **About HP**

HP is a technology solutions provider to consumers, businesses and institutions globally. The company's offerings span IT infrastructure, global services, business and home computing, and imaging and printing. For the four fiscal quarters ended Oct. 31, 2005, HP revenue totaled \$86.7 billion. More information about HP (NYSE, Nasdaq: HPQ) is available at <http://www.hp.com>.

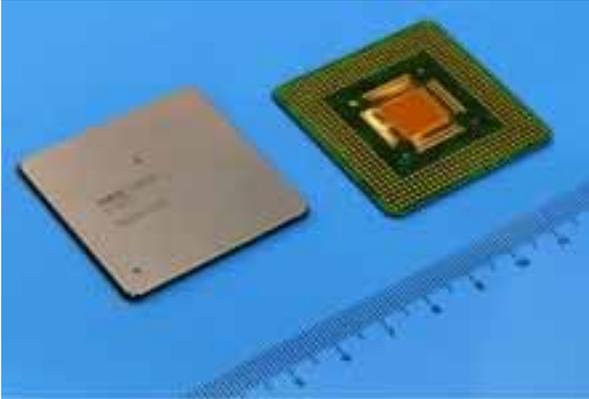
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Bluetooth is a trademark owned by its proprietor and used by Hewlett-Packard Company under license. This news release contains forward-looking statements that involve risks and uncertainties, as well as assumptions that, if they ever materialize or prove incorrect, could cause the results of HP and its consolidated subsidiaries to differ materially from those expressed or implied by such forward-looking statements and assumptions. All statements other than statements of historical fact are statements that could be deemed forward-looking statements, including the expected development, performance or rankings of products or services; statements of expectation or belief; and any statement of assumptions underlying any of the foregoing. Risks, uncertainties and assumptions include the development, performance and market acceptance of products and services and other risks that are described from time to time in HP's Securities and Exchange Commission reports, including but not limited to HP's Quarterly Report on Form 10-Q for the fiscal quarter ended July 31, 2005, and other reports filed after HP's Annual Report on Form 10-K for the fiscal year ended Oct. 31, 2004. HP assumes no obligation and does not intend to update these forward-looking statements.

**HP is listed on LS-DYNA Resource Page in FEA Information News**

## NEC Electronics and NEC Introduce IMAPCAR(R) Image Processor with Advanced Parallel Processing Capabilities for Automotive Safety Systems

[For Article Complete Information Visit NEC](#)



### New Processor Adopted in Lexus LS460 Pre-crash Safety System

**Tokyo, August 25, 2006** --- NEC Electronics Corporation ("NEC Electronics") and NEC Corporation ("NEC"), with support from Toyota Motor Corporation ("Toyota") and Denso Corporation ("Denso"), today introduced the IMAPCAR(R) image processor for automobiles, which can detect nearby objects such as vehicles, pedestrians, and lane markers in real-time, enabling automobile manufacturers to easily implement safety mechanisms and collision prevention systems. IMAPCAR will be featured in the pre-crash safety system of the new Lexus LS460 developed by Toyota, scheduled to be available this autumn.

IMAPCAR is five times faster than the leading automotive image processor, boasting performance of up to 100 GOPS (Giga (billion) Operations Per Second). Using parallel processing technology throughout its 128 processing elements, IMAPCAR provides the advanced performance necessary for real-time identification of objects. The image recognition functions are processed by software, which allows easy modification of programs as compared to hardware

solutions. Additionally, the 0.13-micron process technology used in the IMAPCAR helps it suppress power consumption to under 2 watts, which is optimal for automobiles.

NEC Electronics and NEC have long recognized the need for image recognition technology in automotive and IT applications, and began research and developments in 1990 at NEC's research laboratories. In particular, the companies focused on parallel processing technology, which was necessary for advanced recognition of and response to moving images.

The first single-chip image processor was introduced in February 2003, and consequently exhibited at industry events such as CEATEC 2003, ITS 2004, and Convergence 2004. IMAPCAR was developed in conjunction with Toyota and Denso, based on this technology.

NEC Electronics and NEC believe IMAPCAR will help manufacturers of automobiles and automotive electronics

more efficiently develop safety systems, leading to widespread adoption in vehicles. The companies will pursue further developments in the field of image recognition technology, refining the technology for pre-crash safety systems, as well as developing both high-end and low-end devices for use in a wide range of markets including security, game, robot, and factory automation.

