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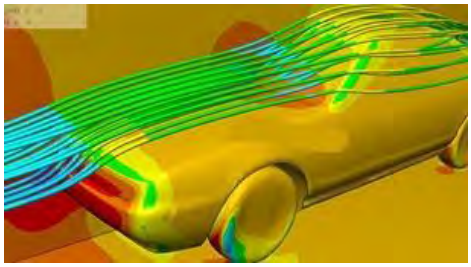

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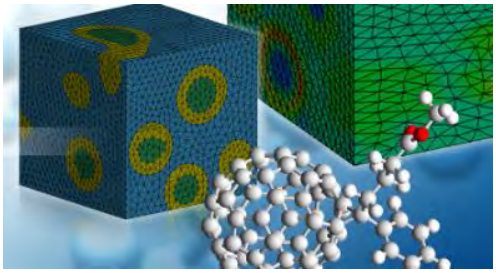

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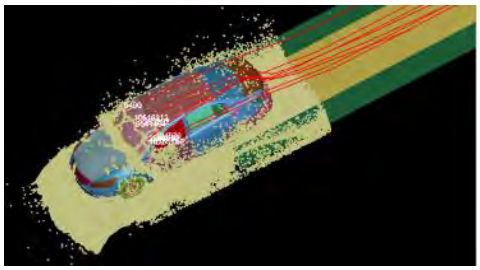

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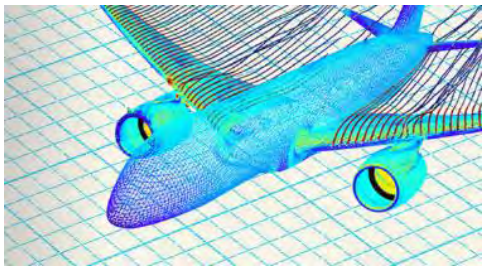

LS-DYNA@ New Feature and Application

A TWO-SCALE APPROACH FOR THE DROP SHOCK SIMULATION OF PCB PACKAGE CONSIDERING THE REFLOWED SOLDER BALL GEOMETRIES

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The focus is engineering technical solutions/information.

Livermore Software Technology, an ANSYS company

Development of LS-DYNA, LS-PrePost, LS-OPT,
LS-TaSC (Topology), Dummy & Barrier models and
Tire models for use in various industries.

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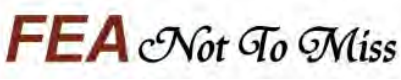
Editor and Contact: Yanhua Zhao - news@feainformation.com

Platinum Particpants



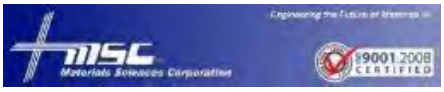


Table of contents

LS-PrePost new release version 4.8

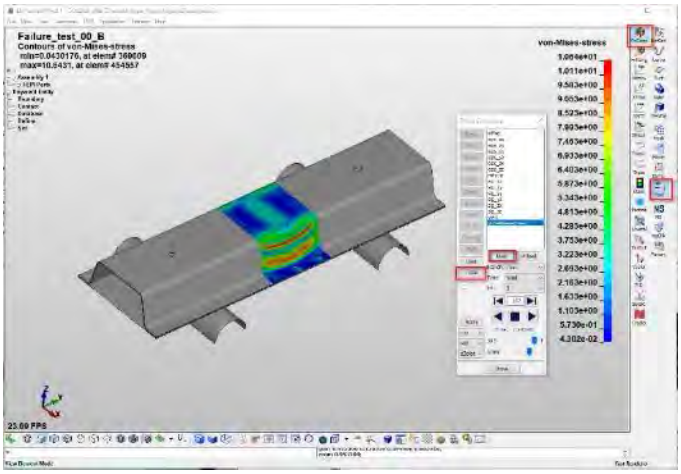
LS-PrePost® is an advanced pre- and post-processor developed for LS-DYNA®. It is fully multi-platform with support for Windows, Linux and Mac OSX. LS-PrePost is based on the OpenGL rendering engine with a design that is both efficient and intuitive. It is delivered with LS-DYNA without additional cost and may be installed on multiple platforms. License keys are not needed.

A few highlighted items in LS-PrePost 4.8:

1. Fringe Binout data – data in Binout branches like ELOUT, NODOUT, TPRINT now can be fringed on an input keyword file (without deformation) or d3plot files. (see C1.png)
2. Greatly improved graphic rendering for SPH particle tracing. (C2.png)
3. Better split windows configurations, XY graphs can also be posted in split windows panels along with models (C3.png)
4. Support NVH Panel Contribution Analysis. (C4.png)
5. SCL (Scripting Command Language) now support Python in addition to the C-like language.

LS-PrePost 4.8 can be download from:

https://ftp.lstc.com/anonymous/outgoing/lsprepost/4.8/



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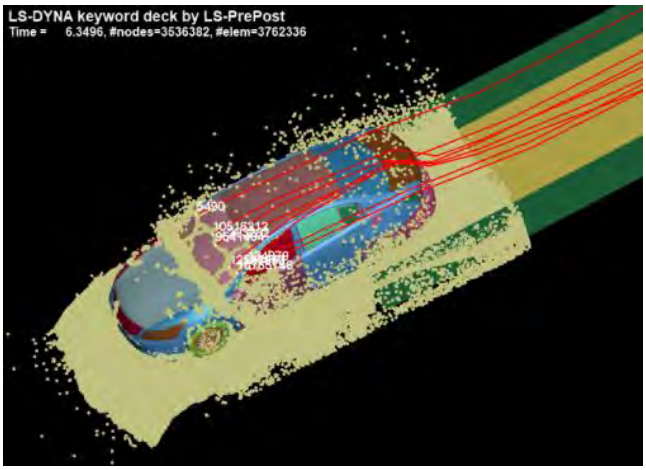

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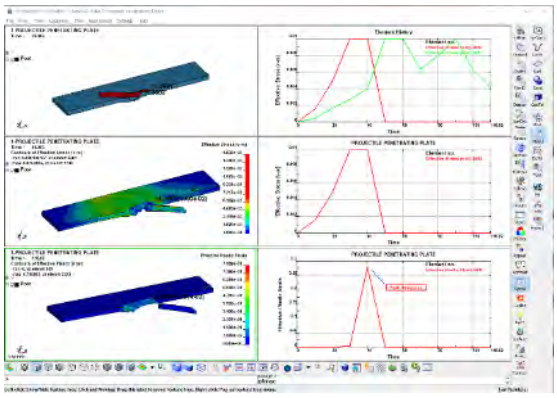

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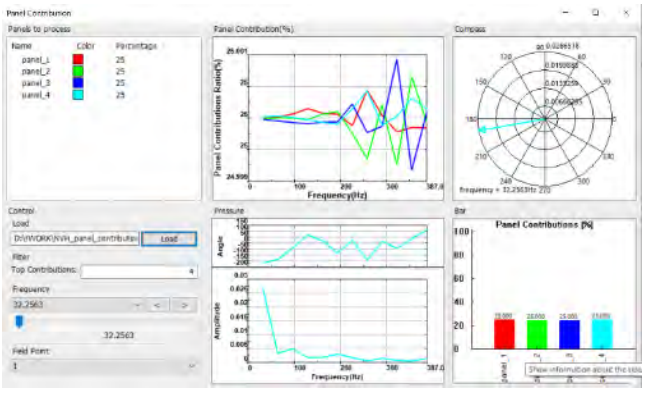


C4

About ANSYS, Inc.

