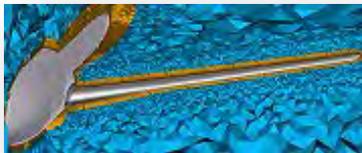**BETA CAE Systems**
Release of v16.2.3

2017 FORD F-SERIES SUPER DUTY, "Heavy Duty Pickup Truck"

Hao Chen

An Introduction to
*CONSTRAINED_BEAM_IN_SOLID

ESI Group – Safram Nacelles
ESI IC.IDO

FEA Information Inc.

A publishing company founded April 2000 – published monthly since October 2000.

The publication's focus is engineering technical solutions/information.

FEA Information Inc. publishes:

FEA Information Engineering Solutions

FEA Information Engineering Journal

FEA Information China Engineering Solutions

Livermore Software Technology, Corp. (LSTC) Developer of LS-DYNA One Code Methodology.

LS-DYNA provides fully integrated, strongly coupled, solvers for extensive multiphysics capabilities.   Integrated, at no additional cost. Optimized for shared and distributed memory for Unix, Linux, & Windows Based platforms.

DYNAmore GmbH – LSTC's Master Distributor in the EU

DYNAmore is dedicated to sales, support, training engineers with LS-DYNA to solve non-linear mechanical   problems numerically. Employs 85 engineers in Europe. Co-develops the LSTC software and provide engineering services.

βBETA
CAE Systems SA

CRAY

eta

esi

JSOL

恒士达科技
Hengstar Tech.

Oasys
The Software House of Arup

rescale

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Articles – Blogs - News

Automotive News -   **Editor - Dilip Bhalsod**

Aerospace News -   **Editor - Marnie Azadian**

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Conferences – Events -

Participant   Solutions

Distribution/Consulting

Cloud/On Demand/ Subscription

Models - THUMS - ADT - Barrier

LS-DYNA Recent Developments, Features, Updates – Editor – Yanhua Zhao

     An Introduction to *CONSTRAINED_BEAM_IN_SOLID

     Hao Chen - Livermore Software Technology Corp

Announcements

Welcome to our 16th year of FEA Engineering Solutions via email, pdf format.

2017 we anticipate additional sections and consolidations, in order to bring more news.

New Consolidated Sections:
      Classes – Webinars – On Line - Social media/You Tube.
        Aleta Hays, Editor

Announcement & Article
      Oasys/LS-DYNA sales and support capabilities office located in San Francisco

Reminder for next month
      LS-DYNA & JSTAMP Forum 2016 – November 8&9
      November 8th & 9th Don't miss out!
       http://ls-dyna.jsol.co.jp/en/event/uf

This month is the 16th year, every month, we have brought you the pdf edition of FEA Engineering Solutions. Additionally it is my bunny's 11th birthday – This is Heidi on the left and her favorite stuffed toy bunny – named toy bunny.
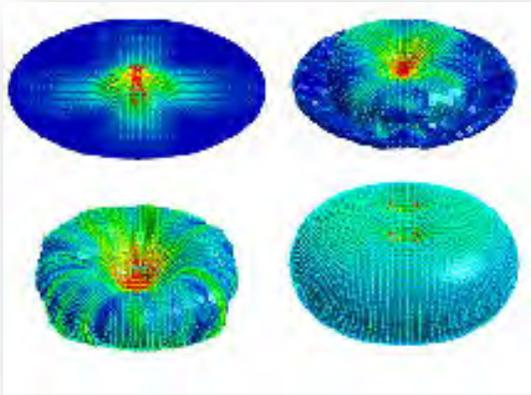
Thank you for being with us and our news - Marsha

Sincerely,
Marsha Victory   Trent Eggleston
Marnie Azadian   Suri Bala   Dilip Bhalsod   Yanhua Zhao   Aleta Hays

Aleta Hays, ayh225@aol.com

Sept. 9, 1966, The US enacted the National Traffic and Motor Vehicle Safety Act into law.　These stricter requirements led to new technologies including airbags.

LS-DYNA provides a comprehensive list of airbag deployment options including a uniform pressure control volume, ALE fluid mechanics, and a particle method.

LS-DYNA is widely used for modeling airbags and airbag deployment.

October showcase:

1. YouTube Video by BeenuZz
2. Safercar.gov powerd by NHTSA
3. Papers from the 14th International LS-DYNA® Users Conference

1. YouTube Video by BeenuZz
   published April 5, 2016 –
   LS-DYNA Ford Taurus crash test
 www.youtube.com/watch?v=jTB1SbW_rmU

Per BeenuZz - "This model is quite complete : i added seatbelt elements, airbag, and crash dummy to my beloved ford taurus. The impact is frontal, on a rigid wall, with an initial velocity of 35 mph. I was lacking a proper realistic seat model : i had to make a very rough simplification for it, with rigid shells. If i get my hands on some real car seat geometry, I would modify the input some day."

2. Air Bag Safety powered by NHTSA
This site offers important information to help you stay safe in a vehicle with air bags.
http://www.safercar.gov/Vehicle-Shoppers/Air-Bags/General-Information

- Air bags are supplemental restraints and are designed to work best in combination with safety belts.
- Both frontal and side-impact air bags are designed to deploy in moderate to severe crashes.
- Air bags reduce the chance that an occupant's upper body or head will strike the vehicle's interior during a crash.
- To avoid an air bag-related injury, always ensure proper seating position.
- Read your owner's manual for specific information about the air bags in your vehicle.

3. 14th International LS-DYNA Users Conference 2016
These listed papers and others can be located on www.dynalook.com

Introducing New Capabilities of JFOLD Version 3 and Airbag Folding Examples
    Richard Taylor - Over Arup and Partners International Limited
    Shingo Yagishita, Shinya Hayashi - JSOL Corp.

Low Risk Deployment Passenger Airbag - CAE Applications & Strategy
    Bil Feng - Jaguar Land Rover

Airbag Inflator Models in LS-DYNA
    Kyoung-Su Im, Zeng-Chan Zhang & Grant O Cook, Jr. - LSTC

Roof Rail Airbag Folding Techniques in LS-PrePost using DynFold Option
    Vijay Chidamber Deshpande - GM India Tech Center
    Wenyu Lian - General Motors Company, Warren Tech Center
    Amit Nair - LSTC

CRAY - PGS Expands - With Purchase of Second Cray XC Supercomputer

News Release

PGS Expands Industry Leading Supercomputing Platform With Purchase of Second Cray XC Supercomputer

SEATTLE and DALLAS, Oct. 17, 2016 (GLOBE NEWSWIRE) -- At the 2016 Society of Exploration Geophysicists (SEG) International Exposition in Dallas, Texas, global supercomputer leader Cray Inc. (NASDAQ:CRAY) today announced that **PGS has significantly enhanced its supercomputing capabilities with the purchase of a new 12-cabinet Cray® XC™ supercomputer. PGS, a worldwide oil-and-gas company and a leader in marine seismology, also added an additional 2.8 petabytes of capacity to its Cray® Sonexion® storage system.**

In March 2015, PGS purchased a 5-petaflops Cray XC supercomputer and a Cray Sonexion storage solution. The Cray systems were instrumental in producing the most detailed images ever of The Gulf of Mexico's subsurface as part of the PGS Triton survey – considered the most revolutionary and technologically advanced survey ever conducted in the region. The new system, which has been delivered and is currently in production, is the second Cray supercomputer at PGS and further strengthens one of the most powerful compute platforms in the oil and gas sector.

Named "Galois" after the French mathematician Évariste Galois, the new Cray XC supercomputer at PGS will analyze seismic data to produce more accurate images and multi-dimensional models of the Earth's subsurface beneath the ocean floor. The new system will allow PGS to run larger jobs with more complex data and algorithms that will produce higher-quality images in less time. With the expanded supercomputing capabilities, PGS can give its customers the ability to better locate oil and gas deposits.

"Galois provides forward-thinking computational capabilities for faster delivery of reverse time migration images and full waveform inversion studies," said Guillaume Cambois, executive vice president for imaging and engineering at PGS. "PGS has brought unique capabilities to the market using Cray supercomputers, enabling the advanced generation and analysis of high resolution pre-stack images of the subsurface."

"Today's most advanced seismic survey datasets encompass many hundreds of terabytes, and gaining insight from this data lies squarely at the convergence of supercomputing and big data," said Barry Bolding, chief strategy officer at Cray. "The Cray supercomputers allow PGS to quickly process this data into an accurate, clear image of what's lying underneath the sea floor, through kilometers of varied geology. This is an extraordinarily complex computational challenge, and is where PGS excels. We're thrilled PGS continues to rely on Cray supercomputers to power the next generation of seismic processing and imaging."
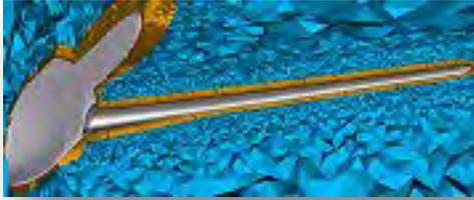
For more information on the Cray XC series of supercomputers and Cray Sonexion storage systems, please visit the Cray website at www.cray.com.

About PGS: PGS is the leading marine seismic company that acquires high resolution seismic data that is used to generate accurate images and 3D models of the sub-surface. Our library contains seismic and EM data, and our services include data acquisition and processing, imaging, reservoir analysis and interpretation. For more information, visit www.pgs.com.

About Cray Inc.: Global supercomputing leader Cray Inc. (Nasdaq:CRAY) provides innovative systems and solutions enabling scientists and engineers in industry, academia and government to meet existing and future simulation and analytics challenges. Leveraging more than 40 years of experience in developing and servicing the world's most advanced supercomputers, Cray offers a comprehensive portfolio of supercomputers and big data storage and analytics solutions delivering unrivaled performance, efficiency and scalability. Cray's Adaptive Supercomputing vision is focused on delivering innovative next-generation products that integrate diverse processing technologies into a unified architecture, allowing customers to meet the market's continued demand for realized performance. Go to www.cray.com for more information.

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Cray Investors: - Paul Hiemstra
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BETA CAE Systems announces the release of the new ANSA / Eπilysis / μETA v16.2.3 suite.

This maintenance release is focused on the correction of identified issues and is addressed to those who wish to continue to use the v16.2x branch with its issues resolved and not upgrade to v17x.

About this release:

The most important additions and fixes implemented in v16.2.3 are listed below.

Known issues resolved in ANSA

- **General:** ANSA.defaults: Lines from ANSA.defaults files from previous versions could be read as errors.
- **GUI:** Toolbar: A custom toolbar containing a whole group from the User Script menu, would appear as an empty toolbar when ANSA was relaunched.
- **Data Management:** Frozen Elements would not be deleted during replacing a part and they could not be re-positioned during DM operations.
- **Shell Mesh:** Scripting: Scripting function CreateEntity would not create second order shells.
- **DECKS:** Renumber: Renumber rules with increment value higher than 1 would not be applied normally with LAMINATE Properties and Materials.
- **Safety:** Interior: The FMVSS201U tool would not follow the regulation about considering or not the Sun Roof SET in the calculations of Targets.
- **Abaqus:** When a STEP was deleted, unexpected termination might occur
- **Kinetics:** Upon input in .cmd format, expressions of VTORQUE forces might not be read.
- **Optimization:** Optimization Task: The performance of DOE might cease responding, in case of de-activated (or not selected) Design Variables.

For more details about the new software features, enhancements and corrections please, refer to the Release Notes document.

Known issues resolved in μETA

Supported Interfaces
- The Reading scalar results issue in the Max Of All Angles calculation has been resolved.
- Reading ANSYS displacement results from DMP runs could cause unexpected termination.
- Reading EnSight files with adaptive mass elements could cause unexpected termination.
- Reading a LS-DYNA file with no grids defined could cause unexpected termination.
- Reading PamCrash file with modules could cause unexpected termination.

NVH Calculators
- In the Modal Response tool, if a response node was not present, modal energy plots lacked phase or were not plotted at all.
- Unexpected termination could occur when calculating additional TPA Fractions in the FRF Assembly tool.

General
- Plotting a large number of curves, such as mode participations from the Modal Response tool, would impact performance.
- μETA could block while creating a report for a Stress Linearization Path.
- Editing a presentation in the Report Composer while another presentation was in slideshow mode could cause unexpected termination.
- The OIC toolbar would calculate wrong Neck Injury Criteria for H3 dummies if the output units were not set to SI.

For more details about the new software features, enhancements and corrections please, refer to the Release Notes document.

Compatibility and Supported Platforms
- ANSA files saved by all the first and second point releases of a major version are compatible to each other. New major versions can read files saved by previous ones but not vice versa.
- To read μETA Project files by versions earlier than v16.2.3, they have to be saved selecting the option "Version <16.2.3".
- Support for 32-bit platform has been discontinued for all operating systems.

Download

Where to download from

- Customers who are served directly by BETA CAE Systems, or its subsidiaries, may download the new software, examples and documentation from their account on our server. They can access their account through the "user login" link at our web site.
- Contact us if you miss your account details. The [PublicDir] link will give you access to the public downloads area.
- Customers who are served by a local business agent should contact the local support channel channel for software distribution details.