### **Pricing and Availability**

Samples of the IMAPCAR(R) are now available priced at US\$200. Volume production is available immediately upon order. Monthly production volumes are expected to reach 10,000 units by the end of the fiscal year in March, 2007. Pricing and availability subject to change.

### **About NEC Electronics**

NEC Electronics Corporation (TSE: 6723) specializes in semiconductor products encompassing advanced technology solutions for the high-end computing and broadband networking markets, system solutions for the mobile handset, PC peripherals, automotive and digital consumer markets, and platform solutions for a wide range of customer applications. NEC Electronics Corporation has 25 subsidiaries worldwide including NEC Electronics America, Inc. ([www.am.necel.com](http://www.am.necel.com)) and NEC Electronics (Europe) GmbH ([www.eu.necel.com](http://www.eu.necel.com)). For additional information about NEC Electronics worldwide, visit [www.necel.com](http://www.necel.com).

### **About NEC**

T NEC Corporation (NASDAQ: NIPNY) is one of the world's leading providers of Internet, broadband network and enterprise business solutions dedicated

to meeting the specialized needs of its diverse and global base of customers. NEC delivers tailored solutions in the key fields of computer, networking and electron devices, by integrating its technical strengths in IT and Networks, and by providing advanced semiconductor solutions through NEC Electronics Corporation. The NEC Group employs more than 150,000 people worldwide and had net sales of approximately 4,825 billion yen (approx. \$41.2 billion) in the fiscal year ended March 2006.

For additional information, please visit the NEC home page at:

<http://www.nec.com>

\*Newsroom:

<http://www.nec.co.jp/press/en/>

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### **Note**

IMAPCAR is a registered trademark of NEC Electronics in Japan. All other trademarks are the properties of their respective owners.

## 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

Jim Kennedy & Len Schwer plan to attend the 5th German LS-DYNA Forum, sponsored by DYNAmore, in Ulm Germany on 12 & 13 October. If you see us, please introduce yourself as a Yahoo Group participant, or Yammerings fan. Visit [www.DYNAmore.de](http://www.DYNAmore.de) for more details.

Len Schwer will be conducting an LS-DYNA 'Discussion Group Forum' at the 77th Shock & Vibration Symposium, on Tuesday 31 October 06 at the Hyatt Regency Monterey in Monterey, CA. Visit [www.saviac.org](http://www.saviac.org) for more symposium details.

This installment of "Yahoo Yammerings" features five questions, with responses, from the past month of postings to the LS-DYNA Yahoo Group<sup>1</sup>:

1. *Mass Scaling?*
2. *\*INCLUDE Sub-Subfiles?*
3. *Rigid Body Acceleration?*
4. *Literature to justify doing static analysis in LS-DYNA?*
5. *Stress-Strain Curve For Mat24 : Inputs And Outputs?*

### Question: Mass Scaling?

I have a doubt regarding mass scaling. I have gone through LS-DYNA manuals, but I am not clear. My questions are

1. When exactly we use mass scaling factor (DT2MS).
2. When we use -ve and +ve values for DT2MS.

### Reply by Santosh

Mass Scaling factor (DT2MS) is used when one wants to reduce the solver run-time by compromising with the % mass increase. Generally, more than 10% mass increase is not acceptable. Now when -ve value of DT2MS is used, then mass is added to only those elements whose critical time-step is below the specified value, i.e.  $TSSFAC * |DT2MS|$ . But, when +ve value of DT2MS is used, then the elements having critical time step more than

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TSSFAC\*|DT2MS| value, for them also the time step is taken as the TSSFAC\*|DT2MS| value , which in most case is not desirable. Hope, this answers your doubt

**Reply by James Kennedy**

I believe that the following archived posting #9344 (posted recently on April 3, 2006), has a collection of some previous related notes, should be of interest.

**Reply by Nick Cristello**

I have found the following link useful in understanding mass scaling:

<http://www.dynasupport.com/Support/howto/mass.scaling>

1) You can use mass scaling to permit a quicker execution of your simulation. Be careful however, as adding to much mass will distort your results.