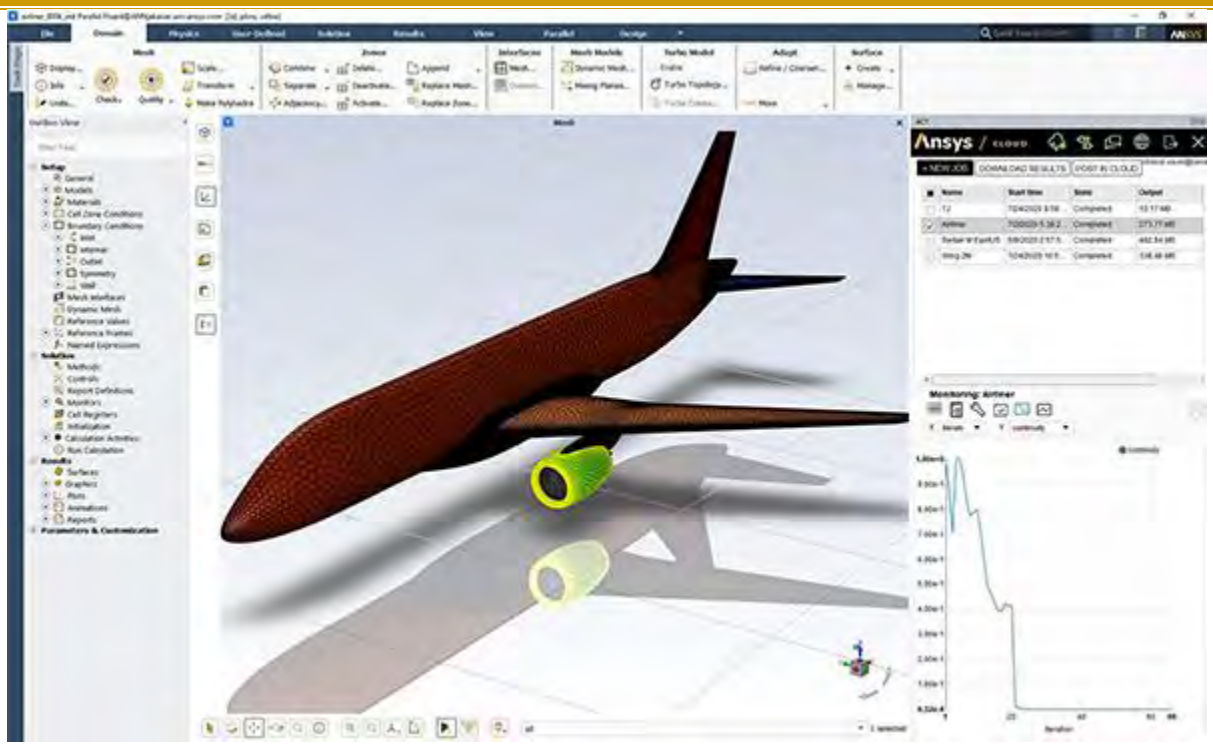
If you've ever seen a rocket launch, flown on an airplane, driven a car, used a computer, touched a mobile device, crossed a bridge or put on wearable technology, chances are you've used a product where ANSYS software played a critical role in its creation. ANSYS is the global leader in engineering simulation. Through our strategy of Pervasive Engineering Simulation, we help the world's most innovative companies deliver radically better products to their customers. By offering the best and broadest portfolio of engineering simulation software, we help them solve the most complex design challenges and create products limited only by imagination. Founded in 1970, ANSYS is headquartered south of Pittsburgh, Pennsylvania, U.S.A., Visit www.ansys.com for more information.

Published on October 6, 2020
by Thomas Lejeune
High Performance Computing
Cloud Computing, High Performance Computing (HPC)

Ansys Cloud on Microsoft Azure: A Vital Resource for Business Continuity During the Pandemic

Around the world, many employees have needed to work from home due to the pandemic. While enabling this is important for businesses regardless of their industry, a work-from-home environment can strain IT resources, as remote workers can have difficulty accessing their employers' technology platforms. Cloud computing is an essential tool to ensure business continuity in these difficult times.

For engineers, designers and analysts running simulations, it's hard to work from home without a powerful computer. Some companies started by providing employees access to on-premises clusters but found that their IT departments were not prepared to maintain those clusters while out of the office. The burden on IT to emulate their office computing environment at home was difficult. Now, organizations have changed their assessment of risk. Many are shifting to the cloud to eliminate the physical operator risk of managed data centers.



Job monitoring in Ansys Fluent.

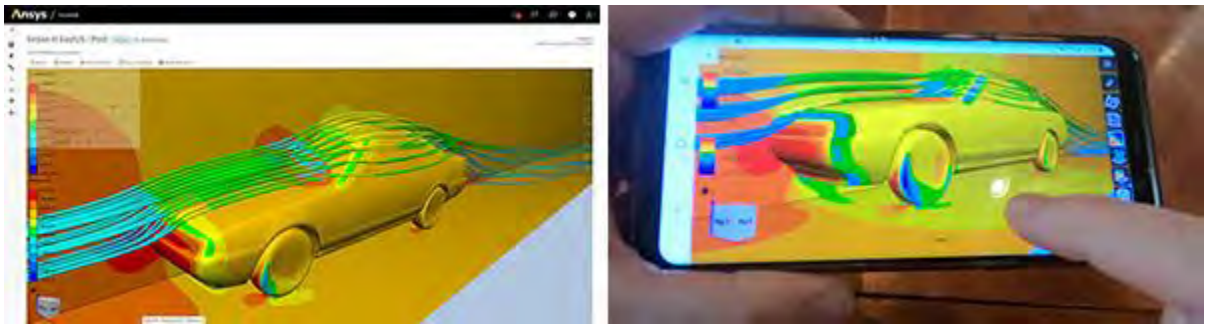
According to Gartner Group, the total public cloud market was $182.4 billion in 2018. This value is expected to rise by 17.5% and reach $214.3 billion in 2019. Statista reports that the infrastructure as a service (IaaS) market is leading the charts, showing a growth of 20.2% between 2018 and 2022, followed by platform as a service (PaaS) and software as a service (SaaS).

Thanks to a recent Ansys poll, we know that around 40% of our existing customers are almost always cutting corners and doing simplified simulations because of compute limitations. In addition, 55% of the Ansys user base runs simulations exclusively on a laptop/desktop, and more than 60% are using less than 8 cores. Hardware constraints negatively impact simulation effectiveness for almost 75% of users.

Virtual Desktop Infrastructure Centralizes Simulation Workflow

Engineers need powerful computational resources to solve, pre- and post-process, and visualize complex simulations. Not everyone can bring their office workstation home or access taxed virtual private networks (VPNs) to connect to high-performance computing (HPC) resources. Even if they have access to a VPN, users still need to work with a powerful workstation capable of pre- and post-processing.

To make this possible, the Ansys development team worked tirelessly during the pandemic to integrate virtual desktop infrastructure (VDI) into Ansys Cloud, which was developed in collaboration with Microsoft to combine the benefits of Azure and engineering simulation in a secure cloud solution. With Ansys VDI technology, any computer with an internet connection can be turned into a high-powered workstation capable of pre- and post-processing simulations. As a result, users working from home can now benefit from an end-to-end, cloud-based simulation workflow.



Ansys Cloud allows you to do the full simulation process on any device connected to the internet.

You can access Ansys Cloud from anywhere at anytime for simulation capabilities compatible with most of Ansys products. By using the cloud, hardware is no longer your concern. You pay only for what you need. You can improve your workflow and reduce expenses while boosting innovation. With Ansys Cloud, you remove IT constraints and security concerns, and focus only on what matters. Ansys Cloud allows you to collaborate with your team on an all-in-one, user-friendly single platform.

Ansys Cloud features an optimized graphical user interface designed to ease your workflow, especially when you are away from the office. Performance is not sacrificed because Ansys Cloud is a complete solution developed by Ansys and running on Azure, from solvers to the cloud, for architecture integration and security optimization.