What to download

- All files required for the installation of this version reside in the folder named "BETA_CAE_Systems_v16.2.3" and are dated as of October 4, 2016. These files should replace any pre-releases or other files downloaded prior to that date.
- The distribution of this version of our pre- and post-processing suite is packaged in one, single, unified installation file, that invokes the respective installer and guides the procedure for the installation of the required components.

- For the installation of the software on each platform type, the.sh installer file residing in the folder with respective platform name, for Linux and MacOS or the respective .msi installer file for Windows, 64bit, have to be downloaded.
- In addition to the above, optionally, the µETA Viewer is available to be downloaded for each supported platform.
- The tutorials and the example files reside in the folder named "TUTORIALS". This folder includes the complete package of the tutorials and example files, and a package with only the updated ones.
- The Abaqus libraries required for the post-processing of Abaqus .odb files are included in the installation package and can be optionally unpacked.
- Earlier software releases are also available in the sub-directory called "old" or in a folder named after the product and version number.

Francois Lancelot

Arup has recently established Oasys/LS-DYNA sales and support capabilities in its San Francisco office in order to better serve its clients and drive the growth of its software business in the Americas.

Oasys in San Francisco-
Sales support and training for the Oasys LS-DYNA environment

Arup aims to provide more focused services to the Region by developing local technical support for its Oasys LS-DYNA Suite (PRIMER, T/HIS, D3PLOT, Reporter) and Finite Element models. Arup is also offering in the Region a wide range of training courses to users of the Oasys LS-DYNA environment.

Promotion of the LS-DYNA software for Building/Civil/Transportation applications
From its San Francisco Office, Arup will champion and strive to promote LS-DYNA usage in the Building/Civil/Transportation environment by leveraging its expertise in the validation and development of geo-seismic material models and Soil-Structure Interaction analysis in particular.
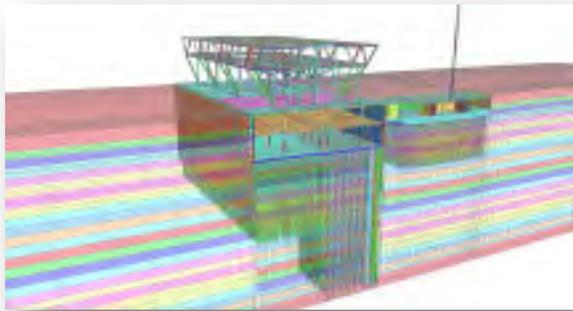
Advanced analysis support and consulting
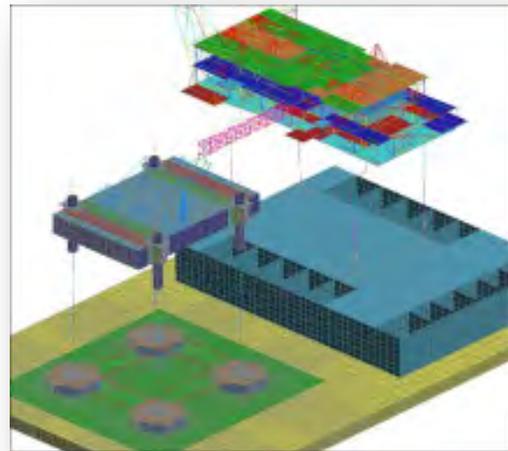Arup's Advanced Technology and Research group in San Francisco is recognized as a world leader in the application of performance-based design techniques for buildings, bridges, industrial and offshore facilities. For complex nonlinear time-history analysis and advanced structural assessments, LS-DYNA is Arup's software of choice. Since 1985 Arup has worked in conjunction with LSTC to develop a number of specific features ranging from seismic analysis to vehicle crashworthiness. Our team of experts is ideally placed to provide both strategic and detailed technical advice to local clients.

For any enquiry about the Oasys LS-DYNA Software Suite, advanced applications of LS-DYNA on Building/Civil/Transportation projects, specific training needs and consulting support, please contact:

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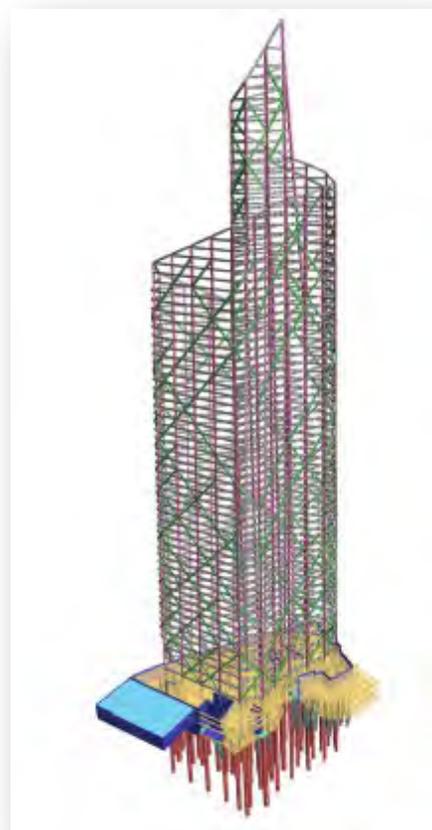www.oasys-software.com

Soil-Structure interaction –
Seismic analysis model © Arup

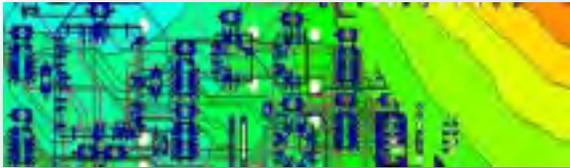Offshore structure –
Analysis model © Arup

Building analysis model © Arup

Foundation design Seismic analysis model © Arup

October 4, 2016 By: Chris Mesibov

Adventures in High Speed PCB Design - Part 1

As an electronics designer since 1987, I have encountered many recurring themes during projects. Board designers, and certainly board leads, contend with the typical pressures of shrinking schedules, expanding scope and "beyond control" issues. Project managers are always willing to roll down schedule constraints from on high and assert "perfect" schedules that ignore the "beyond control" issues such as inaccurate component specifications, performance and delivery problems. This post is aimed toward the Hardware Engineer Board Lead, and is told in a pseudo-story context so as to touch upon the many difficult situations in which HW engineers might find themselves. The story proposes how simulation can provide relief and solutions to common problems confronting the electronics designer throughout the development process. But before the story begins, it is important to identify three phases of a project where simulation can help solve problems and mitigate risk:

1. Pre layout simulation: If time is on your side prior to the critical design review, do as much signal integrity simulation as possible on all your critical signals. The results of these simulations should be used to instruct the PCB designer as to the routing constraints and other critical PCB geometries and properties that need to be maintained.

2. Layout and Post-layout simulation: Parts of the layout deemed critical should be extracted from the PCB CAD tool and simulated. Specifically, before the artwork is sent to the fabricator, this level of verification could catch mistakes due to geometries not managed by constraint configuration:

a. Power and ground plane problems can be caught by power integrity simulation (PI).

b. Ultra-high frequency transmission lines, long transmission lines, noise sensitive signal lines and interfaces where cross talk is a concern, all should be analyzed with signal integrity simulation (SI).
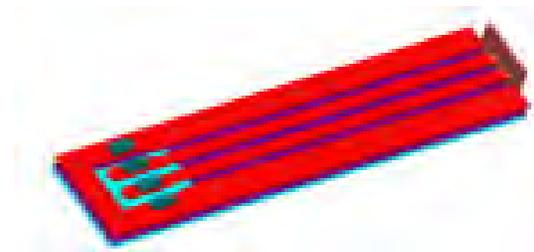
3. Testing stage simulation: During the prototype testing/debug phase, signal probing may present signal waveforms not anticipated during the design analysis (i.e. clock non-monotonicity). Executing a circuit simulation using device models can reveal the actual signal seen at the die as opposed to at the pin.

The project begins – architecture, and design

The provided requirements drive the architecture of the system and the board, which is your responsibility. The management team has demanded that your schedule is to be reduced, affording you little time to get your design and documents completed prior to a preliminary design review, and even less time to perform preliminary simulations on critical interfaces. Examples of simulation that could be performed at this point in the design process would be as follows:

Specialty circuits - Verify complex analog control functions.

•Power control circuits - i.e. buck regulators, constant current drivers.
•Critical interface transmission lines – i.e. high speed serial interfaces, multi-load, special termination situations.

Figure 1 | FEA Consulting

Throughout this first phase, your team is gathered to participate in various preliminary and critical design reviews. The Stakeholders participating in these design reviews are FPGA designers, SMEs, software engineers, EMI/EMC compliance engineers, manufacturing engineers and component engineers.

At the conclusion of the design reviews, your complicated board design starts a lengthy printed circuit board (PCB) layout period, during which you also must prepare a test plan and other required documentation. In our next installment of this story I plan to address competing factors in complex board development and how simulation can reduce design risk.

Rescale and ARGO GRAPHICS announce partnership to provide new cloud HPC service, ARGO sFlexNavi powered by Rescale

Under a new partnership, ARGO GRAPHICS's proprietary software and supporting services will be delivered on Rescale's cloud HPC platform and infrastructure starting in October 2016.

ARGO GRAPHICS Inc. of Tokyo and Rescale, Inc. of San Francisco, California have formed a partnership to jointly offer a cloud-based CAE/HPC service starting in October 2016. Under the agreement, ARGO GRAPHICS's proprietary software and supporting services will be delivered on Rescale's cloud HPC platform and infrastructure. The partnership capitalizes on the growing trend towards computer simulation in the manufacturing industry and the growth of cloud computing in recent years.

ARGO GRAPHICS provides system development, customization, and operational support for on-premise environments with high-performance computing (HPC) needs. By extending its simulation environment onto the Rescale cloud, ARGO GRAPHICS will achieve a new level of flexibility and convenience for its customers. For a wide variety of CAE applications, the availability of scalable HPC resources on the cloud dramatically reduces simulation runtime and design cycles and improves design quality.

Likewise, its affordability permits low-cost prototyping and compelling improvements to return on investment for customers. Working together with Rescale to deliver a hybrid computing environment, ARGO GRAPHICS will apply its expertise in on-premise HPC delivery to help achieve the optimal distribution of analysis workloads on a combined cloud and on-premise infrastructure environment.

Commenting on the partnership, ARGO GRAPHICS CEO Yoshimaro Fujisawa said, "ARGO GRAPHICS believes our mission is to deliver products and services that drive greater sophistication and speed for our customers' CAE analyses. This partnership will help us deliver the convenience our customers demand." Joris Poort, CEO of Rescale, echoed Fujisawa's enthusiasm for the partnership, saying, "We are very excited to be partnering with ARGO GRAPHICS, a true leader and innovator serving the Japan simulation market with a variety of products and services

Our partnership and joint solution will bring a broad set of new cloud-based capabilities to ARGO GRAPHICS customers, enhancing existing simulation products and creating a new platform for innovation."

ARGO sFlexNavi, powered by Rescale, will provide more than 180 natively-integrated commercial and open-source software packages on its cloud platform, including multiple versions of each application. In addition, the platform is built on a global, multi-cloud network of HPC hardware. A GPU-enabled virtualized desktop environment allows users to post-process their results on the cloud, thereby minimizing the need for the transfer of large-scale results files to the workstation. In order to reduce operational work and streamline analysis work, the Rescale platform also supports native cloud-based SaaS functionality to execute simulations such as design of experiments (DOE) embedding and performance optimization, as well as enterprise-grade IT administration and management capabilities. The platform is fully compliant with SOC 2, ITAR, CSA, and ISO27001 data security standards and employs best-in-class security features.

About ARGO GRAPHICS Inc.: As Japan's leading solution provider in product lifecycle management (PLM) and HPC since 1985, ARGO GRAPHICS provides the computer systems to design and test parts and products for the Japanese manufacturing industry, as well as technical support services for customers. In addition to the PLM business, ARGO GRAPHICS also provides HPC solutions for various kinds of scientific computing in government and academia and maintenance services for computing infrastructure and networks.

About Rescale, Inc.: Rescale is the world's leading cloud platform provider of simulation software and high performance computing (HPC) solutions. Rescale's platform solutions are deployed securely and seamlessly to enterprises via a web-based application environment powered by preeminent simulation software providers and backed by the largest commercially-available HPC infrastructure. Headquartered in San Francisco, California, Rescale's customers include global Fortune 500 companies in the aerospace, automotive, life sciences, marine, consumer products, and energy sectors. For more information on Rescale products and services, visit www.rescale.com .

For Full Information Visit www.mfac.com

Metal Forming Analysis Corporation
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Phone: 613-547-5395   E-mail: galb@mfac.com

MFAC was founded in 1995 by Dr. Chris Galbraith. We provide engineering software, technical support, and consulting services for mechanical engineering industries.

MFAC is the Canadian distributor for LS-DYNA, a general purpose finite element code. We also sell DYNAFORM, which is a bundled software package incorporating LS-DYNA for conducting sheet forming simulations.

Chris Galbraith worked at Alcan International Ltd. prior to starting up the Metal Forming Analysis Corporation. He has pioneered a number of enhancements for modeling sheet forming which have been included in LS-DYNA. He has presented and lectured extensively on sheet metal forming simulations using LS-DYNA. His work with Alcan on automotive sheet metal stamping simulations garnered two COMPUTERWORLD-SMITHSONIAN AWARD Nominations in the manufacturing category and was selected as one of five finalists in this category in 1995 and 1996.