2) As I understand it, you always want to use the -ve version, and not +ve version (see above link for explanation)

**Question: \*INCLUDE Sub-Subfiles?**

When including subfiles with the \*INCLUDE\_TRANSFORMATION option, the nodes in the subfile are transformed according to the transformation specified in a \*DEFINE\_TRANSFORMATION card.

My question is, when including sub-subfiles, does a transformation that is applied to a 'child' get inherited by the 'grandchild' as well?

For example, main.k:

```
*INCLUDE_TRANSFORMATION
```

```
car.k
```

(the transformation here just shifts the car into position)

and then in car.k

```
*INCLUDE_TRANSFORMATION
```

```
front_wheel.k
```

(the transformation here places the front wheel with respect to the car)

Sorry for the simple question, intuitively transformations *should* be inherited, but the manual doesn't explicitly state this and I'm not near a copy of LS-DYNA at the moment to run a test.

**Reply by Denis Corkery**

The answer to your question is yes. Any transformations applied to include files using the INCLUDE\_TRANSFORM function will be applied to subsequent child includes. In your case, if the front\_wheel.k file resides in your car.k master file, you don't have to apply the TRANSFORM function to the front\_wheel.k file as this will inherit the transform applied to its parent file.

**Question: Rigid Body Acceleration?**

A colleague asked me a question today that I was unable to answer fully, and I hope that someone in this forum can better direct him (and me).

How is the Global Rigid Body Acceleration (or displacement / velocity) calculated in the Time History Plot (displayed in LS-PREPOST)?

My colleague reports that there is a discrepancy between the nodal accelerations and the rigid body accelerations of nearly 100!

I have not seen this level of discrepancy in my own simulations, and therefore cannot attest to the validity. However, I have noticed some difference between rigid body acceleration and nodal acceleration. I was under the impression that the rigid body acceleration (and displacement or velocity) considered an average of all nodes in the analysis. Therefore, if certain aspects of the simulation had zero velocity (like a wall for example) then they would inadvertently affect the rigid body acceleration. Is this correct?

If so, what would you recommend to achieve a smooth acceleration plot (instead of rigid body acceleration)? The nodal acceleration plots are very "choppy".

**Reply by Ming-Pei Lin**

I think the rigid body acceleration is the average of all nodes in this rigid body. This value is the acceleration of the center of mass of the rigid body. The motion of rigid body are translation and rotation, and rigid body acceleration is only translation acceleration, no rotation. But the node acceleration has translation and rotation effects. So the discrepancy makes no sense. Only if the node you observe is at the center of mass will the two values will be the same. I hope this will help you.

**Reply by Len Schwer**

To add a bit to this nice response, you should consider filtering your acceleration response. Check the archives of this group for some suggestions and reference materials, e.g. Jim Kennedy's postings 26 Jun #9950 & 26 May #9752.

**Follow-up Question**

Thank you both for your kind suggestions.

If I could interject one more question, I might ask why the Z-rigid body velocity is therefore different from the Z-nodal velocities. Not considering rotation of any nodes, I should think that the Z-rigid body velocity would match directly my initial velocity condition. I see that it is slightly different, however the Z-nodal velocity is spot-on. This is a result of the averaging you spoke of, yes?

**Response by James Kennedy**

Perhaps the following comment might be of interest.

As for the global velocity, this value is made from the momentum equation (nodal values) of all parts having a mass, no matter whether they have a velocity or not:

global velocity = (sum of mass x velocity)/(sum of mass)

### **Question: Literature to justify doing static analysis in LS-DYNA?**

I am being questioned as to the suitability of using LS-DYNA to perform some quasi-static analysis (specifically pull / push on components to assess maximum and permanent deflection). Despite the modes correlating well to the physical test, this is not proving sufficient in the eyes of some people : physical test increases the load over a few seconds whereas in the CAE model I increase the load over 100ms.

I was hoping there was any literature out there which could help me justify that LS-DYNA is suitable for doing this type of analysis, and that the method I have applied is correct.

### **Response by Len Schwer**

I am not aware of any literature discussing "how static is quasi-static," but typically one demonstrates the approximation of quasi-static response via:

#1 - plotting the kinetic energy and noting it is less than say 10% of the internal or external energy.

#2 - apply the loading twice as slow, i.e. in your case over 200ms, and demonstrating the results are identical. If you can afford the CPU time, I suggest running 5 or 10 times as slow.