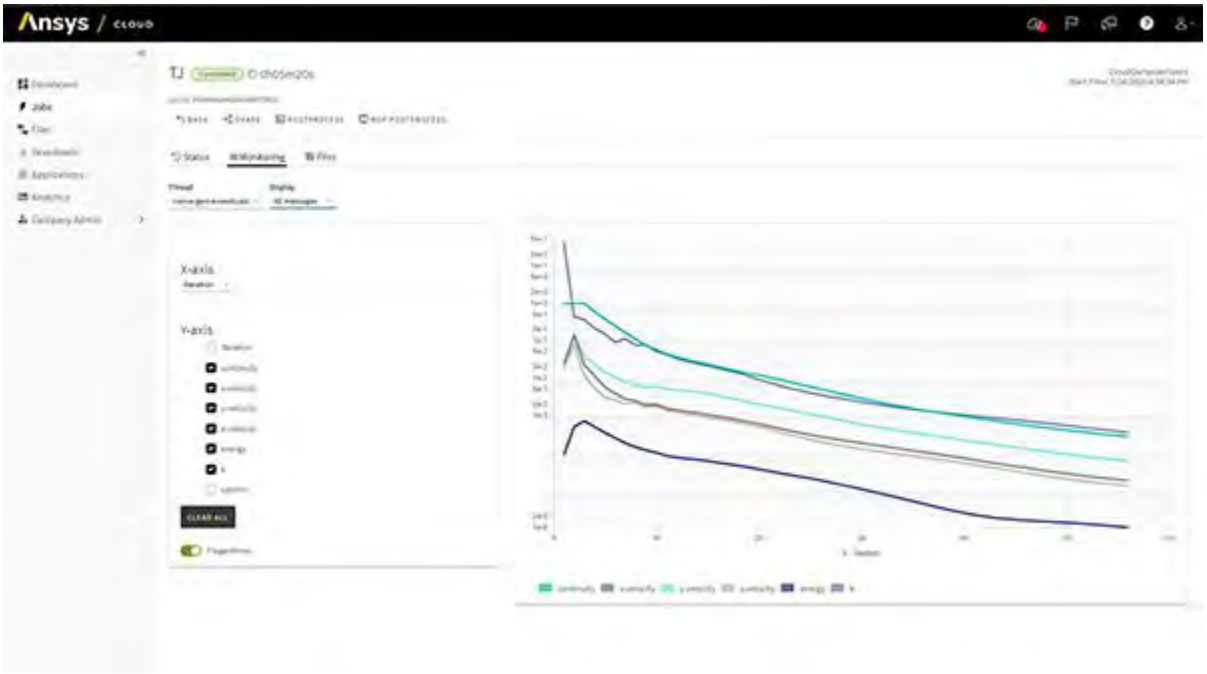
Save Time with Simulation in the Cloud

For our customers already utilizing their own clusters, we've seen Ansys Cloud delivering results anywhere from 30%–100% faster than their on-prem clusters for similar core counts when using newer-generation hardware from Ansys Cloud, and up to 500% faster when using higher core counts. Customers who are looking to accelerate their innovation can benefit from the compute and network optimized cloud infrastructure of Ansys Cloud on Azure, which has been configured specifically for Ansys solvers.

Our customers are seeing the benefit of using Ansys Cloud. Tim Marvel, P.E. vice president, Business Development & Technology, Downing, says: "Ansys Cloud has been a game-changer from a productivity standpoint ... It has reduced the time of each job from 20–25 hours to only 2–4 hours."

Marcos Blanco, Mechanical Simulation Engineer, LEAR Corporation, says: "The Ansys Cloud service built into Ansys Mechanical provides intuitive, easy access to HPC directly from the application. For large, high-fidelity models, Ansys Cloud reduced our solve times by 5X–6X and cut the entire simulation workflow by half."

And Luis Baikauskas, Process Engineer, Hytech Ingeniería agrees: "High-efficiency equipment is critical for improving plant performance in the oil and gas industry. Ansys Cloud enables Hytech Ingeniería to calculate large and complicated geometries within hours, instead of days or weeks — resulting in significant time savings."



Ansys Cloud portal enables job monitoring from any device with a web browser

Thanks to new flexible Ansys Cloud licensing, VDI and HPC functionality are available to Ansys customers with elastic, pre-paid and leased licenses. You no longer need to use Ansys elastic licensing units (AEUs) to pay for software on Ansys Cloud; you can now bring your own license.

The benefit of Ansys Cloud technology reaches beyond the pandemic. Working from home and flexible hours are growing trends. They help employees achieve a better work/life balance while maintaining office efficiency at home. Work-from-home initiatives also benefit employers. Companies are no longer limited to a pool of simulation experts who live, or are willing to move, close to brick-and-mortar offices that contain computational resources. Instead, they can hire the best simulation expert for the job who can access a remote desktop from anywhere in the world.

Want to have a glimpse of the integration between Ansys Cloud and Azure? Learn more here. You can also visit the Microsoft website or read the blog to discover how you can run business critical applications on Azure.

Read from website

Developing CAE software systems for all simulation disciplines. Products: ANSA pre-processor/ EPILYSIS solver and META post-processor suite, and SPDRM, the simulation-process-data-and-resources manager, for a range of industries, incl. the automotive, railway vehicles, aerospace, motorsports, chemical processes engineering, energy, electronics…

Online webinar: Optimization of airbag design for better FMVSS226 results

The National Highway Traffic Safety Administration (NHTSA) has identified "Ejection mitigation" as a top priority regulation and have issued final rule to set performance standards for ejection mitigation countermeasures. The countermeasures used for compliance with this standard are rollover activated curtain airbags that deploy from a vehicle's roof rail. With engineering simulation holding a key role during the design of such systems new solutions and tools are required to achieve the proper set up of the virtual models.

By attending this webinar, participants will get a brief understanding how to get better results for FMVSS226 (less displacement of head-form) and achieve high accuracy simulations.

The webinar will be highly beneficial for researchers, students, teachers, practicing industry personnel and anyone with a keen interest in advancing their knowledge on the domain of Crash and Safety.

About "B-webinars"

Beyond the numerous videos that we release every week, which allow you to enhance your knowledge upon demand, this is a new series of live webinar events that brings closer BETA and our friends.

The events comprise talks, presentations and demos, on topics related to the use and deployment of our software for solving demanding problems in computational engineering.

You are all welcomed to enjoy our webinars and take the most out of it by deepening your knowledge and broaden your horizons.