Dr. Chris Galbraith is a graduate of Mechanical Engineering from Queen's University at Kingston who is licensed to provide consulting services in Mechanical Engineering.

With 25+ years of experience in mechanical engineering, Dr. Galbraith has provided numerous companies with technical expertise

aimed at quickly debugging sheet forming operations.

Software Services - http://mfac.com/products-services/

Training: We offer many different training options for our LS-DYNA and DYNAFORM users. There is an extensive list of classes that can be found on the MFAC website.

A very popular training option is to schedule on-site training at your location, which combines consulting and training. In this way, our experts work with you to solve one of your engineering problems while you are simultaneously being trained in the use of our software.

Consulting Engineering Services: MFAC is a full-service supplier to the mechanical engineering industry, with a specialization in sheet forming and vehicle crash analysis. In addition, MFAC is a general mechanical engineering consulting company with expertise in Crash Analysis, Stress Analysis, and Manufacturing Simulations.

Support: At MFAC, we pride ourselves on providing top-notch support for all products that we sell. We not only sell these superior software packages, we use them daily in our consulting activities.

Safran Nacelles uses Virtual Reality Solution ESI IC.IDO to Validate Nacelles Manufacturing Tooling

Interactive collaboration in IC.IDO prevents ergonomic and assembly issues right from the design stage

Safran Nacelles engineers conduct an immersive and interactive process design review using ESI IC.IDO.

Paris, France – October 21, 2016 – ESI Group, leading innovator in Virtual Prototyping software and services for manufacturing industries, announces their collaboration with global aerospace manufacturer Safran Nacelles. The aerospace company has recently deployed an R&D project to demonstrate how they can use ESI's Virtual Reality solution IC.IDO to conduct process design reviews and validation, to set-up new manufacturing and assembly processes, and to deliver interactive maintenance training. The project has already delivered successful results for Safran Nacelles, who intend to roll out Virtual Reality within the entire company. ESI IC.IDO has proven its ability to deliver Safran Nacelles greater agility in their design and development process, while promoting collaborative and interactive work.

In early 2015, Safran Nacelles launched an R&D program to evaluate the potential of Virtual Reality to improve their new product and process design. In order to incorporate innovative concepts and new materials, Safran Nacelles engineers needed a tool that could enable them to visualize and validate new manufacturing and assembly line set-ups, to conduct ergonomic studies, and to train their operators efficiently.

Safran Nacelle's site at Gonfreville l'Orcher in Normandy, France, hosts a design office, a materials laboratory, a Center for Excellence in composite materials applied to engine nozzles, customer support, and service departments. After a test phase and a 6-month benchmark during which the Safran Nacelle project team exchanged experiences with ESI IC.IDO customers at Boeing, Airbus and Renault, Safran Nacelles chose to adopt IC.IDO, running on Immersion's Virtual Reality hardware.

The first entity in the Safran Group to deploy Virtual Reality technologies on site, Safran Nacelles purchased a 2 sided "cave" and placed it at the heart of its design facilities. The system projects an image measuring 4 meters wide by 2.5 meters high. Since deploying the system on site in March 2016, Safran Nacelles engineers developed over 60 use cases. Their Virtual Reality (VR) room has become a true hub for local and remote users, and is used daily for collaborative design reviews. Engineers can easily discuss current design projects and swiftly detect errors early in the design process, thus avoiding bad surprises in later product development stages.

The IC.IDO implementation of Virtual Reality enables users to see the 3D image of any given CAD part "real-size" and to interact with it in real-time. Engineers can test the reachability of parts, evaluate early feasibility for even the most complex maintenance operations, validate tool design, assess the ergonomics of a workstation, and simulate realistic operating conditions.

IC.IDO is profoundly changing the way Safran Nacelles engineers work: Virtual Reality reduces the need for physical prototypes and costly retooling, while promoting live team discussion to deploy optimum designs much faster than when working in silos says Philippe JAMES, Vice President Continuous Improvement and Risks at SAFRAN Nacelles.

Today, Virtual Reality is a trusted process validation tool and is truly integrated in Safran Nacelles' design and development processes, at an industrial scale. Thanks to this collaborative tool, engineering teams save time and get their parts right the first time. Ten champion users from different teams at Safran Nacelles have been thoroughly trained to ensure the fast integration of Virtual Reality at Safran Nacelles and to assure best practices for several use cases. As an added benefit, Safran Nacelles can now schedule remote and on-site collaborative process design reviews with their customers who use the same technology.

For more information about ESI IC.IDO, please visit www.esi-group.com/icido

Join ESI's customer portal myESI to get continuously updated product information, tips & tricks, view the online training schedule and access selected software downloads: myesi.esi-group.com.

For more ESI news, visit:
www.esi-group.com/press

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Marsha Victory,   /Yanhua Zhao   /Grace Su

AUTOMOTIVE NEWS & EVENTS

Dilip Bhalsod

The purpose of this section is to provide a place, for our automotive readers, to share news and events relative to their company and/or products.

The criteria for submitting information is as follows:

- · It has to be public information
- · Published on the Internet
- · Be automotive informational, or human interest.
- · We do not accept financial quarterly information

We would welcome the opportunity to share information about your company with our readership.

You may send Title to your information and the accompanying URL to agiac99@aol.com - Subject Line please

use " Automotive News"

Submissions should be received by the 15th of each month, of the month you want your article placed

Submission publications is at the sole discretion of FEA Information Inc.

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ALL-NEW 2017 FORD F-SERIES SUPER DUTY EARNS 13TH 'TRUCK OF TEXAS' AWARD AT ANNUAL TAWA TEXAS TRUCK RODEO
2017 Ford F-Series Super Duty – the toughest, smartest, most capable Super Duty ever – is named "Truck of Texas," the most prestigious award presented by the Texas Auto Writers Association (TAWA) at its annual Texas Truck Rodeo

All-new 2017 Ford Super Duty also named segment winner, "Heavy Duty Pickup Truck"
"Best Powertrain" award given to the 2017 Ford F-150 with all-new 3.5-liter EcoBoost V-6 engine paired exclusively with the first volume-production 10-speed automatic transmission

More than 70 member journalist named Ford Motor Company as "Truck Line of Texas"
AUSTIN, Oct. 11, 2016 – Ford trucks earned top honors at the Texas Auto Writers Association's 2016 Texas Truck Rodeo, with the all-new 2017 Ford F-Series Super Duty – the toughest, smartest, most capable Super Duty ever – being named "Truck of Texas," the most prestigious award given at the 23rd annual competition.

"We are honored to win the 'Truck of Texas' award as it underscores how the all-new 2017 Ford Super Duty lineup are the toughest, smartest and most capable trucks we've ever built," said Doug Scott, Ford Truck Group Marketing Manager. "This prestigious award from the Texas Auto Writer's Association

further solidifies Ford's truck leadership in Texas, where F-series continues to be the best-selling truck and builds on our momentum as the top-selling truck in the United States for 39 consecutive years."

The 2016 Texas Truck Rodeo marks the 13th time the most prestigious award has been won by Ford F-series pickup trucks (1993, 1997, 1999, 2003-2008, 2009, 2011, 2014 and 2016).

"Ford's all-new 2017 Super Duty and its innovative use of advance materials, as well as improvements in powertrain and features, thoroughly impressed our journalists," TAWA President Nic Phillips said. "This year's Texas Truck Rodeo was by far the most competitive in the most categories. More than 70 member journalists put in more than the equivalent of 15 days of driving time in the competing vehicles. After careful evaluation, I believe the results of the competition show just how competitive the truck and utility vehicles are today."

Using advanced materials to reduce weight, 2017 F-Series Super Duty pickup trucks feature all-new segment-exclusive smart technology features to help increase customer productivity, comfort and convenience.

The backbone of the truck is an all-new fully boxed frame comprising more than 95 percent high-strength steel that's up to 24 times stiffer than the previous frame – enabling best-in-class towing and hauling capability. Super Duty also features heavier-duty four-wheel-drive components, driveline, axles and towing hardware.

For the first time, the Super Duty body uses high-strength, military-grade, aluminum alloy, which is more dent- and ding-resistant than the outgoing steel body and not subject to red rust corrosion. Together, high-strength steel and high-strength aluminum alloy help reduce weight by up to 350 pounds. Ford engineers reinvested that weight savings everywhere it counts, to give customers more towing and hauling capability than ever before.

With towing central to the Super Duty mission, an all-new advanced coaching and camera technology makes conventional as well as gooseneck and fifth-wheel towing easier and more efficient than ever.

From LED lighting to adaptive cruise control, the all-new truck boasts 17 segment-first features that assist Super Duty customers – making driving and work situations easier and more comfortable. As many as seven cameras help drivers see angles and monitor conditions surrounding the truck, providing better trailering than ever before.

A center high-mounted stop lamp camera provides visibility into the cargo box, especially useful for hooking up gooseneck and fifth-wheel trailers. A 360-degree camera system uses four high-definition digital cameras to give the driver a bird's-eye view surrounding Super Duty. Trailer Reverse Guidance provides visual cues and tips to help ease backing up a trailer. The first factory-available trailer camera can be attached to a trailer to improve visibility backing up.

Super Duty is part of the Ford F-Series lineup. Now in its 68th year, F-Series has been the best-selling truck in America for 39 consecutive years and the best-selling vehicle in America for 34 consecutive years.

Here is the complete list of Ford vehicles and features winning top honors at the 2016 TAWA Truck Rodeo:

Truck of Texas: 2017 Ford F-Series Super Duty
Heavy Duty Pickup Truck: 2017 Ford Super Duty
Best Powertrain: 2017 Ford F-150 with 3.5-liter EcoBoost V-6 engine
Truck Line of Texas: Ford Motor Company

AEROSPACE NEWS & EVENTS

Marnie Azadian

The purpose of this section is to provide a place, for our automotive readers, to share news and events relative to their company and/or products.

The criteria for submitting information is as follows:

- It has to be public information
- An internet URL
- Be technical, informational, or human interest.
- We do not accept financial quarterly information

We would welcome the opportunity to share information about your company with our readership.

You may send Title to your information and the accompanying URL to Marnie Azadian at agiac99@aol.com - Subject Line please use "Aerospace News"

Submissions should be received by the 15th of each month, of the month you want your article placed. For example: We would need the title of the news or event by December 15th, 2015 to be featured in the December 2015 FEA newsletter.

Submission publications is at the sole discretion of FEA Information Inc.

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NASA to Test In-Flight Folding Spanwise Adaptive Wing to Enhance Aircraft Efficiency

NASA is developing and validating a system that will allow part of an aircraft's wing to fold in flight to increase efficiency through wing adaptation.

Engineers at NASA's Armstrong Flight Research Center in California, Langley Research Center in Virginia, and Glenn Research Center in Ohio, are working on the Spanwise Adaptive Wing concept, or SAW. The concept would permit the outboard portions of the wings to move to the optimal position during operation. This could increase efficiency by reducing drag and increasing lift and performance.

Through advanced actuation, SAW aims to use control surfaces to allow the outboard portions of wings to adapt as much as 75 degrees, to optimally meet the demands of the various conditions throughout a flight. A mechanical joint, acting as a hinge line for rotation, makes the freedom of movement possible.

"Ideally, we would be able to take that portion of the wing, and articulate it up or down to the optimal flight condition that you're in," NASA Armstrong principal investigator for SAW Matt Moholt said. "So let's say you're a condition

that requires a climb-out. The optimal position might be up 15 degrees or down 15 degrees, and you would be able to get that."

The ability to achieve an optimal wing position for different aspects of flight may also produce enough yaw control to allow for rudder reduction on subsonic and supersonic aircraft, which may provide additional benefits to aircraft efficiency, such as reduced drag and weight.

Folding-wing capabilities have been around for decades. However, wing-folding articulation, or shaping, has generally been used as a method for the conservation of deck space on aircraft carriers and aircraft storage areas. NASA is looking at ways to apply these methods to aircraft in flight, for the advancement of aviation. While the XB-70 Valkyrie examined wing articulation 50 years ago, modern actuator technology makes it possible to explore deeper into its potential benefits, says Moholt.

"We are revisiting folding-wing aircraft because new technologies that did not exist in the 1960s allow actuation to be put in tighter wings, in smaller volumes," said Moholt. "Now you can articulate a very small, thin air foil, whereas before the actuator technology didn't exist."

The objectives of testing on PTERA include the development of tools and vetting of system integration, evaluation of vehicle control law, and analysis of SAW airworthiness to examine benefits to in-flight efficiency. Credits: NASA

The increase in the size of aircraft, including the integration of higher aspect ratio wings, has made wing articulation more practical in areas of heavy aircraft ground operation. Moholt says NASA seeks to unlock further benefits from the technology, by applying it to flight. This is made possible, he says, through the use of advanced actuators.

"Some wings are so long that to clear infrastructure it has to fold on the ground. If we're going to be articulating wings, let's use an advanced actuator that would enable it to articulate in flight as well, then you can really put the wing in an ideal setting," said Moholt. "Why just take the ground benefit of it? Let's take the flight benefit of it as well."