Lastly, for the doubting Thomas, perhaps you can run the simulation implicitly for the 'few second' duration and demonstrate the results are (nearly) the same.

Frankly, no literature citation is going to be convincing to the people you are dealing with, so it is easier to just do the above suggested calculations than to try to explain why you didn't.

### **Response by James Kennedy**

I wholeheartedly concur with Len Schwer.

The following paper may be of some help; however, the numerical studies will carry much more weight:

Schweizerhof, K., Walz, M., Rust, W., Franz, U. and Krichner, M., "Quasi-static Structural Analysis with LS-DYNA - Merits and Limits," 2nd European LS-DYNA User's Conference, Gothenburg, Sweden, June, 1999.

A FAQ provided by LSTC which may also be of interest:

<ftp://ftp.lstc.com/outgoing/faq/quasistatic>

**Question: Stress-Strain Curve For Mat24 : Inputs And Outputs?**

I have some simple questions about material inputs and outputs and I am hoping you will be able to give me simple answers :

- 1) I have received some material data for a steel plate from tensile testing (in true stress-strain form) and want to input it into Mat24 curve. The material sample is rather "stronger" than the specification from the supplier (i.e. UTS is higher and elongation at failure is less), but the supplied is clueless as to the reason why. I am concerned that this sample is "optimistic" in terms of performance and want to scale it down to put into the nominal range of the supplier's specification. Is this common practice and are there any things I should out for ?
- 2) The true stress-strain curve drops off after the necking of the sample. To avoid erroneous results, I plan to extrapolate the curve after this point. Should I extrapolate horizontally or as an increasing curve following the previous slope of the curve ?
- 3) I have been told that it is usual practice to "chop off" the beginning of the curve, at the offset yield strength (by constructing a curve parallel to the elastic portion which starts at 0.2%). Is this true ?
- 4) My understanding is that once the material is in the plastic portion of the curve, DYNA should follow that curve. I have run a simple drop test on a plate which is attached at its edges but non constrained in the middle, and analyzed the stress (von Mises) and strain (effective plastic) in the middle of the plate which is in tension. I was expecting that the values given for stress and strain would be the same as the stress-strain curve I hade input (i.e. for a given value of stress, the strain plot would show the same value as what is in the curve for that stress value). To my surprise, this is not the case... Is this normal and what should I be expecting ?

**Response by Philipp Roemelt**

- 1.) A material sample meeting the specifications does not mean, that its properties are exactly as those in the specification, but that at least X%, depending on the class, i.e. 95% for class A, have a strength higher than those specified. Scaling the properties down is common practice for structural analysis and design.
- 2.) Stress-Strain curves can be idealized to follow  $\text{strain} = (\text{stress}/\text{Young's modulus}) + 1/m * \text{stress}/\text{Young's modulus} * (\text{stress}/f_n)^{(m-1)}$ .  $m$  is a material parameter, that can be determined from the non-linear part of the stress-strain curve  $m = \log(\text{strain}_1/\text{strain}_2) / (\log(\text{stress}_1/\text{stress}_2))$ , usually  $m$  is calculated using the 0.1% and 0.2% stresses.  $f_n$  is a reference stress, that is determined using  $f_n = \text{stress} * (m * \text{strain} * \text{Young's modulus} / \text{stress})^{(-1/(m-1))}$ , again the stress and strain value need to be from the non-linear part of the stress-strain curve.
- 3.) I do not know what you mean by the curve being "chopped off," however the 0.2% yield stress is determined by drawing a line parallel to the linear part of the curve starting at 0.002 strain. The 0.2% yield stress is the stress corresponding to the intersection point of that line with the stress-strain curve.

4.) I do not know how LS-DYNA calculates the stress for \*MAT24, however I think the reason why you see a different stress-strain curve is because you are looking at von-Mises stress, which is an equivalent stress, reducing a 3-dimensional state of stress to a 1-dimensional. Therefore you have a coupling effect with the stresses generated by Poisson's effect in the unloaded directions of the plate. I would think that if you look at the stress component in load direction vs. strain it should give you the curve you put in, though I am only guessing, I do not know for sure.