Register to the webinar

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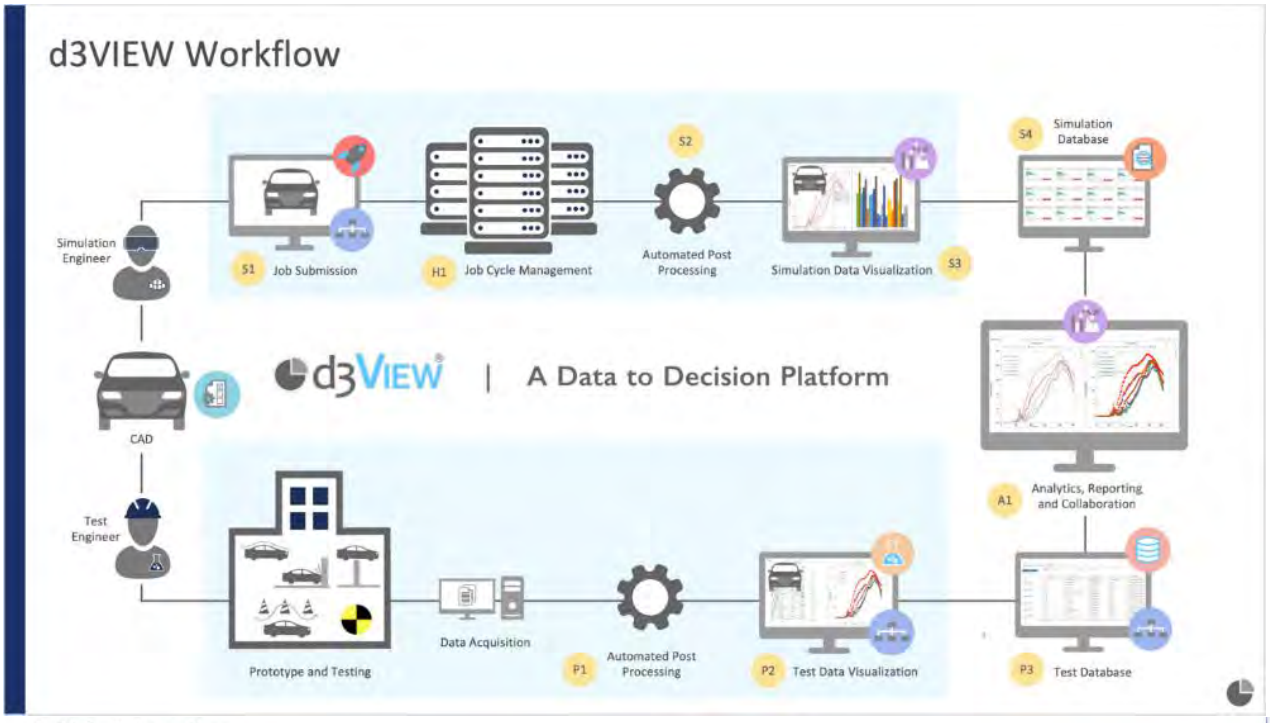
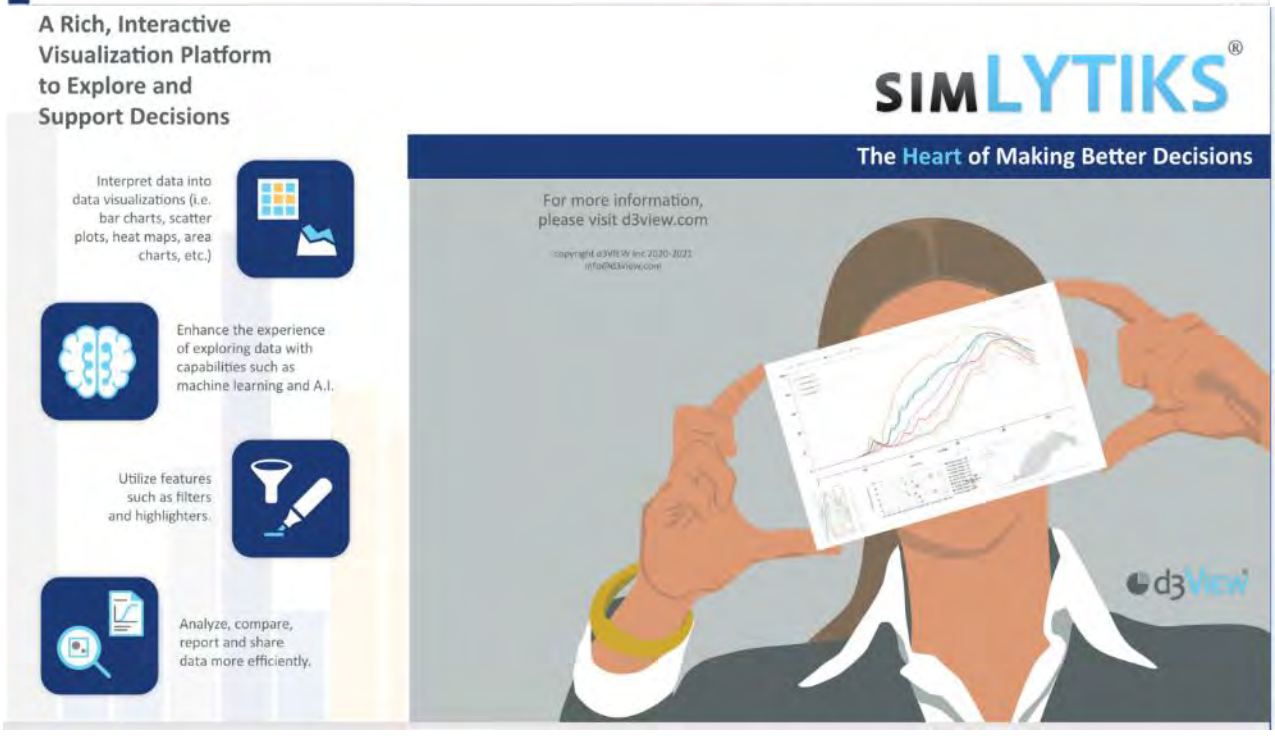
d3VIEW is a data to decision platform that provides out-of-the box data extraction, transformation and interactive visualizations. Using d3VIEW, you can visualize, mine and analyze the data quickly to enable faster and better decisions.





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Author: Christian Frech christian.frech@dynamore.de

Three new on-demand Video Seminars

More information: www.dynamore.de/en/seminars

DYNAmore Video Seminars
We have expanded our range of on-demand video seminars with three new courses. A total of five video seminars are currently available.

The convenient video seminars allow you to take part at our courses on your own computer and according to your own time preferences. The trainings are video recordings of the on-site seminars or the webinars and correspond exactly to these in terms of content and scope. Please register via our website at www.dynamore.de/en/seminars.

Modeling Metallic Materials (New)
Scope: Part 1 - Isotropic Modeling: *MAT_024, *MAT_081, *MAT_251
Part 2 - Anisotropic Modeling: *MAT_036, *MAT_037, *MAT_133
Lecturer: Dr. Filipe Andrade (DYNAmore)
Date: anytime
Fee:400 Euro plus VAT
Registration: www.dynamore.de/en/vs20-03

LS-OPT Optimization (New)
Scope: corresponds to webinar
Lecturer: Katharina Liebold (DYNAmore)
Date: anytime
Fee: 200 Euro plus VAT
Registration:
www.dynamore.de/en/vs20-04

LS-OPT Robustness (New)
Scope: corresponds to webinar
Lecturer: Katharina Liebold (DYNAmore)
Date: anytime
Fee: 200 Euro plus VAT
Registration: www.dynamore.de/en/vs20-05

Introduction to LS-DYNA
Scope: corresponds to 3 seminar days (11 chapters and 11 exercises)
Lecturers: Dr. Maik Schenke, Dr. Steffen Mattern (DYNAmore)
Date: anytime
Fee: 1,575 Euro plus VAT
Registration: www.dynamore.de/en/vs20-02

Crashworthiness Simulation with LS-DYNA
Scope: corresponds to 4 seminar days (15 chapters)
Lecturer: Paul Du Bois (Consultant)
Date: anytime
Fee: 2,400 Euro plus VAT
Registration: www.dynamore.de/en/vs20-01

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E-Mail: info@dynamore.de
www.dynamore.de

Author: Christian Frech christian.frech@dynamore.de

Webinars and Video-Seminars 2020

Online trainings in October/November

Webinars LS-DYNA Compact	
Introduction to Passive Safety (2 Parts)	21-22 October
CPM Airbag Modelling	2 November
User Interfaces in LS-DYNA	3 November
NVH (2 Parts)	4-5 November
New Features in LS-DYNA	6 November
ICFD Incompressible Fluid Solver (3 Parts)	9-11 November
From Explicit to Implicit Simulation Models in LS-DYNA (2 Parts)	12-13 November
Electromagnetism in LS-DYNA	18 November
Resistive Heating and Battery Modeling	19 November
Simulation of fiber-reinforced plastics (3 Parts)	25-27 November
Introduction to LS-PrePost (2 Parts)	30 November - 1 December
Webinars from DYNAmore Nordic	
Co-Simulation with LS-DYNA through FMI	22 October
News in LS-DYNA R12	29 October and 5 November
Video Seminars	
Introduction to LS-DYNA online	anytime
Crashworthiness Simulation with LS-DYNA	anytime
Modeling Metallic Materials	anytime
LS-OPT - Optimization	anytime
LS-OPT - Robustness	anytime

Visit our website for complete overview and registration www.dynamore.de/en/seminars

A leading innovator in Virtual Prototyping software and services. Specialist in material physics, ESI has developed a unique proficiency in helping industrial manufacturers replace physical prototypes by virtual prototypes, allowing them to virtually manufacture, assemble, test and pre-certify their future products.

Get on the 'Fast Track' to Winning Back Your Railway Business

The COVID-19 pandemic has done a good job of derailing our plans as we knew them for 2020. Read this blog to see how Virtual Prototyping gets you 'back on track' and start winning back your business.