The development of advanced actuation makes possible a design that is both compact and lightweight, minimizing stress on the wing and allowing for more compact packaging. Conventional systems have proven to be heavy, bulky systems, too large for practical use on an aircraft. These have included gear boxes and hydraulic, pneumatic, or magnetic motors. NASA engineers believe actuator technology has advanced and may be dramatically reduced in size and weight.

Additionally, these solid-state actuators can be driven by an all-electric mechanism, contributing to NASA's goal of exploring the benefits of low-carbon propulsion under the agency's Aeronautics Research Mission Directorate.

Additionally, these solid-state actuators can be driven by an all-electric mechanism, contributing to NASA's goal of exploring the benefits of low-carbon propulsion under the agency's Aeronautics Research Mission Directorate.

The Spanwise Adaptive Wing concept seeks to enhance aircraft performance through allowing the outboard portions of wings to adapt, or fold, according to different flight condition demands. NASA engineers believe this could create lateral-directional stability and reduce drag. Credits: NASA

Moholt says that the benefits of wing articulation spans across several regimes, from taxiing on the ground, to takeoff, to cruise and even to supersonic flight.

"In supersonic flight, yaw stability becomes a big issue," said Moholt. "If you're flying supersonically, you have tons of lift. Let's say you need more yaw control. Well, if I fold the wing portion all the way down, I can trade lift in favor of more yaw control where I need it and less lift where I don't need it."

The concept may be flight tested on the subscale Prototype-Technology Evaluation and Research Aircraft, or PTERA, as early as Spring 2017. Concept research will be augmented by ground tests of much larger actuators, capable of relevant scale wing actuation. The objectives of testing would include the validation of tools and vetting of the system's integration, vehicle control law evaluation, and analysis of SAW's airworthiness and potential benefits to inflight efficiency.

PTERA, developed by Area-I out of Kennesaw, GA, is an ideal test platform because it is outfitted with full research instrumentation. The research vehicle gives the team a chance to apply real air loads in a real air environment to vet the control system.

SAW is a collaboration between NASA, The Boeing Company and Area-I, and is funded through NASA's Convergent Aeronautics Solutions, which is a project under the agency's Transformative Aeronautics Concepts Program.
Matt Kamlet
NASA Armstrong Flight Research Center

Conference – Events – Users Meetings

Keep up to date on upcoming

Conferences

Meetings

Events

We will be adding to this section monthly – if you have a new event to be listed please send to agiac99@aol.com

http://ls-dyna.jsol.co.jp/en/event/uf

Organizer: JSOL Corporation   -   Dates: Tuesday 8 November to Wednesday 9 November 2016.
Venue: NAGOYA TOKYU HOTEL (Aichi, Japan)
URL: http://ls-dyna.jsol.co.jp/en/event/uf/

Welcome to the LS-DYNA & JSTAMP Forum 2016

JSOL Corporation holds an annual LS-DYNA & JSTAMP Forum to provide our users a wide range of information including the latest simulation technologies and case studies and also to offer the opportunity for information exchange among our users.

This year the venue of the LS-DYNA & JSTAMP Forum 2016 moves from Tokyo to Nagoya. It will be held at NAGOYA TOKYU HOTEL, from Tuesday 8 November to Wednesday 9 November 2016. Our engineers will showcase the latest simulation technologies and poster sessions will be held. We welcome any inquiry, consultation and discussion about your day-to-day work.

We encourage our users to take advantage of this once a year opportunity. We look forward to your attendance in the event.

JSOL Corporation
 Engineering Technology Division

Among The Keynote – Special and Sessions speakers:

Tuesday, 8 November, 2016
  Prof. Frederic Barlat
   The Graduate Institute of Ferrous Technology, Pohang University of Science and Technology
   Advanced constitutive modeling and application to sheet forming process simulations

Tuesday, 8 November, 2016
  Mr. Toshihiko Kuwabara
   Professor, Division of Advanced Mechanical Systems Engineering, Institute of Engineering, Tokyo University of Agriculture and Technology
   Advanced Material Testing Methods for enhancing high-precision metal forming simulations
.
Wednesday, 9 November, 2016
  Dr. Yuichi Kitagawa
   General Manager, Advanced CAE Div. Safety CAE Technology Development Dept., Toyota Motor Corporation
   Development of THUMS Version 4 Child Models

Wednesday, 9 November, 2016
  Dr. David J. Benson
   Livermore Software Technology Corporation
   Recent Development in LS-DYNA

Kaizenat Technologies Pvt. Ltd. participated in the NAFEMS India Conference 2016 as an Exhibitor with a booth to present the latest capabilities of LSTC's suite of products.

NAFEMS India successfully concluded the NAFEMS India Conference 2016 conducted at Bangalore and attracted more than 500 engineers all over India.

Kaizenat was invited, attended and contributed "Industry Interaction programs."
We attended both programs of FEM & CFD discussing various issues faced in the industry & their possible solutions.

We had the opportunity to meet leading visionaries, developers, and practitioners of CAE-related technologies in the NAFEMS Conference open forum, as well as share experiences, discuss trends and future issues with our customers and other attendees.

Among the discussions at the conference that were of interest and we will pursue in future discussions are:
• The future for engineering analysis and simulation - where it will lead.
• Best practices how designers and engineers can realize full potential.
• The past and current successful developments bringing them to new levels.

We found it to be a forum that we look forward to future participation in and its future successes.

BETA CAE Open Meeting Japan
November 8, 2016, Nagoya, Japan
hosted by TOP CAE Corp.

BETA CAE Open Meeting Beijing China
November 22, 2016
Beijing, China - hosted by Beijing E&G Software

BETA CAE Open Meeting Shanghai China
November 25, 2016
Shanghai, China
hosted by Shanghai Turing Info. Tech.

7th BETA CAE International Conference
30 May - 1 June, 2017
Thessaloniki, Greece

SPONSORED EVENTS: BETA CAE Systems participation

SIMULIA RUM Benelux
    November 9-10, Antwerp, Belgium

SIMULIA RUM Germany
    November 10-11, Darmstadt, Germany

NAFEMS A Guide to High-Fidelity CFD for Industry
    November 16, Stratfort-upon-Avon, UK

 SIMVEC - Simulation und Erprobung in der Fahrzeugentwicklung
    Nov. 22-23, Baden Baden, Germany

Training and Social Media Section
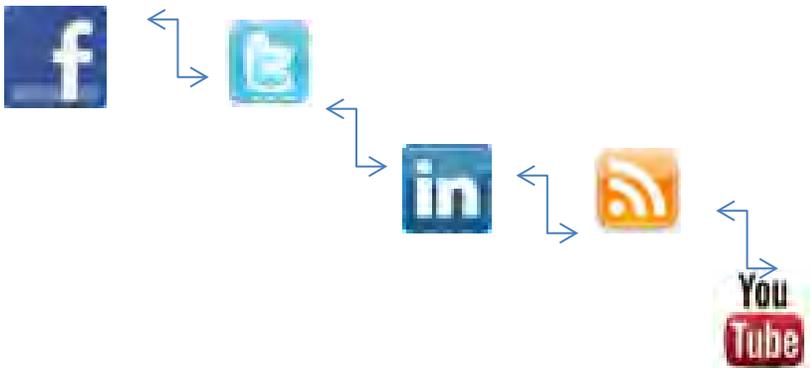
Aleta Hays

Training

Classes

Webinars

On Site – On Line

We will be adding to this section monthly – if you have a new event to be listed please send to Aleta ayh225@aol.com and cc Anthony agiac99@aol.com

Participant's Training Classes

Webinars

Info Days

Class Directory

Participant Class Directory

Arup (corporate)	www.oasys-software.com/dyna/en/training
BETA CAE Systems S.A. (corporate)	www.beta-cae.com/training.htm
DYNAmore (corporate)	www.dynamore.de/en/training/seminars
ESI-Group (corporate)	https://myesi.esi-group.com/trainings/schedules
ETA (corporate)	www.eta.com/support2/training-calendar
LSTC (corporate)	www.lstc.com/training
LS-DYNA OnLine (Al Tabiei)	www.LSDYNA-ONLINE.COM

ARUP   Visit the website for complete listings/changes/locations

www.oasys-software.com/dyna/en/training

To enrol on any of these courses please email Dyna Support at dyna.support@arup.com.

Date	Training Class
Scheduled on request	Oasys PRIMER - An Introduction
Scheduled on request	Oasys PRIMER - Automatic Assembly of Multiple Crash Cases
Scheduled on request	Oasys PRIMER - Spotwelds and Connections
Scheduled on request	Oasys PRIMER - Seat and Dummy Positioning
Scheduled on request	Oasys PRIMER & D3PLOT - An Introduction to JavaScripting

BETA CAE   Visit the website for complete listings/changes/locations

www.beta-cae.com/training.htm

Basic and advanced training courses can be scheduled upon request. A variety of standard or tailored training schedules, per product or per discipline, are being offered to meet customers needs.

A number of recommended training courses offered are described below. The list is not exhaustive and more courses can be designed according to your needs.
Please, contact ansa@beta-cae.gr   for further details.

Recommended Training Courses (Complete information on website)
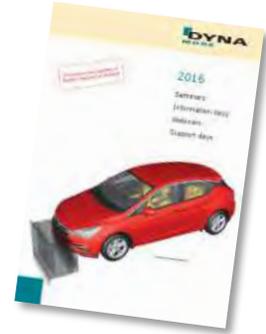
- SPDRM
- ANSA / µETA Basics
- ANSA / µETA for CFD
- ANSA / µETA for Crash & Safety simulation
- ANSA / µETA for Durability simulation

- ANSA / µETA for NVH analyses
- Multi-Body Dynamics
- Laminated Composites
- Morphing and Optimization
- Automation
- Additional special sessions

Author: Nils Karajan nik@dynamore.de

DYNAmore   Visit the website for complete listings / changes / locations
www.dynamore.de/seminars

Selection of trainings as well as free-of-charge information & support days in September – November 2016

Download full seminar brochure (pdf): www.dynamore.de/seminars-2016

Trainings

Applied Forming Simulation with eta/DYNAFORM	7-8 Nov.
Metal Forming Simulation with LS-DYNA	9-11 Nov.
Modelling Metallic Materials	14-15 Nov.
Introduction to Welding Simulation	18 Nov.

Support days (free of charge)

LS-DYNA	18 Nov.

If not otherwise stated, the event location is Stuttgart, Germany. Other event locations are:
  G = Göteborg, Sweden;   V = Versailles, France;   A = Aachen, Germany;
  L = Linköping, Sweden;   T = Turin, Italy,

If the offered seminars do not fully suit your needs, we are pleased to meet your individual requirements by arranging tailored on-site training courses on your company premises.

We hope that our offer will meet your needs and are looking forward to welcoming you at one of the events.

https://myesi.esi-group.com/trainings/schedules

Please visit the website for complete information on all the classes and locations

VA One for aerospace industry (FE/BEM topics)
        3 Nov 2016 to 4 Nov 2016
        Munich - Aschheim, Germany

SEA for marine industry
        7 Nov 2016 to 8 Nov 2016
        Munich - Aschheim, Germany

PAM-DIEMAKER for CATIA V5
        8 Nov 2016 to 10 Nov 2016
        Munich - Aschheim, Germany

Underwater radiation simulation methods
9 Nov 2016 to 10 Nov 2016
Munich - Aschheim, Germany

Introduction to ProCAST
        29 Nov 2016 to 2 Dec 2016
        Munich - Aschheim, Germany

Tabiei	Intro to LS-DYNA	CA	Nov 1-4
Y Huang	NVH and Frequency Domain Analysis with LS-DYNA	CA	Nov 7-8
Tabiei	Adv Impact	MI	Dec 8-9
Yan / Ho	Intro to LS-PrePost	MI	Dec 12
Tabiei	Intro to LS-DYNA	MI	Dec 13-16

LS-DYNA   Visit the website for complete listings/changes/locations

On Line   www.LSDYNA-ONLINE.COM

For Information contact: courses@lsdyna-online.com or 513-3319139

Composite Materials In LS-DYNA

This course will allow first time LS-DYNA users to use composite materials. The most important elements to start using all the composite material models in LS-DYNA will be presented in the 8 hours.

Foam & Viscoelastic Materials in LS-DYNA

Objective of the course: Learn about several foam material models in LS-DYNA to solve engineering problems. Detailed descriptions are given of the data required to use such material in analysis. Examples are used to illustrate the points made in the lectures

Plasticity, Plastics, and Viscoplastics Materials in LS-DYNA

Objective of the course: Learn about several plasticity based material models in LS-DYNA to solve engineering problems. Detailed descriptions are given of the data required to use such material in analysis. Examples are used to illustrate the points made in the lectures.

Rubber Materials in LS-DYNA

Objective of the course: Learn about several rubber material models in LS-DYNA to solve engineering problems. Detailed descriptions are given of the data required to use such material in analysis. Examples are used to illustrate the points made in the lectures.