### **LS-DYNA Yahoo Groups**

There are over 1920 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](mailto: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](http://www.dynalook.com)

## Publication Showcase:

Paper is located online: [FEA Publications](#)  
sidebar link "Featured"

## Numerical Modeling of Friction Effects on the Ballistic Impact Response of Single-Ply Tri-Axial Braided Fabric

Daihua Zheng, Wieslaw K. Binienda,  
Jingyun Cheng and Marcin Staniszewski  
**Department of Civil Engineering**  
*The University of Akron*  
**Akron, OH, 44325**  
*E-mail: dz15@uakron.edu*

### Abstract

It has been shown by experiments that frictional effects play an important role in the energy absorption of fabrics subjected to ballistic impact. However, the specific role of friction is not well understood and established. In this paper, a detailed finite element model was developed, using LS-DYNA<sup>®</sup>, to parametrically study the frictional effects during the ballistic impact of a square patch of single-ply 2D tri-axially braided fabric. The individual yarns (bias and axial direction) in the fabric were modeled discretely and considered as a continuum by considering the measured properties of the braided fabric (weave architecture, crimp, yarn cross-section etc.). The friction between yarns at their crossovers and the friction between projectile and fabric were taken into account. The damage of a single yarn model were compared with the experimental data and included in the material model of the fabric. It was shown that the friction contributes to decreasing of the residual velocity of the projectile more quickly than the one without friction. Thus the fabric energy absorption capacity can be increased by 18%. The results from the simulation also indicated that the frictional sliding energy starts to play more important role when the fabric begins to get damage and more movements between axial yarns and braider yarns are involved.

## Previous Month - August Weekly News Page Highlights Review

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

Information is copyright to the respective listed companies.

### [Intel For Complete Information](#)

Including up to 4MB of shared L2 cache, and up to 1066 MHz Front Side Bus

### [AMD For Complete Information:](#)

**AMD Athlon™ 64 X2 Dual-Core Processor for Desktop**

### [Engineering Technology Associates, Inc](#)

**VPG/Structure:** VPG enables users to create unique system level simulations of mechanical systems such as vehicle suspensions and linkages. VPG enables users to include components as flexible bodies, combining the traditional kinematic/dynamic simulation methods with finite element analysis methods. The results are simulations that provide greater insight and opportunities to improve or prove out your design.

### [Oasys, Ltd. For Complete Information](#)

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.

### [Fujitsu Limited For Complete Information](#)

**Best Value in a Solaris Operating System** - Bringing together the world's fastest bus technology and the latest in SPARC64® processor development, PRIMEPOWER servers are your best choice for the enterprise. Modularly designed with future-oriented technology, PRIMEPOWER servers offer maximum scalability. The reliable performance of the PRIMEPOWER server is coupled with the Solaris operating system.

### [SGI "A Multi-Workflow Architecture for High-Performance Computing."](#)

Whatever your environment, there's an SGI server that can keep your data moving.

## **FEA Information Inc. News Notes on ARUP - China**



**Mr Blair and Mr Wen were keen to stress new business deals**

### **British PM Tony Blair and Chinese Premier Wen Jiabao have met in London - Arup to design major airport hub in China**

Three were announced as part of the visit. Among them being The global design and engineering group Arup entering an agreement to develop a design for the new Yunnan Kunming International Airport in southern China. The agreement will see Arup work alongside a Chinese design institute (still to be appointed), to undertake the design of the terminal building. Yunnan Kunming International Airport is set to become the fourth largest airport hub in China, handling in excess of 60 million passengers a year by 2035.

It will become the country's fourth largest airport hub.

## LSTC Training Classes – 2006



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 [www.lstc.com](http://www.lstc.com)

Onsite training is also available.

Training Class	US \$	Livermore, CA	Detroit, MI
Advanced LS-DYNA for Impact Analysis	\$950		
Advanced Options in LS-DYNA	\$750		Sept 05-06
ALE/Eulerian & Fluid/Structure Interaction in LS-DYNA	\$750		
Concrete and Geomaterial Modeling with LS-DYNA	\$750	Oct 24-25	
Contact in LS-DYNA	\$750	Sept. 12-13	Aug 15-16
Introduction to LS-DYNA	\$750	Aug. 01-04 Nov. 14-17	Oct 23-26 Dec. 11-14
Introduction to LS-OPT	\$750	Nov. 07-10	
LS-DYNA Composite Materials	\$750	Sept. 14-15	
LS-DYNA Implicit	\$750		Sept. 07-08
LS-DYNA for Heat Transfer & Thermal-Stress Problems	\$500		
Material Modeling Using LS-DYNA User Defined Options	\$750		
MESH Free Methods in LS-DYNA (SPH and EFG)	\$750		