Thursday, October 1, 2020 By Massimiliano Calloni

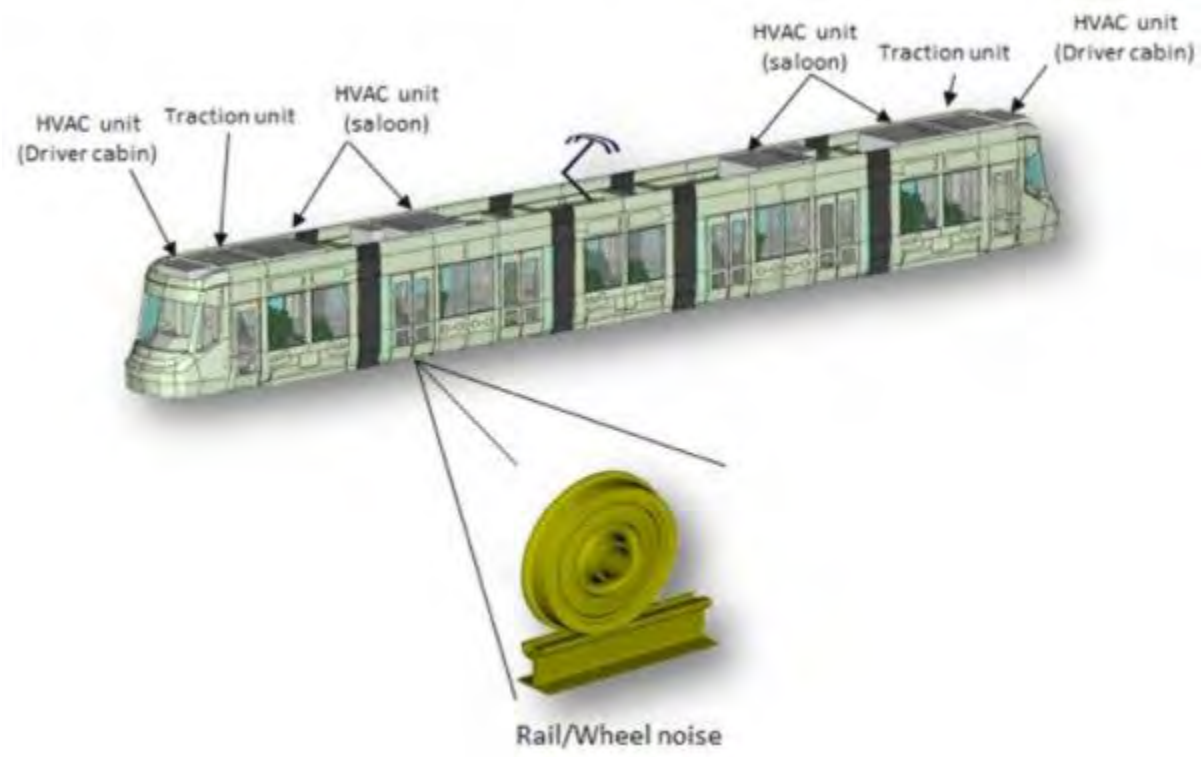
Trains Make a Comeback

COVID-19 has disrupted almost every single economy around the world and quite possibly changed our daily lives indefinitely. Although the railway industry hasn't gone unscathed, one thing remains true: essential people and goods must still be transported from place to place.

Therefore, it comes as no surprise that offering this vulnerable group of passengers a comfortable and enjoyable ride is essential for rail companies during this most sensitive economical time. It also remains essential that trains, whether transporting passengers or goods, keep noise to a minimum so as not to disturb the surrounding ecosystem. So then, what are the crucial differentiators for railway operators? Interior and exterior noise. Imagine being handed a roadmap on eliminating both, in a single environment, in as little time and with the fewest resources possible?

The causes of interior, onboard noise

Sound propagation occurs when vibrations from the noise source introduce energy into the system to the receiver – passing through the structure, substructures, and the air. This describes the transmission path. We typically define a receiver as a specific location within or external to the source. For instance, depending on the source's frequency, something as simple as a seat could absorb the noise, while complex paths contained in structures, such as walls and open spaces, can diffract, echo, or perpetuate the noise.



Numerous sources of noise on a train

A train's predominant interior noise sources include HVAC systems & pumps, rolling noise resulting from the imperfections and roughness of the wheel & rail interface, and aerodynamic 'flow-induced' excitation. All of these challenges make acoustic engineering a central focus for rail designers and engineers.

Now the question becomes, how can train manufacturers ensure that their carriages are quiet enough for optimum passenger comfort?

Silence speaks volumes – achieve it through Virtual Prototyping

Design teams are successfully using Virtual Prototyping to reduce and refine onboard noise. Designers use predictive solutions to foresee, analyze, and manage radiated wheel & rail noise issues, as well as propagation both inside and outside of the train, to meet challenging targets at strategic points in the train's carriage.

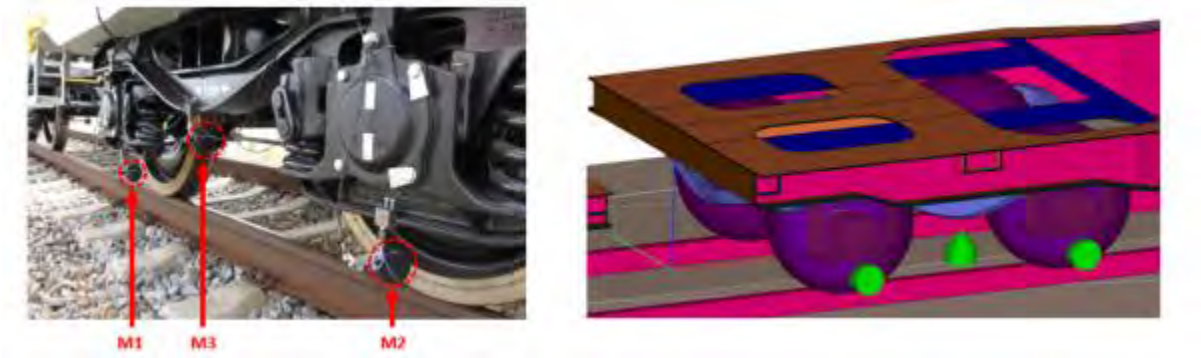
Through Virtual Prototyping, engineers can utilize techniques such as Statistical Energy Analysis (SEA) to predict interior noise at critical locations inside of the cabin, accounting for the contribution from all noise sources and paths in the system. Onboard noise sources combined in a system model, including structural variants such as extruded panels or composite structures, can be evaluated in a single model to attain interior noise targets specified by rail operators.

> *Hybrid FE-SEA analysis is a real leap forward when it comes to acoustical modeling technologies and is likely to set the standard for industrial computational acoustics of large structures for the future. The innovative integration of FE and SEA methods within one model allows the user to solve problems that cannot be addressed by applying SEA or FE methods separately.*
>
> *Ulf Orrenius, Senior Acoustics and Vibration Specialist, Bombardier Transportation*

ESI VA One allows engineers to use these tools to assess the sound levels at a receiver location and then determine how features within an acoustic space (carpets, curtains, etc.,) absorb the sound. Engineers can use this information to optimize the acoustic space's features to limit noise, leading to a quiet space and comfortable passengers

Navigate pass-by noise, while contending with local noise regulations

The same rails that carry passengers by day also carry goods, frequently by night. Now the concern is not only onboard comfort but also the comfort of the people living and working near these tracks. Because of this and the increase in traffic density, rail transport is increasingly regulated by local bylaws. These bylaws specifically limit pass-by noise of rail rolling stock near settlements (homes and businesses). Naturally, complying with these rules becomes a major issue for rail operators as their work cannot be performed if rolling stock noise levels exceed legislative guidelines.



Experiment to evaluate pass-by noise levels at various speeds

An even more complex problem arises for freight trains. A fully loaded liquid tanker behaves differently to an empty tanker upon its return trip. Additionally, when designers are trying to predict exterior rolling stock noise, their main concern is the predictive model's size, which is directly correlated to the rolling stock's actual size. Designers are liable to end up with extremely large models – but that's not all. As the train moves, its speed varies. This forces engineers to account for huge models, which alone can take several hours or even days, and now at varying speeds. Additionally, exterior noise requires that engineers use deterministic tools to calculate time intervals, resulting in large, repeated computations, both costly in computing infrastructure and time.

VA One provides a full simulation capability to predict pass-by noise early in the design process to avoid costly rework at a later stage. This is possible using the new "Rail Modeler" tool developed by ESI as part of a three-year-long project supported by the Technology Agency of the Czech Republic (TACR). It calculates complex noise sources arising from wheel & rail interaction and uses optimized Boundary Element calculations to predict the noise in intervals necessary for detailed prediction of exterior noise.

Using the Rail Modeler, designers can perform 'what if' exterior noise analysis to investigate the effects of both rolling stock loading and differing train speeds. This provides rolling stock designs that comply with exterior noise thresholds, which ensures rail operators can confidently achieve ROI targets.