FACEBOOK

| BETA CAE SYSTEMS SA | CADFEM | Cray Inc. |

ESI Group   Lenovo

TWITTER

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ETA   CADFEM   Lenovo

LINKEDIN

| BETA CAE SYSTEMS SA | CADFEM | Cray Inc. |

DYNAmore Nordic   ETA   Oasys

ESI Group

NEWS FEEDS   ETA:

YOUTUBE

YOUTUBE Channel	WebSite URL
BETA CAE SYSTEMS SA	www.beta-cae.gr
CADFEM	www.cadfem.de
Cray Inc.	www.cray.com
ESI Group	www.esi-group.com
ETA	www.eta.com
Lancemore	www.lancemore.jp/index_en.html
Lenovo	

LS-DYNA Resource Links

LS-DYNA   Multiphysics   YouTube   Facundo Del Pin
https://www.youtube.com/user/980LsDyna

FAQ   LSTC   Jim Day
ftp.lstc.com/outgoing/support/FAQ

LS-DYNA Support Site
www.dynasupport.com

LS-OPT   &   LS-TaSC
www.lsoptsupport.com

LS-DYNA   EXAMPLES
www.dynaexamples.com

LS-DYNA   CONFERENCE   PUBLICATIONS
www.dynalook.com

ATD –DUMMY   MODELS
www.dummymodels.com

LSTC   ATD   MODELS
www.lstc.com/models   www.lstc.com/products/models/mailinglist

AEROSPACE   WORKING   GROUP
http://awg.lstc.com/tiki/tiki-index.php

BETA CAE Systems S.A.

BETA CAE Systems S.A.– ANSA

BETA CAE Systems S.A.– μETA

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

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

Solutions for:

Process Automation - Data Management – Meshing – Durability - Crash & Safety NVH   - CFD - Thermal analysis - Optimization - Powertrain   Products made of composite materials   - Analysis Tools -

Maritime and Offshore Design - Aerospace engineering - Biomechanics

CRAY　　　　　　　　　　　　　　　　　　　　　　　　**www.cray.com**

THE CRAY® XC™ SERIES: ADAPTIVE SUPERCOMPUTING ARCHITECTURE

The Cray® XC™ series delivers on Cray's commitment to an adaptive supercomputing architecture that provides both extreme scalability and sustained performance. The flexibility of the Cray XC platform ensures that users can precisely configure the machines that will meet their specific requirements today, and remain confident they can upgrade and enhance their systems to address the demands of the future.

Cray® XC40™ and XC40-AC™ supercomputers are enabled by a robust Intel® Xeon® processor road map, Aries high performance interconnect and flexible Dragonfly network topology, providing low latency and scalable global bandwidth to satisfy the most challenging multi-petaflops applications.

While the extreme-scaling Cray XC40 supercomputer is a transverse air-flow liquid-cooled architecture, the Cray XC40-AC air-cooled model provides slightly smaller and less dense supercomputing cabinets with no requirement for liquid coolants or extra blower cabinets. A reduced network topology lowers costs, and the system is compatible with the compute technology, OS, ISV and software stack support of high-end XC40 systems.

MAXIMIZE PRODUCTIVITY WITH CRAY CS SERIES SUPERCOMPUTERS

Understanding the need for nimble, reliable and cost-effective high performance computing (HPC), we developed the Cray® CS™ cluster supercomputer series. These systems are industry-standards-based, highly customizable, and expressly designed to handle the broadest range of medium- to large-scale simulation and data analytics workloads.

All CS components have been carefully selected, optimized and integrated to create a powerful HPC environment. Flexible node configurations featuring the latest processor and interconnect technologies mean you can tailor a system to your specific need — from an all-purpose cluster to one suited for shared memory, large memory or accelerator-based tasks.

Innovations in packaging, power, cooling and density translate to superior energy efficiency and compelling price/performance. Expertly engineered system management software instantly boosts your productivity by simplifying system administration and maintenance.

Maximize your productivity with flexible, high-performing Cray CS series cluster supercomputers.

CRAY® SONEXION® SCALE-OUT LUSTRE®STORAGE SYSTEM

Brought to you by Cray, the world's leading experts in parallel storage solutions for HPC and technical enterprise, the Cray® Sonexion® 2000 system provides a Lustre®-ready solution for popular x86 Linux® clusters and supercomputers through Cray Cluster Connect™. As a leader in open systems and parallel file systems, Cray builds on open source Lustre to unlock any industry-standard x86 Linux compute cluster using InfiniBand™ or 10/40 GbE utilizing proven Cray storage architectures.

The Cray Sonexion 2000 system provides 50 percent more performance and capacity than the Sonexion 1600 system in the same footprint.

Simplify

· Through its fully-integrated and pre-configured design, Cray Sonexion storage gets customers deployed faster and reduces the total number of components to manage.

· The Sonexion system's compact design reduces the total hardware footprint of petascale systems by 50 percent over component-based solutions.

Scale

· Performance scales from 7.5 GB/s to 1.7 TB/s in a single file system.

· Capacity scales in modular increments; the Sonexion 2000 system stores over two usable petabytes in a single rack. Fewer drives and components reduce capital costs as capacity grows.

Protect

· New software-based GridRAID offers higher levels of data protection and up to 3.5 times faster rebuild times than traditional RAID6 and MD-RAID storage.

· Cray ensures quality, reliability and stability at scale through exhaustive thermal and real-world stress testing, system hardening and availability, and tight hardware and software integration.

OPEN ARCHIVE AND TIERED STORAGE SYSTEM FOR BIG DATA AND SUPERCOMPUTING

Cray Tiered Adaptive Storage (TAS), powered by Versity, is designed to meet the expansive data preservation and access needs driven by big data, where data needs to migrate fluidly from high performance storage to deep tape archives, while always being accessible to users.

With Cray TAS you can:

- Deploy tiered storage and archives faster
- Feel confident preserving and protecting data into the future, using Linux®
- Simplify managing data using familiar tools for years to come

CRAY® URIKA-XA™ EXTREME ANALYTICS PLATFORM

Pre-integrated, open platform for high performance analytics delivers valuable business insights now and into the future

The flexible, multi-use Cray® Urika-XA™ extreme analytics platform addresses perhaps the most critical obstacle in data analytics today — limitation. Analytics problems are getting more varied and complex but the available solution technologies have significant constraints. Traditional analytics appliances lock you into a single approach and building a custom solution in-house is so difficult and time consuming that the business value derived from analytics fails to materialize.

In contrast, the Urika-XA platform is open, high performing and cost effective, serving a wide range of analytics tools with varying computing demands in a single environment. Pre-integrated with the Apache Hadoop® and Apache Spark™ frameworks, the Urika-XA system combines the benefits of a turnkey analytics appliance with a flexible, open platform that you can modify for future analytics workloads. This single-platform consolidation of workloads reduces your analytics footprint and total cost of ownership.

Based on pioneering work combining high-performance analytics and supercomputing technologies, the Urika-XA platform features next-generation capabilities. Optimized for compute-heavy, memory-centric analytics, it incorporates innovative use of memory-storage hierarchies and fast interconnects, which translates to excellent performance at scale on current as well as emerging analytics applications.

Additionally, the enterprise-ready Urika-XA platform eases the system management burden with a single point of support, standards-based software stack and compliance with enterprise standards so you can focus on extracting valuable business insights, not on managing your environment.

THE URIKA-GD™ GRAPH DISCOVERY APPLIANCE IS A PURPOSE-BUILT SOLUTION FOR BIG DATA RELATIONSHIP ANALYTICS.

The Urika-GD™ appliance enables enterprises to:

· Discover unknown and hidden relationships and patterns in big data
· Build a relationship warehouse, supporting inferencing/deduction, pattern-based queries and intuitive visualization
· Perform real-time analytics on the largest and most complex graph problems

The Urika-GD system is a high performance graph appliance with a large shared memory and massively multithreaded custom processor designed for graph processing and scalable I/O.

With its industry-standard, open-source software stack enabling reuse of existing skill sets and no lock in, the Urika-GD appliance is easy to adopt.

The Urika-GD appliance complements an existing data warehouse or Hadoop® cluster by offloading graph workloads and interoperating within the existing enterprise analytics workflow.

Realize rapid time to powerful new insights.

DatapointLabs   **www.datapointlabs.com**

Testing over 1000 materials per year for a wide range of physical properties, DatapointLabs is a center of excellence providing global support to industries engaged in new product development and R&D.

The compary meets the material property needs of CAE/FEA analysts, with a specialized product line, TestPaks®, which allow CAE analysts to easily order material testing for the calibration of over 100 different material models.

DatapointLabs maintains a world-class testing facility with expertise in physical properties of plastics, rubber, food, ceramics, and metals.

Core competencies include mechanical, thermal and flow properties of materials with a focus on precision properties for use in product development and R&D.

Engineering Design Data including material model calibrations for CAE Research Support Services, your personal expert testing laboratory Lab Facilities gives you a glimpse of our extensive test facilities Test Catalog gets you instant quotes for over 200 physical properties.

ETA – Engineering Technology Associates
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www.eta.com

Inventium Suite™

Inventium Suite™ is an enterprise-level CAE software solution, enabling concept to product. Inventium's first set of tools will be released soon, in the form of an advanced Pre & Post processor, called PreSys.

Inventium's unified and streamlined product architecture will provide users access to all of the suite's software tools. By design, its products will offer a high performance modeling and post-processing system, while providing a robust path for the integration of new tools and third party applications.

PreSys

Inventium's core FE modeling toolset. It is the successor to ETA's VPG/PrePost and FEMB products. PreSys offers an easy to use interface, with drop-down menus and toolbars, increased graphics speed and detailed graphics capabilities. These types of capabilities are combined with powerful, robust and accurate modeling functions.

VPG

Advanced systems analysis package. VPG delivers a unique set of tools which allow engineers to create and visualize, through its modules-- structure, safety, drop test, and blast analyses.

DYNAFORM

Complete Die System Simulation Solution. The most accurate die analysis solution available today. Its formability simulation creates a "virtual tryout", predicting forming problems such as cracking, wrinkling, thinning and spring-back before any physical tooling is produced

Latest Release is ESI Visual-Environment 12.0

ESI Group   **www.esi-group.com**

Visual-Environment is an integrative simulation platform for simulation tools operating either concurrently or standalone for various solver. Comprehensive and integrated solutions for meshing, pre/post processing, process automation and simulation data management are available within same environment enabling seamless execution and automation of tedious workflows. This very open and versatile environment simplifies the work of CAE engineers across the enterprise by facilitating collaboration and data sharing leading to increase of productivity.

Visual-Crash DYNA provides advanced preprocessing functionality for LS-DYNA users, e.g. fast iteration and rapid model revision processes, from data input to visualization for crashworthiness simulation and design. It ensures quick model browsing, advanced mesh editing capabilities and rapid graphical assembly of system models. Visual-Crash DYNA allows graphical creation, modification and deletion of LS-DYNA entities. It comprises tools for checking model quality and simulation parameters prior to launching calculations with the solver. These

tools help in correcting errors and fine-tuning the model and simulation before submitting it to the solver, thus saving time and resources.

Several high productivity tools such as advanced dummy positioning, seat morphing, belt fitting and airbag folder are provided in **Visual-Safe,** a dedicated application to safety utilities.

Visual-Mesh is a complete meshing tool supporting CAD import, 1D/2D/3D meshing and editing for linear and quadratic meshes. It supports all meshing capabilities, like shell and solid automesh, batch meshing, topo mesh, layer mesh, etc. A convenient Meshing Process guides you to mesh the given CAD component or full vehicle automatically.

Visual-Viewer built on a multi-page/multi-plot environment, enables data grouping into pages and plots. The application allows creation of any number of pages with up to 16 windows on a single page. These windows can be plot, animation, video, model or drawing block windows. Visual-Viewer performs automated tasks and generates customized reports and thereby increasing engineers' productivity.

Latest Release is ESI Visual-Environment 12.0

ESI Group   **www.esi-group.com**

Visual-Process provides a whole suite of generic templates based on LS-DYNA solver (et altera). It enables seamless and interactive process automation through customizable LS-DYNA based templates for automated CAE workflows.

All generic process templates are easily accessible within the unique framework of Visual-Environment and can be customized upon request and based on customer's needs.

Visual*DSS* is a framework for Simulation Data and Process Management which connects with Visual-Environment and supports product

engineering teams, irrespective of their geographic location, to make correct and realistic decisions throughout the virtual prototyping phase. Visual*DSS* supports seamless connection with various CAD/PLM systems to extract the data required for building virtual tests as well as building and chaining several virtual tests upstream and downstream to achieve an integrated process. It enables the capture, storage and reuse of enterprise knowledge and best practices, as well as the automation of repetitive and cumbersome tasks in a virtual prototyping process, the propagation of engineering changes or design changes from one domain to another.

JSOL

JSOL Corporation   **www.jsol.co.jp/english/cae/**

HYCRASH

Easy-to-use one step solver, for Stamping-Crash Coupled Analysis. HYCRASH only requires the panels' geometry to calculate manufacturing process effect, geometry of die are not necessary. Additionally, as this is target to usage of crash/strength analysis, even forming analysis data is not needed. If only crash/strength analysis data exists and panel ids is defined. HYCRASH extract panels to calculate it's strain, thickness, and map them to the original data.

JSTAMP/NV

As an integrated press forming simulation system for virtual tool shop

the JSTAMP/NV meets the various industrial needs from the areas of automobile, electronics, iron and steel, etc. The JSTAMP/NV gives satisfaction to engineers, reliability to products, and robustness to tool shop via the advanced technology of the JSOL Corporation.

JMAG

JMAG uses the latest techniques to accurately model complex geometries, material properties, and thermal and structural phenomena associated with electromagnetic fields. With its excellent analysis capabilities, JMAG assists your manufacturing process

Livermore Software Technology Corp.