## EVENTS – 2006

If you want your event listed please send the information to:  
[mv@feainformation.com](mailto:mv@feainformation.com)

<b>Oct 12-13, 2006</b>	<b><u>LS-DYNA Users Meeting in Ulm.</u></b> Hosted by DYNAmore
<b>Oct 25-27, 2006</b>	<b><u>2006 CADFEM Users Meeting</u></b> - Sessions on LS-DYNA International Congress on FEM Technology Stuttgart area - Germany
<b>May 28-20, 2007</b>	<b><u>6th European LS-DYNA User's Conference</u></b> - Gothen- burg. Sweden - hosted by ERAB <b><u>PDF: First Announce- ment</u></b>
<b>June 8-10, 2008</b>	<b>10th International LS-DYNA Users' Conference</b> - The Hyatt Regency, Dearborn, MI, US -hosted by LSTC

## 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**

<b>TABLE 1: SMP - Fully QA'd by LSTC</b>	
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

<b>TABLE 1: SMP - Fully QA'd by LSTC</b>	
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

<b>TABLE 2: MPP Interconnect and MPI</b>			
<b>Vendor</b>	<b>O/S</b>	<b>HPC Intereconnect</b>	<b>MPI Software</b>
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\*Environment highly capable, yet easy to use for advanced modeling needs.

### [ETA – DYNAFORM](#)

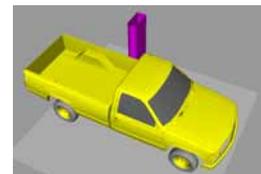
Includes a complete CAD interface capable of importing, modeling and analyzing, any die design. Available for PC, LINUX and UNIX, DYNAFORM couples affordable software with today's high-end, low-cost hardware for a complete and affordable metal forming solution.

### [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**

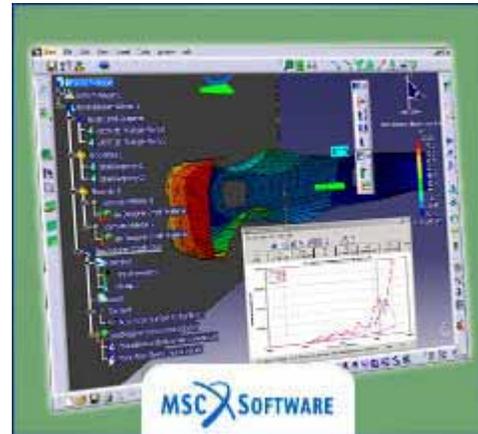
**MSC.Software - MSC.Nastran/SOL 700**

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**

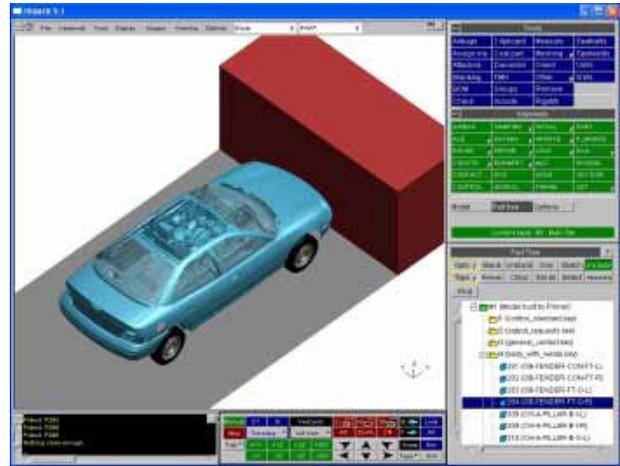
Gateway for LS-DYNA provides you with the ability to access basic LS-DYNA simulation capabilities in a fully integrated and generative way. Accessed via a specific Crash workbench on the GPS workspace, the application enhances CATIA V5 to allow finite element analysis models to be output to LS-DYNA and 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