A click away from designing the quietest trains

Well, maybe it's a few clicks away – but wouldn't you agree that a few clicks are still far better than the alternative? Virtual Prototyping not only hands you all of the tools you need to minimize interior and exterior noise for your railway cars, but it gives you the power to do so in the least amount of time and with as few resources as possible, all while meeting local bylaws.

For more information visit: Eliminate Interior and Exterior Noise Issues Before Production with a Single Comprehensive Tool

Learn more about Designing the Quietest Railway with Exterior Acoustics Simulation

ETA has impacted the design and development of numerous products - autos, trains, aircraft, household appliances, and consumer electronics. By enabling engineers to simulate the behavior of these products during manufacture or during their use, ETA has been involved in making these products safer, more durable, lighter weight, and less expensive to develop.

ETA Inc., Engineering Technology Associates Announces DYNAmore as Master Distributor in Europe

TROY, Michigan (USA) /STUTTGART, Germany – September 8, 2020 –
ETA Inc. (Engineering Technology Associates), an engineering and software innovator with over 37 years in the automotive engineering community, has signed a master distribution agreement with DYNAmore GmbH. DYNAmore is one of the largest distributors of LS-DYNA simulation software worldwide.

"I highly appreciate to further strengthen our long-standing and very good cooperation with ETA and to coordinate the distribution of Dynaform throughout Europe. Together we are well positioned to meet the increasing demands on deep drawing, hydroforming and tube bending simulations."
Ulrich Franz, Managing Director, DYNAmore GmbH

'It is my pleasure to welcome DYNAmore, our long time Dynaform partner and German distributor as our new Master Distributor for Dynaform in the European Union. I am pleased by DYNAmore's business expansion, as they increase their presence in new growth markets across Europe.'
– Dr. Akbar Farahani, CEO & President, ETA Inc.

ETA and DYNAmore have been the most prominent LS-DYNA distributors for over 25 years. This new partnership will bring both companies closer, strengthen the software sales and support to the end-customer and showcase a unified market expansion to European OEMs' and suppliers.

ETA and DYNAmore are committed to creating a powerful virtual presence with webinars, online support and training for customers during the current pandemic and beyond.

DYNAmore will lead the following efforts:

- Supporting customers with the 6th generation of Dynaform
- Providing assistance to European sub-distributors
- Delivering consistent, streamlined communication for software sales and support throughout Europe

For further information on ETA, please visit eta.com
For further information on DYNAmore, please visit www.dynamore.de/en.

FEA Not to Miss (feantm) comprises a group of interested parties that bring information to you. This is done via this website and a monthly pdf publication FEA Not To Miss Engineering Solutions.

The publication is no fee, and there is no fee to have an article or notice on the FEANTM website or in the publication.

Our main goal is to make sure you have information on companies with expertise and innovative products. Strengths that rely on smart work ethics in today's changing world.

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Start your Monday with coffee or tea reading our engineering blog, at the FEA Not To Miss coffee shop.
Postings every Monday on what you have missed

www.feantm.com

10/12/2020 - FIRST, let us not forget that October 13th is my 71st birthday (yes, this was self-serving) BUT 71!! Damn I'm old! Okay, No way in the below video could that person hold their To Go Coffee Cup!

Saeed Ahmadi - Side crash of two vehicles using LS-DYNA explicit finite element code

10/05/2020 - As engineers I do know that you may not be interested in The Early Pioneers of Coffee - SO, we can take our To Go Coffee Cups and head over to listen to The Early Pioneers of Virtual Prototyping.

Alain de Rouvray, Founder and Chairman of ESI Group discusses some of the early beginnings of ESI Group with co-founder Eberhard Haug

Shanghai Hengstar & Enhu Technology sells and supports LST's suite of products and other software solutions. These provide the Chinese automotive industry a simulation environment designed and ready multidisciplinary engineering needs, and provide a CAD/CAE/CAM service platform to enhance and optimize the product design and therefore the product quality and manufacture.

Online workshop of the PeriDynamics theory and application in LS-DYNA

Shanghai Hengstar Technology & Ansys/Lst will jointly organize a Web Training of the PeriDynamics theory and application in LS-DYNA on Oct 27 2020.

Contents:

1. Basic theory of PeriDynamics

2. Implementation details of PeriDynamics in LS-DYNA®

3. Keywords of PeriDynamics in LS-DYNA®

4. Analysis process of PeriDynamics in LS-DYNA®

5. Application examples and details of PeriDynamics in LS-DYNA®

Instructor:

Bo Ren Ph.D.

Dr. Ren has more than ten years of experience in CAE numerical method research and engineering application development. He joined in LSTC(ANSYS, LST) in 2014. At present, as a senior R & D Engineer, he has led a team for numerical calculation and multi-scale model development. The team focuses on the research and industrial application of advanced numerical calculation methods, involving adaptive EFG / FEM, XFEM, SPG, MEFEM and Peridynamics. These models have been widely used in processing and failure analysis of ductile and brittle materials such as metals, concrete and composites.

Duration and Style: (2 hours web training)

Time: Oct 27 (9:00AM-11:00AM)

Language: Mandarin

Contact: Xixi Fei

Tell: 021-61630122 mobile: 13524954631

Email: training@hengstar.com

Contact:

Xixi Fei
Tell:021-61630122 Mobile:13524954631
Email: Training@hengstar.com

LS-DYNA Basic Training Online

Shanghai Hengstar Technology & Ansys/Lst will jointly organize "LS-DYNA Basic Training Online" on Nov 20 2020.

Contents:

1. Introduction of LS-DYNA
2. Instructions of LS-PrePost
3. Element Type
4. Selection of material model
5. Loading and setting initial conditions
6. Boundary condition
7. Contact settings
8. Control card
9. Output files and data
10. Time step and CPU time
11. Hourglass
12. Connect
13. Damping application
14. Finite element model evaluation
15. Exercise

Instructor：

Jun Liu (Senior Engineer)

Mr. Liu was graduated from Tongji University with a degree in vehicle engineering in 2008. He has been engaged in automobile R & D industry for more than ten years, and has rich experience in automobile safety performance research and simulation. He has accumulated a lot of pre-processing and post-processing techniques for FRB, ODB, AEMDB collision modeling and simulation analysis. And He has a lot of experience in simulation and optimization of five-star vehicle development process. In addition, he is proficient in LS-DYNA, Ansa, Meta, Hypermesh, Hyperview, PRIMER software.

Duration and Style: (7 hours web training)

Time: Nov 20 (9:00AM-17:00PM)

Language: Mandarin

Contact: Xixi Fei

Tell: 021-61630122 mobile: 13524954631

Email: training@hengstar.com

Shanghai Hengstar Technology Co., Ltd

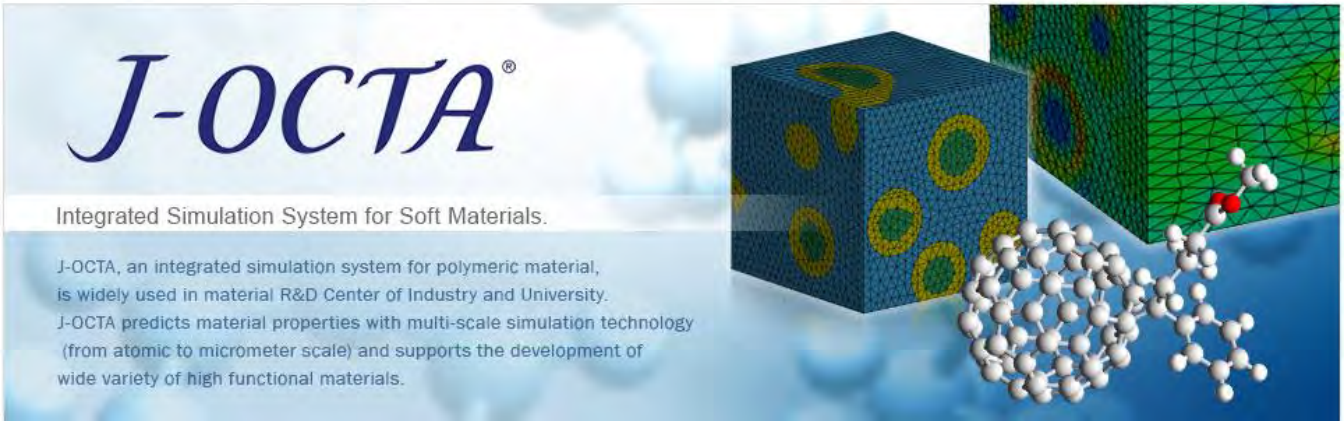
hongsheng@hengstar.com

http://www.hengstar.com

Shanghai Enhu Technology Co., Ltd

http://www.enhu.com

JSOL supports industries with the simulation technology of state-of-the-art. Supporting customers with providing a variety of solutions from software development to technical support, consulting, in CAE (Computer Aided Engineering) field. Sales, Support, Training.