LS-DYNA
A general-purpose finite element program capable of simulating complex real world problems. It is used by the automobile, aerospace, construction, military, manufacturing, and bioengineering industries. LS-DYNA is optimized for shared and distributed memory Unix, Linux, and Windows based, platforms, and it is fully QA'd by LSTC. The code's origins lie in highly nonlinear, transient dynamic finite element analysis using explicit time integration.

LS-PrePost: An advanced pre and post-processor that is delivered free with LS-DYNA. The user interface is designed to be both efficient and intuitive. LS-PrePost runs on Windows, Linux, and Macs utilizing OpenGL graphics to achieve fast rendering and XY plotting.

LS-OPT: LS-OPT is a standalone Design Optimization and Probabilistic Analysis package with an interface to LS-DYNA. The graphical preprocessor LS-OPTui facilitates definition of the design input and the creation of a command file while the postprocessor provides output such as approximation accuracy, optimization convergence, tradeoff curves, anthill plots and the relative importance of design variables.

LS-TaSC: A Topology and Shape Computation tool. Developed for engineering analysts who need to optimize structures, LS-TaSC works with both the implicit and explicit solvers of LS-DYNA. LS-TaSC handles topology optimization of large non-linear problems, involving dynamic loads and contact conditions.

LSTC Dummy Models:
Anthropomorphic Test Devices (ATDs), as known as "crash test dummies", are life-size mannequins equipped with sensors that measure forces, moments, displacements, and accelerations.

LSTC Barrier Models: LSTC offers several Offset Deformable Barrier (ODB) and Movable Deformable Barrier (MDB) model.

Oasys Ltd. LS-DYNA Environment

www.oasys-software.com/dyna

The Oasys Suite of software is exclusively written for LS-DYNA® and is used worldwide by many of the largest LS-DYNA® customers. The suite comprises of:

Oasys PRIMER

Key benefits:

· Pre-Processor created specifically for LS-DYNA®

· Compatible with the latest version of LS-DYNA®

· Maintains the integrity of data

· Over 6000 checks and warnings – many auto-fixable

· Specialist tools for occupant positioning, seatbelt fitting and seat squashing (including setting up pre-simulations)

· Many features for model modification, such as part replace

· Ability to position and depenetrate impactors at multiple locations and produce many input decks

automatically (e.g. pedestrian impact, interior head impact)

· Contact penetration checking and fixing

· Connection feature for creation and management of connection entities.

· Support for Volume III keywords and large format/long labels

· Powerful scripting capabilities allowing the user to create custom features and processes

www.oasys-software.com/dyna

Oasys D3PLOT

Key benefits:

· Powerful 3D visualization post-processor created specifically for LS-DYNA®

· Fast, high quality graphics

· Easy, in-depth access to LS-DYNA® results

· Scripting capabilities allowing the user to speed up post-processing, as well as creating user defined data components

Oasys T/HIS

Key benefits:

· Graphical post-processor created specifically for LS-DYNA®

· Automatically reads all LS-DYNA® results

· Wide range of functions and injury criteria

· Easy handling of data from multiple models

· Scripting capabilities for fast post-processing

Oasys REPORTER

Key benefits:

· Automatic report generation tool created specifically for LS-DYNA®

· Automatically post-process and summarize multiple analyses

· Built-in report templates for easy automatic post-processing of many standard impact tests

Shanghai Hengstar

Center of Excellence: Hengstar Technology is the first LS-DYNA training center of excellence in China. As part of its expanding commitment to helping CAE engineers in China, Hengstar Technology will continue to organize high level training courses, seminars, workshops, forums etc., and will also continue to support CAE events such as: China CAE Annual Conference; China Conference of Automotive Safety Technology; International Forum of Automotive Traffic Safety in China; LS-DYNA China users conference etc.

On Site Training: Hengstar Technology also provides customer customized training programs on-site at the company facility. Training is tailored for customer needs using LS-DYNA such as material test and input keyword preparing; CAE process automation with customized script program; Simulation result correlation with the test result; Special topics with new LS-DYNA features etc..

www.hengstar.com

Distribution & Support: Hengstar distributes and supports LS-DYNA, LS-OPT, LS-Prepost, LS-TaSC, LSTC FEA Models; Hongsheng Lu, previously was directly employed by LSTC before opening his distributorship in China for LSTC software. Hongsheng visits LSTC often to keep update on the latest software features.

Hengstar also distributes and supports d3View; Genesis, Visual DOC, ELSDYNA; Visual-Crash Dyna, Visual-Process, Visual-Environment; EnkiBonnet; and DynaX & MadyX etc.

Consulting

As a consulting company, Hengstar focus on LS-DYNA applications such as crash and safety, durability, bird strike, stamping, forging, concrete structures, drop analysis, blast response, penetration etc with using LS-DYNA's advanced methods: FEA, ALE, SPH, EFG, DEM, ICFD, EM, CSEC..

Lenovo   www.lenovo.com

Lenovo is a USD39 billion personal and enterprise technology company, serving customers in more than 160 countries.

Dedicated to building exceptionally engineered PCs, mobile Internet devices and servers spanning entry through supercomputers, Lenovo has built its business on product innovation, a highly efficient global supply chain and strong strategic execution. The company develops, manufactures and markets reliable, high-quality, secure and easy-to-use technology products and services.

Lenovo acquired IBM's x86 server business in 2014. With this acquisition, Lenovo added award-winning System x enterprise server portfolio along with HPC and CAE expertise.

Canada   **Metal Forming Analysis Corp MFAC**   galb@mfac.com

www.mfac.com

LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
LSTC Dummy Models	LSTC Barrier Models	eta/VPG	
eta/DYNAFORM	INVENTIUM/PreSys		

Mexico   **COMPLX**
www.complx.com.mx /   Armando Toledo
armando.toledo@complx.com.mx

LS-DYNA   LS-OPT   LS-PrePost

LS-TAsc Barrier/Dummy Models

United States   **CAE Associates Inc.**   info@caeai.com
www.caeai.com

ANSYS Products   CivilFem   Consulting ANSYS

Consulting LS-DYNA

United States   **DYNAMAX**   sales@dynamax-inc.com
www.dynamax-inc.com

LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
LSTC Dummy Models		LSTC Barrier Models	

United States	**ESI Group N.A**	**info@esi-group.com**		
	www.esi-group.com			
	PAM-STAMP			
	QuikCAST	SYSWELD	PAM-COMPOSITES	CEM One
	VA One	CFD-ACE+	ProCAST	
		Weld Planner	Visual-Environment	IC.IDO

United States	**Engineering Technology Associates – ETA** www.eta.com		etainfo@eta.com	
	INVENTIUM/PreSy	NISA	VPG	LS-DYNA
	LS-OPT	DYNAform		

United States	**Livermore Software Technology Corp**		sales@lstc.com	
	LSTC www.lstc.com			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	TOYOTA THUMS	

United States	**Predictive Engineering** www.predictiveengineering.com		george.laird@predictiveengineering.com	
	FEMAP	NX Nastran	LS-DYNA	LS-OPT
	LS-PrePost	LS-TaSC	LSTC Dummy Models	
			LSTC Barrier Models	

France   **DynaS+**   v.lapoujade@dynasplus.com

www.dynasplus.com   Oasys Suite

LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
DYNAFORM	VPG	MEDINA	
LSTC Dummy Models		LSTC Barrier Models	

France   **DYNAmore France SAS**   sales@dynamore.eu

www.dynamore.eu

LS-DYNA, LS-PrePost	LS-OPT	Primer	DYNAFORM
DSDM Products		LSTC Dummy Models	FEMZIP
LSTC Barrier Models		DIGIMAT	

Germany   **CADFEM GmbH**   lsdyna@cadfem.de

www.cadfem.de

ANSYS	LS-DYNA	optiSLang
ESAComp	AnyBody	
ANSYS/LS-DYNA		

Distribution/Consulting		Europe	Distribution/Consulting

Germany **DYNAmore GmbH** uli.franz@dynamore.de

www.dynamore.de

PRIMER	LS-DYNA	FTSS	VisualDoc
LS-OPT	LS-PrePost	LS-TaSC	DYNAFORM
Primer	FEMZIP	GENESIS	Oasys Suite
TOYOTA THUMS		LSTC Dummy & Barrier Models	

The Netherlands **Infinite Simulation Systems B.V** j.mathijssen@infinite.nl

www.infinite.nl

ANSYS Products	CivilFem	CFX	Fluent
LS-DYNA	LS-PrePost	LS-OPT	LS-TaSC

Italy **EnginSoft SpA** info@enginsoft.it

www.enginsoft.it

ANSYS	MAGMA	Flowmaster	FORGE
CADfix	LS-DYNA	Dynaform	Sculptor
ESAComp	AnyBody	FTI Software	
AdvantEdge	Straus7	LMS Virtual.Lab	ModeFRONTIER

Russia **STRELA** info@dynarussia.com

LS-DYNA LS-TaSC LS-OPT LS-PrePost

LSTC Dummy Models LSTC Barrier Models

Sweden **DYNAmore Nordic** marcus.redhe@dynamore.se

www.dynamore.se Oasys Suite

ANSA µETA LS-DYNA LS-OPT

LS-PrePost LS-TaSC FastFORM DYNAform

FormingSuite LSTC Dummy Models

LSTC Barrier Models

Switzerland **DYNAmoreSwiss GmbH** info@dynamore.ch

www.dynamore.ch

LS-DYNA LS-OPT LS-PrePost

LS-TaSC LSTC Dummy Models

LSTC Barrier Models

UK **Ove Arup & Partners** dyna.sales@arup.com

www.oasys-software.com/dyna TOYOTA THUMS

LS-DYNA LS-OPT LS-PrePost

LS-TaSC PRIMER D3PLOT T/HIS

REPORTER SHELL FEMZIP HYCRASH

DIGIMAT Simpleware LSTC Dummy Models

LSTC Barrier Models

China	**ETA – China**		lma@eta.com.cn	
	www.eta.com/cn			
	Inventium	VPG	DYNAFORM	NISA
	LS-DYNA	LS-OPT	LSTC Dummy Models	LS-PrePost
			LSTC Barrier Models	LS-TaSC

China	**Oasys Ltd. China**			Stephen.zhao@arup.com	
	www.oasys-software.com/dyna				
	PRIMER	D3PLOT	HYCRASH	T/HIS REPORTER	SHELL
	LS-DYNA	LS-OPT		LSTC Dummy Models	LS-PrePost
	DIGIMAT	FEMZIP		LSTC Barrier Models	LS-TaSC

China	**Shanghai Hengstar Technology**		info@hengstar.com	
	www.hengstar.com			
	LS-DYNA	LS-TaSC	LSTC Barrier Models	D3VIEW
	LS-PrePOST	LS-OPT	LSTC Dummy Models	
	Genesis	VisualDoc		ELSDYNA
	Visual-Crahs DYNA	Visual-Proeces		DynaX & MadyX
	Enki Bonnet	Visual Environement		

India	**Oasys Ltd. India**		lavendra.singh@arup.com	
	www.oasys-software.com/dyna			
	PRIMER D3PLOT	T/HIS		
		LS-OPT	LSTC Dummy Models	LS-PrePost
		LS-DYNA	LSTC Barrier Models	LS-TaSC

India	**CADFEM Eng. Svce**		info@cadfem.in	
	www.cadfem.in			
	ANSYS	VPS	ESAComp	optiSLang
	LS-DYNA	LS-OPT	LS-PrePost	

India	**Kaizenat Technologies Pvt. Ltd**		support@kaizenat.com	
	http://kaizenat.com /			
	LS-DYNA	LS-OPT	LSTC Dummy Models	LS-PrePost
	Complete LS-DYNA suite of products		LSTC Barrier Models	LS-TaSC

Distribution/Consulting	Asia Pacific	Distribution/Consulting	

Japan **CTC** LS-dyna@ctc-g.co.jp
www.engineering-eye.com

LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
LSTC Dummy Models	LSTC Barrier Models	CmWAVE	

Japan **JSOL**
www.jsol.co.jp/english/cae

		Oasys Suite	
JSTAMP	HYCRASH	JMAG	
LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
LSTC Dummy Models	LSTC Barrier Models	TOYOTA THUMS	

Japan **FUJITSU**
http://www.fujitsu.com/jp/solutions/business-technology/tc/sol/

LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
LSTC Dummy Models	LSTC Barrier Models	CLOUD Services	

Japan **LANCEMORE** info@lancemore.jp
www.lancemore.jp/index_en.html

Consulting

LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
LSTC Dummy Models	LSTC Barrier Models		

Japan **Terrabyte** **English:**
www.terrabyte.co.jp   www.terrabyte.co.jp/english/index.htm

Consulting

LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
LSTC Dummy Models	LSTC Barrier Models	AnyBody	

Distribution/Consulting	Asia Pacific	Distribution/Consulting	

Korea **THEME** wschung7@gmail.com

www.lsdyna.co.kr

		Oasys Suite	
LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
LSTC Dummy Models	LSTC Barrier Models	eta/VPG	Planets
eta/DYNAFORM	FormingSuite	Simblow	TrueGRID
JSTAMP/NV	Scan IP	Scan FE	Scan CAD
FEMZIP			

Korea **KOSTECH** young@kostech.co.kr

www.kostech.co.kr

LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM
eta/DYNAFORM	DIGIMAT	Simuform	Simpack
AxStream	TrueGrid	FEMZIP	

Taiwan **APIC**

www.apic.com.tw

LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM

Contact: **JSOL Corporation   Engineering Technology Division cae-info@sci.jsol.co.jp**

**Cloud computing services
for
JSOL Corporation   LS-DYNA users in Japan**

**JSOL Corporation is cooperating with chosen
cloud computing services**

JSOL Corporation, a Japanese LS-DYNA distributor for Japanese LS-DYNA customers.