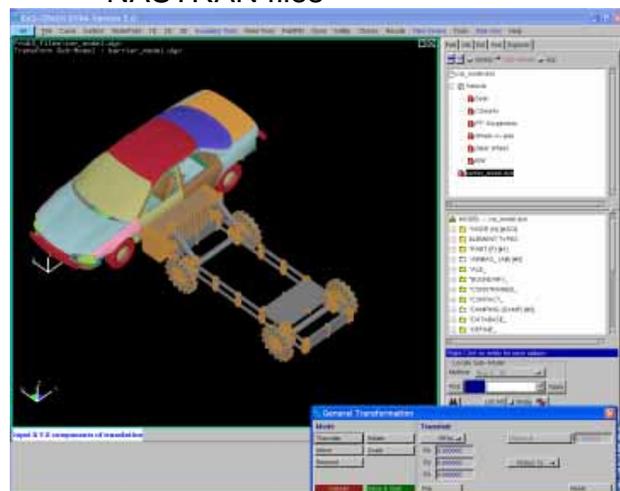
EASi-CRASH DYNA is the first fully integrated environment for crashworthiness and occupant safety simulations with LS-DYNA, and covers the complete CAE-process from model building and dataset preparation to result evaluation and design comparisons.

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

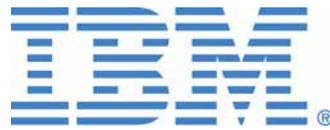
EASi-CRASH DYNA's main features include:

- 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 (support of MADYMO format till version 6.2.2)
- 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



**Hardware - Computing - Communication Products**  
Logo's hyperlink to company's website



## Software Distributors Alphabetical order by Country

Australia	<a href="#"><u>Leading Engineering Analysis Providers</u></a>
Canada	<a href="#"><u>Metal Forming Analysis Corporation</u></a>
China	<a href="#"><u>ANSYS China</u></a> www.ansys.cn
China	<a href="#"><u>Arup</u></a>
China	<a href="#"><u>MSC. Software – China</u></a>
Germany	<a href="#"><u>CAD-FEM</u></a>
Germany	<a href="#"><u>DynaMore</u></a>
India	<a href="#"><u>Altair Engineering India</u></a>
Italy	<a href="#"><u>Altair Engineering Italy</u></a>
Italy	<a href="#"><u>Numerica SRL</u></a>
Japan	<a href="#"><u>Fujitsu Limited</u></a>
Japan	<a href="#"><u>The Japan Research Institute</u></a>
Japan	<a href="#"><u>CRC Solutions Corp.</u></a> www.engineering-eye.com
Korea	<a href="#"><u>Korean Simulation Technologies</u></a>
Korea	<a href="#"><u>Theme Engineering</u></a>

**Software Distributors (cont.)**  
**Alphabetical order by Country**  
 (direct links will be completed October)

Netherlands	<b>Infinite Simulation Systems B.V</b> www.infinite.nl
Russia	<b>Strela, LLC</b> www.ls-dynarusia.com
Sweden	<b>Engineering Research AB</b> www.erab.se
Taiwan	<b>Flotrend</b> www.flotrend.com.tw
USA	<b>Engineering Technology Associates</b> www.eta.com
USA	<b>Dynamax</b> www.dynamax-inc.com
USA	<b>Livermore Software Technology Corp.</b> www.lstc.com
UK	<b>Arup</b> www.arup.com/dyna/