J-OCTA V6.1 Online Seminar
Introduction of the new functions

The latest version of J-OCTA V6.1 has been released in September 2020.
In this version, following new functions and improvements are included.

Key new functions and improvements in J-OCTA V6.1

- **SIESTA Modeler and FCEWS**.
  SIESTA Modeler (Modeling tool for SIESTA) has been implemented, and the interface with FCEWS.
  (X(Chi) parameter estimation tool with FMO method) has been updated.
  By using SIESTA Modeler, you can calculate stable structures, elastic modulus and reaction paths and more, with Density Functional Theory (DFT).
- **Machine Learning QSPR**
  Trained models about several material properties are added and the features of Machine Learning are improved.
  Latest feature to extract the common molecular structure has been implemented.
  Using this feature, we can extract common molecular substructures based on the range of specified physical properties.
- **Modeling functions**
  Additional functions for scenarios are developed, which is useful to build and share the workflow to estimate material properties.
  PCFF force field is supported in the molecular modeling.
  API function for high throughput calculations without GUI has been released. This function is useful to build the material property DB for Machine Learning.
- **i-Rheo GT for J-OCTA**
  "i-Rheo GT" proposed by Dr.M.Tassieri from The University of Glasgow has been implemented in J-OCTA.
  i-Rheo GT converts the relaxation modulus obtained by MD to complex elastic modulus.
  In this seminar, we will introduce and demonstrate new features in the latest version of J-OCTA, and show you how to use J-OCTA conveniently.

Our presentation about the machine learning includes the common substructure extraction and simple inverse problems solving by the feature. Futhermore, we also show you future roadmap about the ML-QSPR, machine learning based QSPR.

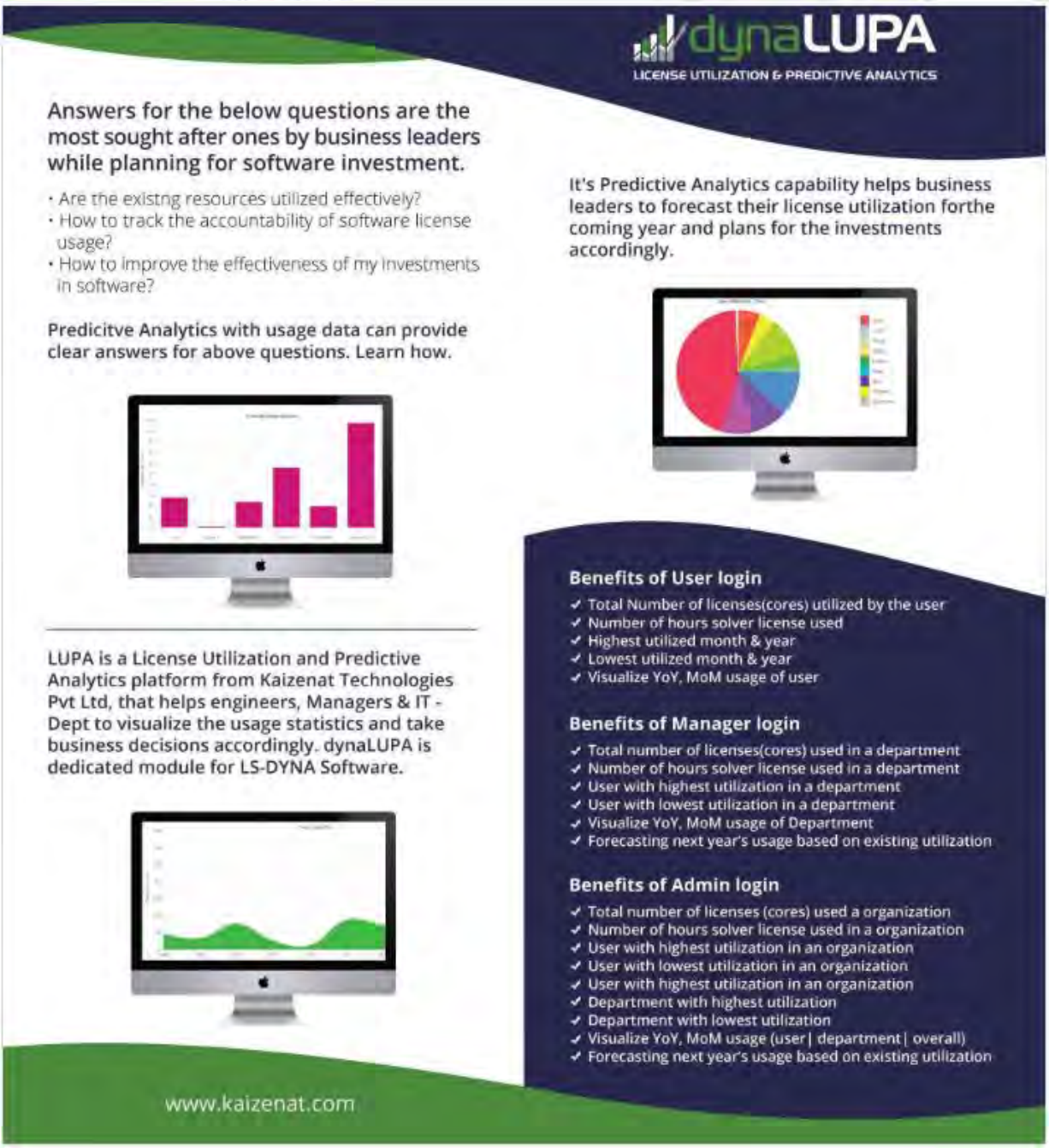
Title: J-OCTA V6.1 Online Seminar Introduction of the new functions
Dates:13:30 p.m., 30 October, 2020 - 17:00 p.m., 5 November, 2020

Registration

KAIZENAT Technologies Pvt Ltd is the leading solution provider for complex engineering applications and is founded on Feb 2012 by Dr. Ramesh Venkatesan, who carries 19 years of LS-DYNA expertise. KAIZENAT sells, supports, trains LS-DYNA customers in India. We currently have office in Bangalore, Chennai, Pune and Coimbatore.

KAIZENAT Keep Improving

LUPA



Contact
Email : support@kaizenat.com Phone: +91 80 41500008

A team of engineers, mathematicians, & computer scientists develop LS-DYNA, LS-PrePost, LS-OPT, LS-TaSC, and Dummy & Barrier models, Tire models.

LS-PrePost® an Advanced Pre- and Post-processor

LS-PrePost® is an advanced pre- and post-processor developed for LS-DYNA®. It is fully multi-platform with support for Windows, Linux and Mac OSX. LS-PrePost is based on the OpenGL rendering engine with a design that is both efficient and intuitive. It is delivered with LS-DYNA without additional cost and may be installed on multiple platforms. License keys are not needed.