LS-DYNA customers in industries / academia / consultancies are facing to the increase use of LS-DYNA more and more in recent years.

In calculations of optimization, robustness, statistical analysis, larger amount of LS-DYNA license in short term are required.

JSOL Corporation is cooperating with some cloud computing services for JSOL's LS-DYNA users and willing to provide large in short term license.

This service is offered to the customers by the additional price to existence on-premises license, which is relatively inexpensive than purchasing yearly license.

**The following services are available
(only in Japanese).   HPC OnLine:**

NEC Solution Innovators, Ltd.
http://jpn.nec.com/manufacture/machinery/hpc_online/

Focus
Foundation for Computational Science
http://www.j-focus.or.jp

Platform Computation Cloud
CreDist.Inc.
http://www.credist.co.jp /

PLEXUS CAE
Information Services International-Dentsu, Ltd.
(ISID) https://portal.plexusplm.com/plexus-cae/

SCSK Corporation
http://www.scsk.jp/product/keyword/keyword07.html

www.rescale.com

Rescale: Cloud Simulation Platform

The Power of Simulation Innovation
We believe in the power of innovation. Engineering and science designs and ideas are limitless. So why should your hardware and software be limited? You shouldn't have to choose between expanding your simulations or saving time and budget.

Using the power of cloud technology combined with LS-DYNA allows you to:
·   Accelerate complex simulations and fully explore the design space
·   Optimize the analysis process with hourly software and hardware resources
·   Leverage agile IT resources to provide flexibility and scalability

True On-Demand, Global Infrastructure
Teams are no longer in one location, country, or even continent. However, company data centers are often in one place, and everyone must connect in, regardless of office. For engineers across different regions, this can cause connection issues, wasted time, and product delays.

Rescale has strategic/technology partnerships with infrastructure and software providers to offer the following:
·   Largest global hardware footprint – GPUs, Xeon Phi, InfiniBand
·   Customizable configurations to meet every simulation demand
·   Worldwide resource access provides industry-leading tools to every team
·   Pay-per-use business model means you only pay for the resources you use
·   True on-demand resources – no more queues

ScaleX Enterprise: Transform IT, Empower Engineers, Unleash Innovation
The ScaleX Enterprise simulation platform provides scalability and flexibility to companies while offering enterprise IT and management teams the opportunity to expand and empower their organizations.

ScaleX Enterprise allows enterprise companies to stay at the leading edge of computing technology while maximizing product design and accelerating the time to market by providing:
· Collaboration tools
· Administrative control
· API/Scheduler integration
· On-premise HPC integration

Industry-Leading Security
Rescale has built proprietary, industry-leading security solutions into the platform, meeting the needs of customers in the most demanding and competitive industries and markets.
· Manage engineering teams with user authentication and administrative controls
· Data is secure every step of the way with end-to-end data encryption
· Jobs run on isolated, kernel-encrypted, private clusters
· Data centers include biometric entry authentication
· Platforms routinely submit to independent external security audits

Rescale maintains key relationships to provide LS-DYNA on demand on a global scale. If you have a need to accelerate the simulation process and be an innovative leader, contact Rescale or the following partners to begin running LS-DYNA on Rescale's industry-leading cloud simulation platform.

LSTC   - DYNAmore GmbH   JSOL Corporation

Rescale, Inc. - 1-855-737-2253 (1-855-RESCALE) - info@rescale.com

 944 Market St. #300, San Francisco, CA 94102 USA

ESI Cloud Based Virtual Engineering Solutions

www.esi-group.com/software-solutions/cloud-solutions/esi-cloud

ESI Cloud offers designers and engineers cloud-based computer aided engineering (CAE) solutions across physics and engineering disciplines.

ESI Cloud combines ESI's industry tested virtual engineering solutions integrated onto ESI's Cloud Platform with browser based modeling,

With ESI Cloud users can choose from two basic usage models:

- An end-to-end SaaS model: Where modeling, multi-physics solving, results visualization and collaboration are conducted in the cloud through a web browser.
- A Hybrid model: Where modeling is done on desktop with solve, visualization and collaboration done in the cloud through a web browser.

Virtual Performance Solution:

ESI Cloud offers ESI's flagship Virtual Performance Solution (VPS) for multi-domain performance simulation as a hybrid offering on its cloud platform. With this offering, users can harness the power of Virtual Performance Solution, leading multi-domain CAE solution for virtual engineering of crash, safety, comfort, NVH (noise, vibration and harshness), acoustics, stiffness and durability.

In this hybrid model, users utilize VPS on their desktop for modeling including geometry, meshing and simulation set up. ESI Cloud is then used for high performance computing with an integrated visualization and real time collaboration offering through a web browser.

The benefits of VPS hybrid on ESI Cloud include:

- Running large concurrent simulations on demand
- On demand access to scalable and secured cloud HPC resources
- Three tiered security strategy for your data
- Visualization of large simulation data sets
- Real-time browser based visualization and collaboration
- Time and cost reduction for data transfer between cloud and desktop environments
- Support, consulting and training services with ESI's engineering teams

ESI Cloud Based Virtual Engineering Solutions

www.esi-group.com/software-solutions/cloud-solutions/esi-cloud

VPS On Demand

ESI Cloud features the Virtual Performance Solution (VPS) enabling engineers to analyze and test products, components, parts or material used in different engineering domains including crash and high velocity impact, occupant safety, NVH and interior acoustics, static and dynamic load cases. The solution enables VPS users to overcome hardware limitations and to drastically reduce their simulation time by running on demand very large concurrent simulations that take advantage of the flexible nature of cloud computing.

Key solution capabilities:

- Access to various physics for multi-domain optimization
- Flexible hybrid model from desktop to cloud computing
- On demand provisioning of hardware resources
- Distributed parallel processing using MPI (Message Passing Interface) protocol
- Distributed parallel computing with 10 Gb/s high speed interconnects

Result visualization

ESI Cloud deploys both client-side and server-side rendering technologies. This enables the full interactivity needed during the simulation workflow along with the ability to handle large data generated for 3D result visualization in the browser, removing the need for time consuming data transfers. Additionally ESI Cloud visualization engine enables the comparisons of different results through a multiple window user interface design.

Key result visualization capabilities:

- CPU or GPU based client and server side rendering
- Mobility with desktop like performance through the browser
- 2D/3D VPS contour plots and animations
- Custom multi-window system for 2D plots and 3D contours
- Zooming, panning, rotating, and sectioning of multiple windows
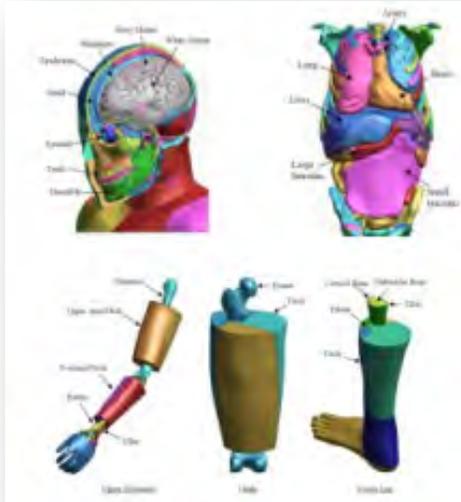
Collaboration

To enable real time multi-user and multi company collaboration, ESI Cloud offers extensive synchronous and asynchronous collaboration capabilities. Several users can view the same project, interact with the same model results, pass control from one to another. Any markups, discussions or annotations can be archived for future reference or be assigned as tasks to other members of the team.

Key collaboration capabilities:

- Data, workflow or project asynchronous collaboration
- Multi-user, browser based collaboration for CAD, geometry, mesh and results models
- Real-time design review with notes, annotations and images archiving and retrieval
- Email invite to non ESI Cloud users for real time collaboration

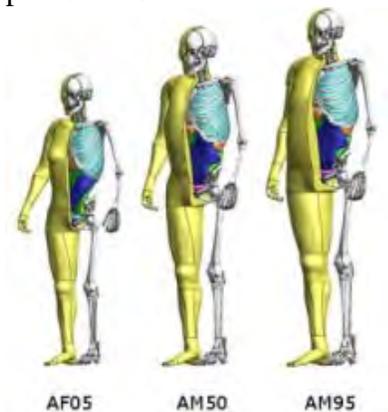## TOYOTA - Total Human Model for Safety – THUMS

The Total Human Model for Safety, or THUMS®, is a joint development of Toyota Motor Corporation and Toyota Central R&D Labs. Unlike dummy models, which are simplified representation of humans, THUMS represents actual humans in detail, including the outer shape, but also bones, muscles, ligaments, tendons, and internal organs. Therefore, THUMS can be used in automotive crash simulations to identify safety problems and find their solutions.

Each of the different sized models is available as sitting model to represent vehicle occupants

and as standing model to represent pedestrians.

The internal organs were modeled based on high resolution CT-scans.

THUMS is limited to civilian use and may under no circumstances be used in military applications.

LSTC is the US distributor for THUMS. Commercial and academic licenses are available.

For information please contact: THUMS@lstc.com

THUMS®, is a registered trademark of Toyota Central R&D Labs.

LSTC – Dummy Models

LSTC Crash Test Dummies (ATD)

Meeting the need of their LS-DYNA users for an affordable crash test dummy (ATD), LSTC offers the LSTC developed dummies at no cost to LS-DYNA users.

LSTC continues development on the LSTC Dummy models with the help and support of their customers. Some of the models are joint developments with their partners.

e-mail to: atds@lstc.com

Models completed and available (in at least an alpha version)
- Hybrid III Rigid-FE Adults
- Hybrid III 50th percentile FAST
- Hybrid III 5th percentile detailed
- Hybrid III 50th percentile detailed
- Hybrid III 50th percentile standing
- EuroSID 2
- EuroSID 2re
- SID-IIs Revision D
- USSID
- Free Motion Headform
- Pedestrian Legform Impactors

Models In Development
- Hybrid III 95th percentile detailed
- Hybrid III 3-year-old
- Hybrid II
- WorldSID 50th percentile
- THOR NT FAST
- Ejection Mitigation Headform

Planned Models
- FAA Hybrid III
- FAST version of THOR NT
- FAST version of EuroSID 2
- FAST version of EuroSID 2re
- Pedestrian Headforms
- Q-Series Child Dummies
- FLEX-PLI

LSTC – Barrier Models

Meeting the need of their LS-DYNA users for affordable barrier models, LSTC offers the LSTC developed barrier models at no cost to LS-DYNA users.

LSTC offers several Offset Deformable Barrier (ODB) and Movable Deformable Barrier (MDB) models:

•ODB modeled with shell elements
•ODB modeled with solid elements
•ODB modeled with a combination of shell and solid elements

•MDB according to FMVSS 214 modeled with shell elements
•MDB according to FMVSS 214 modeled with solid elements

•MDB according to ECE R-95 modeled with shell elements
•AE-MDB modeled with shell elements

•IIHS MDB modeled with shell elements
•IIHS MDB modeled with solid elements
•RCAR bumper barrier

•RMDB modeled with shell and solid elements

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October

   An Introduction to *CONSTRAINED_BEAM_IN_SOLID
      Hao Chen - Livermore Software Technology Corp

Previously Presented: For a copy of the presentation write to yanhua@feainformation.com

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      Introduction to the new framework for User Subroutine Development of LS-DYNA
         Zhidong Han and Brian Wainscott
      *New Features in *ELEMENT_LANCING*
         Xinhai Zhu, Li Zhang, Yuzhong Xiao
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      Recent Developments for Laminates and TSHELL Forming
         Xinhai Zhu,   Li Zhang,   Yuzhong Xiao - LSTC

An Introduction to *CONSTRAINED_BEAM_IN_SOLID

Hao Chen

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Background

Rebar reinforced concrete is commonly used in construction industries. Its mechanical properties are of interest to people working in various engineering fields. While experimental, theoretical studies provided us essential guidelines to utilize this material efficiently and effectively, numerical simulations also showed their usefulness in predicting the overall structure behavior.

There are different techniques to simulate rebar reinforced concrete. One is to construct an inhomogeneous material model in which the concrete and the rebars inside were treated as a whole. This way, there is not explicit modeling of rebars. Instead they are assumed to be aligned along some specific directions inside the concrete solid elements.

Another way is to discretize rebars as beams and concrete as solids and make them share the same sets of nodes. Of course this requires extra efforts in mesh generations. It is not always doable if not cumbersome enough.

So an alternative technique becomes appealing to our users. It is to apply constraints between two set of nodes. One is for beams and another for solids. This way we avoid the meshing difficulties in "shared nodes" technique. Also, we don't need to construct complicated material models with the "composite material" approach.