**Consulting and Engineering Services**  
**Alphabetical Order By Country**  
 (direct links will be completed October)

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

## Educational & Contributing Participants Alphabetical Order By Country

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

## FEA Information China Participants

Software, Hardware, Training, Consulting, Services

<p><b>Arup</b>  <b>China: LS-DYNA sales, support, training</b></p>	<p>Name: Li YuQiang          Email: <a href="mailto:Yu-qiang.li@arup.com">Yu-qiang.li@arup.com</a>          Tel 021 5396 6633 extn 151</p>
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<p>Ansys-China, Inc.</p>	<p>Tel: 86-10-84085558          Website: <a href="http://www.ansys.com.cn">www.ansys.com.cn</a>          Contact: <a href="mailto:China@ansys.com.cn">China@ansys.com.cn</a></p>
<p>Arup</p>	<p>Kimbal Viridi          Tel: +86 21 5396 6633          Contact: <a href="mailto:Kimbal.virdi@arup.com">Kimbal.virdi@arup.com</a>          Website: <a href="http://www.arup.com/dyna">www.arup.com/dyna</a></p>
<p>Beijing Yuntong Forever CPC. Co. Ltd.</p>	<p>Tel: +86-10-82561200/01/03          Website: <a href="http://cpc.ytforever.com">http://cpc.ytforever.com</a>          Sole Distributor of LINUX NETWORKX, INC. (USA) in China          Contact: <a href="mailto:service@ytforever.com">service@ytforever.com</a></p>
<p>Engineering Technology Associates (China) Inc.</p>	<p>Martin Ma          Tel: + 86-21-64385725          Contact: <a href="mailto:support@eta.com.cn">support@eta.com.cn</a></p>
<p>Hewlett-Packard Asia Pacific Ltd.</p>	<p>Jerry Huang          Tel: +86-10-65645261          Contact: <a href="mailto:J.Huang@hp.com">J.Huang@hp.com</a></p>
<p>IBM China</p>	<p>Ms. Ling WANG -          Tel: +86-10-6539-1188 x4463 (T/L: 901-4463)          Website: <a href="http://www.ibm.com/cn/">http://www.ibm.com/cn/</a>          Contact: <a href="mailto:wangling@cn.ibm.com">wangling@cn.ibm.com</a></p>
<p>MSC. Software Corp.</p>	<p>Tel: +86-10-6849-2777          Website: <a href="http://www.mscsoftware.com.cn">www.mscsoftware.com.cn</a>          Contact: <a href="mailto:mscprc.contact@mscsoftware.com">mscprc.contact@mscsoftware.com</a></p>

## FEA Information China Participants

Software, Hardware, Training, Consulting, Services

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

## Informational Websites

The LSTC LS-DYNA Support site: [www.dynasupport.com](http://www.dynasupport.com)

<b>LSTC LS-DYNA Support Site</b>	<b><a href="http://www.dynasupport.com">www.dynasupport.com</a></b>
<b>FEA Informationwebsites</b>	<b><a href="http://www.feainformation.com">www.feainformation.com</a></b>
<b>TopCrunch – Benchmarks</b>	<b><a href="http://www.topcrunch.org">www.topcrunch.org</a></b>
<b>LS-DYNA Examples (more than 100 Examples)</b>	<b><a href="http://www.dynaexamples.com">www.dynaexamples.com</a></b>
<b>LS-DYNA Conference Site</b>	<b><a href="http://www.ls-dynaconferences.com">www.ls-dynaconferences.com</a></b>
<b>LS-DYNA Publications to Download On Line</b>	<b><a href="http://www.dynalook.com">www.dynalook.com</a></b>
<b>LS-DYNA Publications</b>	<b><a href="http://www.feapublications.com">www.feapublications.com</a></b>
<b>LS-DYNA CADFEM Portal</b>	<b><a href="http://www.lsdyna-portal.com">www.lsdyna-portal.com</a></b>

**6<sup>th</sup> European LS-DYNA Conference**  
**May 28-29, 2007**  
[www.erab.se/conference2007/](http://www.erab.se/conference2007/)



**Engineering Research Nordic will be hosting the 6th European LS-DYNA Users' Conference held at Quality Hotel 11 in Gothenburg, Sweden, May 28-29 2007.**

The conference brings together LS-DYNA users, researchers and developers to discuss LS-DYNA simulations of complex mechanical problems. The conference also attracts a wide range of hardware and software companies wishing to showcase their special solutions when running LS-DYNA simulations.

The conference will cover LS-DYNA applications – Among them will be:

- Aerospace,
- Automotive,
- Biomechanics,
- Civil Engineering,
- Impact and Drop Testing,
- Material Modeling,
- Metal Forming,
- Nuclear,
- Occupant Pedestrian Safety,
- Seismic Engineering and more.

A software and hardware exhibition will be organized during the conference. Interested companies should contact Engineering Research Nordic.

We are expecting delegates and presentations from all over the world to discuss problems facing the industry today and in the future.

Dr. John Hallquist, will be a keynote speaker presenting new LS-DYNA features.

**Specifications for Paper Submissions**

- Paper length: 3.000 words maximum
- Abstract deadline: January 26th, 2007
- Notification of acceptance: February 9th, 2007
- Final paper deadline: April 1st, 2007

For information on Paper Submissions, Exhibit Booth and/or Available Sponsorships Contact:

- Dr. Marcus Redhe  
Engineering Research Nordic  
Brigadgatan 16  
SE-581 31 Linköping  
Sweden



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