Motivation

The rebar-concrete constraint coupling was done through a legacy keyword called *CONSTRAINED_LAGRANGE_IN_SOLID. This keyword is shared by two totally different applications. CTYPE=2 is used to model rebar coupling while CTYPE=4/5 is used to perform ALE fluid structure interactions. We will refer its rebar coupling function as "CLIS CTYPE 2" in the discussion below.

The CLIS CTYPE 2 had been widely used and proved being quite helpful in solving our users' problems. However, there are several flaws and shortcomings found by both our users and the author. Efforts were made to fix and enhance this function. But later the author found it was not possible to solve the fundamental error without overhauling it coding structure. He also found its implementation made it is very hard to add in new features requested by users.

In early 2015, the author started to develop *CONSTRAINED_BEAM_IN_SOLID to perform rebar constraint coupling. A new keyword was introduced for two reasons. First, the fix for CLIS CTYPE 2 was designed for beam only. However the "slave" in the legacy CLIS could also be other Lagrange entities such as node set, segment set and parts other than beams. The second reason is to be user-friendly. Too many times, the author witnessed users' confusion caused by the dual functionalities of the CLIS card. Also it has become a heavy, lengthy one with way too many flags so that even the most experienced user would frequently make input mistakes. So the author thought it would be the best to separate these two functionalities by giving rebar coupling a new, dedicated keyword contains minimum input fields. This way, the author could also secure the input fields needed for new features.

Constraint coupling

Rebars and concrete are modeled by beams and solids, respectively. Beam mesh is submerged in solid mesh. Each of them has its own independent motion. Without some kind of coupling algorithm, they will move freely as if the other one doesn't exist at all. The way we couple these two is called "constraint method". There are always two parties involved in a constraint coupling. One is "master" and the other "slave". The slave contributes to the master and the master constraints the salve.

Typically both velocity and acceleration need to be constraint. The first is to ensure momentum conservation and the second force balance. The algorithm is exactly the same for both velocity and acceleration. For simplicity, we will limit the discussion below to velocity only.
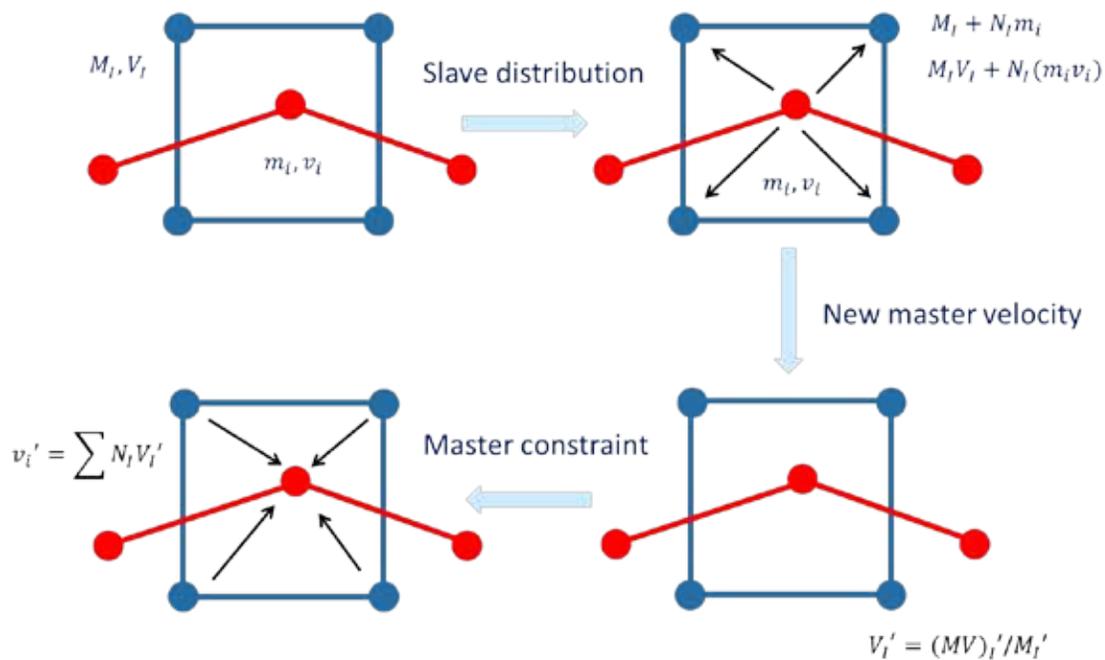
We start with an incompatible velocity field. Beam nodes are slave and denoted by lower case characters; solid nodes are master and upper case ones.

The first step is for slave beam nodes to distribute their nodal mass and momentum to master solid nodes.

Next we update the master nodal velocity by dividing the new momentum by new mass.

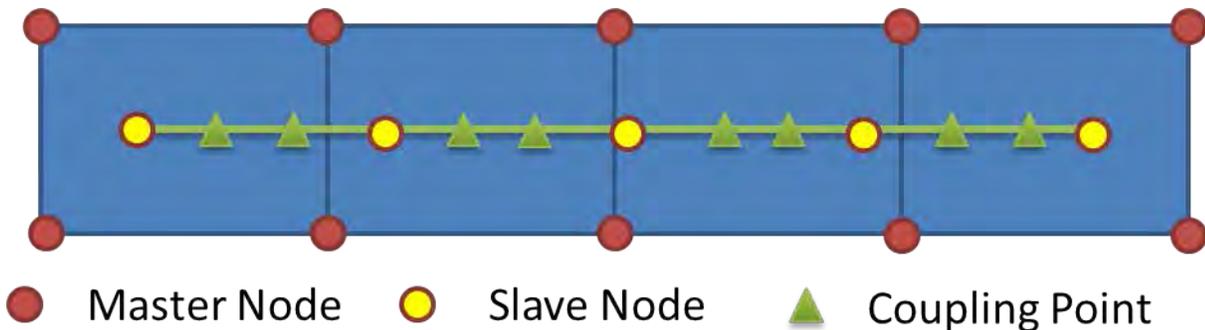Finally we assign the interpolated velocity back to slave nodes.

Now we have slave nodes moving exactly the same way as master nodes. The process is shown in the figure below.

Problems

The theory is straightforward. However, in real cases, the beam nodes are not always placed that well so that all solid elements contain at least one beam node. If a beam crossed certain solid element but its nodes did not fall in that solid, this solid won't get any distribution from this beam and the algorithm simply would fail.

So in both CLIS CTYPE 2 and CBIS we have an option to put extra "coupling points" in between the two end nodes of a beam element. This way, solid nodes get distributions either from beam nodes or these coupling points. This field is referred as "NQUAD" in CLIS or "NCOUP" in CBIS.
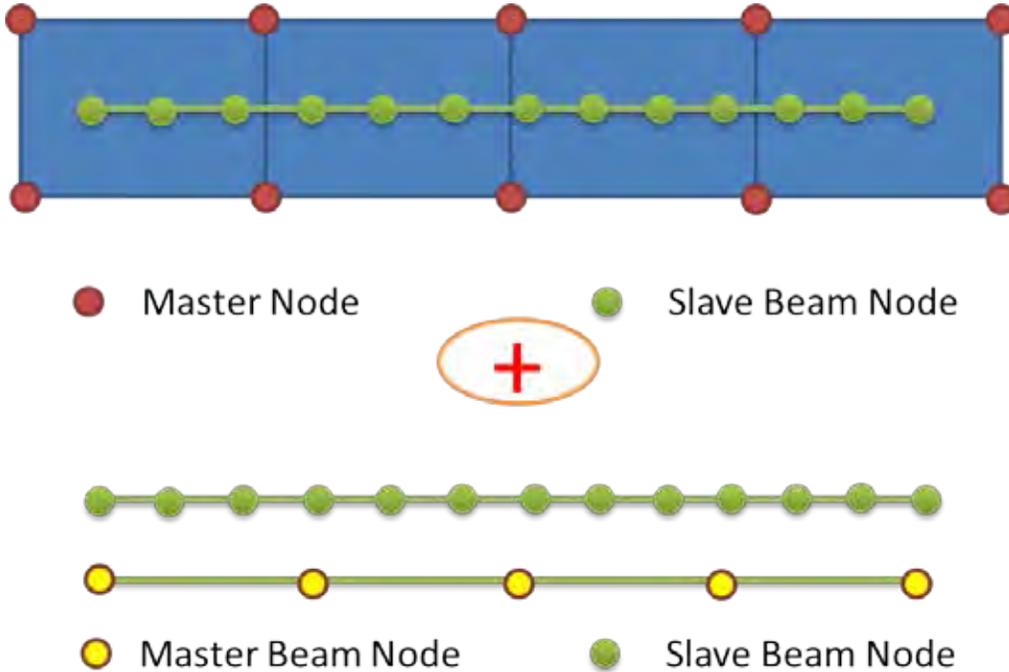

Now comes the puzzle, we all know each beam node has its nodal mass. This mass comes out naturally from discretization. Also it has its nodal velocity. These two entities are "physical". But for these artificially generated coupling points, there are no such properties. For velocity, it is pretty straightforward. We simply assume the velocity at a coupling point should be interpolated from the beam end nodes. How about mass?
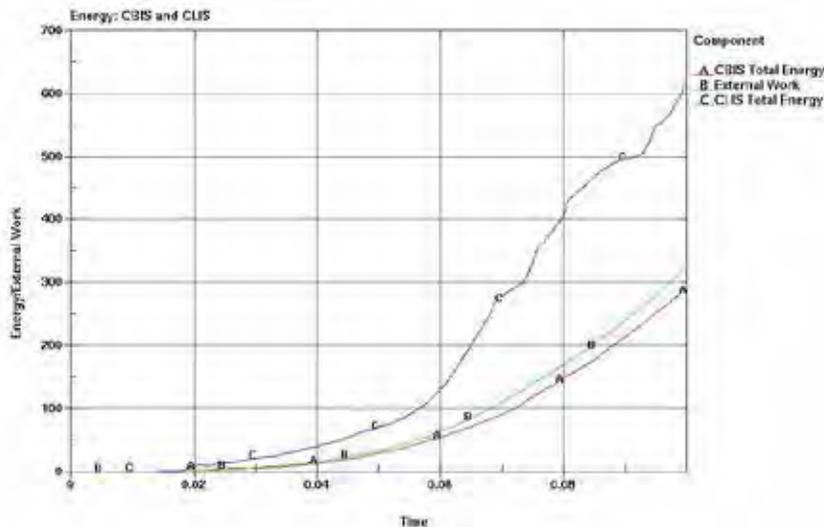
Unfortunately CLIS CTYPE 2 did not do it right. It moved half the beam element mass from nodes to these coupling points. This approach is rather arbitrary and lacks of theoretical basis. Another mistake it made was in the constraint process. The velocity was mapped only from master nodes to beam nodes, not to coupling points. So the overall process is not complete. These two errors won't reveal themselves if we only look at the structure motion. But when we checked the energy plot, we saw a spurious large internal energy increase.

Bridging Coupling

So how should we address this problem? The author came up with an idea which he called "bridging coupling". As the beam mesh is too coarse to be directly coupled to the solid elements, a "slave beam" is constructed in between to couple to both "master beam" and "master solid". Now we have two couplings. The first is between the "slave beam" and the "master beam"; the second between the "slave beam" and the solid mesh. "Slave beam" serves as a "bridge" connecting the real beam and solid elements. The concept is shown in the figure below.

We could see from the following figure that with the new CBIS implementation, the previously shown spurious energy increase disappeared. This mysterious spurious energy increase had puzzled both the author and our users for quite some time.

The mass at coupling point now simply takes the value of the "slave beam" nodal mass. It has a clear physical meaning and is theoretically correct. The coupling point has its velocity constrained by solid nodes during the "mapped-back" stage. And it then distributes the corresponding momentum to the "master beam" nodes.

The author does not intend to bother the readers with too many details. The idea of bridging coupling is conceptually simple and straightforward. However its implementation has been through some difficulties. It underwent several trial and error loops. Our users tested it extensively and provided valuable feedbacks.

Bucket sorting and searching

There were also some other improvements in CBIS. One deserves some explanation here. CBIS has an enhanced, independent bucket sorting and searching routine. That is in contrast to CLIS CTYPE 2, which shares these routines with ALE FSI coupling.

There are two advantages for CBIS to have its own sorting and searching routines. First, only solid elements belong to the "master" concrete are included in the bucket sorting. ALE elements won't be included. This brings memory reduction and a more efficient execution.

Secondly, as most ALE elements are hexahedron, searching subroutine, for efficiency, doesn't contain a separate treatment for tetrahedron and pentahedron. Rather they are treated as degenerated hexahedron. While in ALE FSI case it won't have too much difference, it is not acceptable for unstructured mesh used in rebar coupling. The new CBIS subroutine contains the enhanced algorithm to treat these three different solid elements separately.

Conclusion

By introducing the new *CONSTRAINED_BEAM_IN_SOLID keyword, we successfully fixed problems in the legacy *CONSTRAINED_LAGRANGE_IN_SOLID CTYPE 2. By separating this functionality from ALE FSI, we achieved both a clean keyword card and a clean code base for future development.

The author wants to express his gratitude towards our users for their effort testing this new keyword and valuable feedbacks. And hopes it could be of help to our users in solving their challenging problems.