Geometry and Meshing Includes

- A geometry engine which allows the creation and modification of curves, surfaces, and solid objects. Also included are tools to heal and simplify the geometry model
- An automatic surface meshing tool
- An automatic 3-Dimension(3D) tetrahedron meshing module
- Various methods to create a mesh by dragging, spinning, offsetting, and sweeping
- The construction of middle surface shells from 3D Solids

Pre- and Post-Processing Capabilities

- Complete LS-DYNA Keyword management
- Tools to create and modify LS-DYNA entities
- General model setup for NVH (Noise, Vibration and Harshness), Implicit, and Thermal Analyses
- Tools to measure FEA data like distance, area, angle, volume, mass, etc.
- Section cuts for better visualization in complicated models
- Comprehensive time history plotting for the d3plot, ASCII history, and BINOUT databases
- Time history plotting for user defined data
- Particle elements (SPH, CPM, DES, SPG) visualization
- CFD models and results visualization

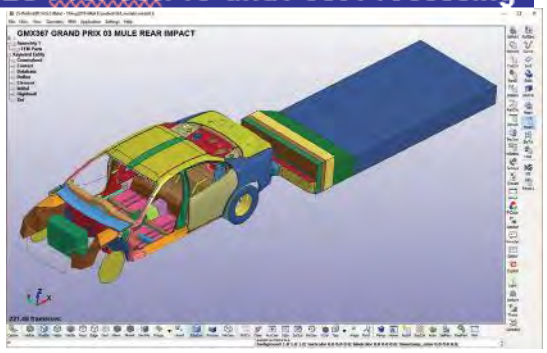
Other General Functions

- Tools to display, reverse, and auto reverse the normal vector directions of Shells, Segments, Thick Shells, and Cohesive Elements
- Printing of High Definition pictures in a choice of formats
- Movie creation for animation sequences
- Commands, Macros and a Scripting Command Language (SCL) with C /Python API for automated Pre- and Post-Processing

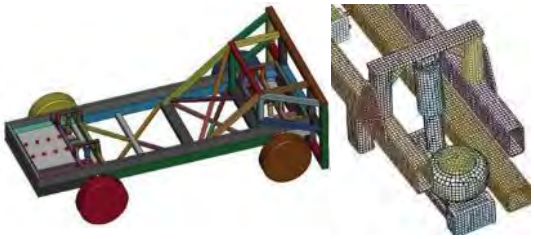
Applications

- Airbag folding
- Comprehensive model checking including contact initial penetration check
- Dummy positioning
- Metal forming process setup
- Seatbelt fitting

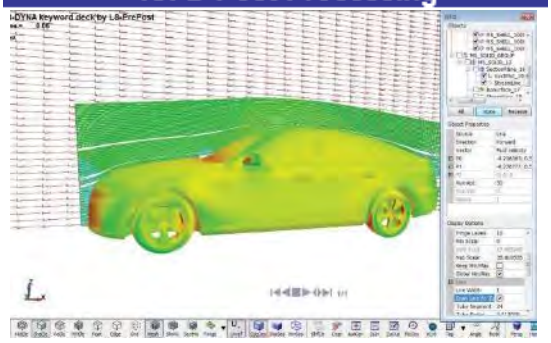
LS-PrePost Pre-and Post-Processing



LS-DYNA Geometry and Meshing



ICFD Post-Processing



LS-TaSC™ for Topology and Shape Design

LS-TaSC is for the topology and shape optimization of large non-linear problems, involving dynamic loads and contact conditions. The focus is on multidisciplinary topology optimization considering a combination of impact, statics, and NVH load cases. The methodology is specifically developed for huge models and requires no special treatment for nonlinearities such as contact.

General abilities

- Solid design using 1st-order hexahedrons, pentahedra, and tetrahedral elements
- Shell design using 1st-order quadrilateral and triangular elements
- Global constraints using the multi-point scheme and surrogate models
- Multiple load cases such as impact, statics, and NVH load cases with/out element deletion
- Occupant safety features such as global variables and responses
- Models with more than 10 million elements
- Geometry definitions such as multiple parts, extrusion, symmetry, edge smoothing, one or two sided casting

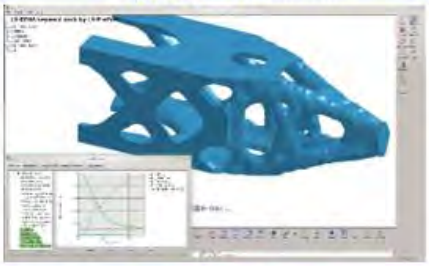
Methodologies

- Solid / Void Schemes: SIMP, True Mechanics
- Analytical and/or Numerical Design Sensitivity Analysis
- Optimality Criteria for Dynamic Problems
- Projected Sub-gradient Design Optimization Method
- Design Contribution Estimation

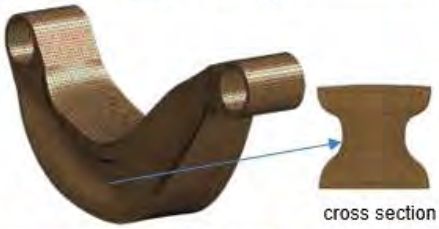
Integration

- With LS-DYNA – No special treatment for nonlinearities such as contact
- With LS-PrePost – Results visualization and model editing
- With LS-OPT – LS-OPT can drive LS-TaSC for complex design schemes

LS-TaSC User Interface



Surface Design

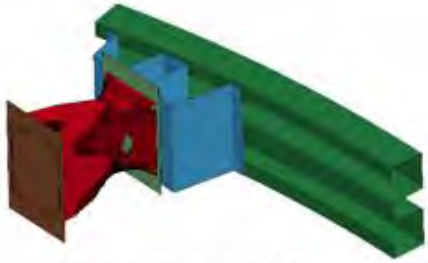


cross section

Hood Design

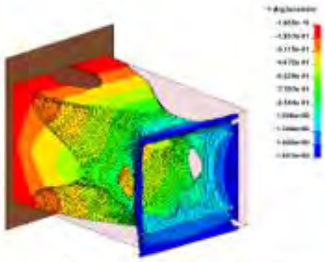
Model courtesy of Jaguar Land Rover

Crash Box Design



Final design of crash box

Deformation at t=30 ms



First bending mode in y-direction

LS-TaSC® New Release Version 4.2

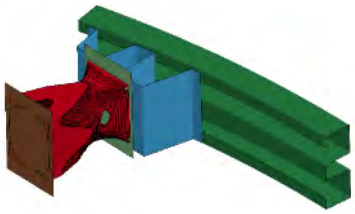
LS-TaSC Version 4.2 has the following new features:

1. *Constrained Multidisciplinary Design Optimization:* this release can solve multidisciplinary topology optimization problems for the combination of impact, NVH, and static load cases. The importance of each design discipline is defined using one or more constraints. The design sensitivity analysis of constraints related to NVH is computed analytically, while the design sensitivity of the impact related constraints is handled using a numerical, multipoint scheme. This design framework can therefore tackle complex problems; for example, the hood structure below was solved for a HIC (Head Injury Criterion) constraint from an impact load together with a displacement constraint from a static load, while the problem at the bottom of the page considered both the natural frequency and the crash deformation behavior.

Hood optimization problem considering both impact and static load cases. Model courtesy of Jaguar Land Rover.

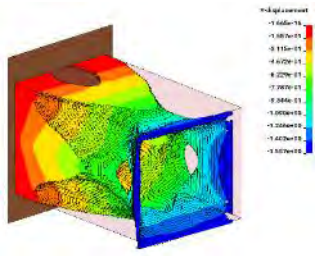
Final design of Hood with side view at upper and bottom view at lower

2. The constraints from different load cases can have drastically different scales. *Normalizing constraints using bounds* was therefore added as an optional setting in the Method dialog.
3. Contact setting was updated to (1) *set eroding surface contact automatically*, and (2) *allow mortar contact definitions*.
4. Failed elements are handled by strengthening them, instead of deleting them as before.
5. The design contribution plots show the effect of the different design disciplines on the final design. These plots were updated to account for the effects of the constraints.



Final design of crash box for crashworthiness and NVH

Crashing deformation at t=30 ms



First bending mode in y-direction

New version download: http://ftp.lstc.com/user/ls-tasc/v4.2/

Providing engineering services to the composites industry since 1970. During this time, we have participated in numerous programs that demonstrate our ability to perform advanced composite design, analysis and testing; provide overall program management; work in a team environment; and transition new product development to the military and commercial sectors.

Progressive Composite Damage Modeling in LS-DYNA (MAT162 & Others)

Bazle Z. (Gama) Haque, Ph.D.
Senior Scientist, University of Delaware Center for Composite Materials (UD-CCM)
Assistant Professor of Mechanical Engineering, University of Delaware, Newark, DE 19716 P: (302) 690-4741 | E: bzhaque@udel.edu

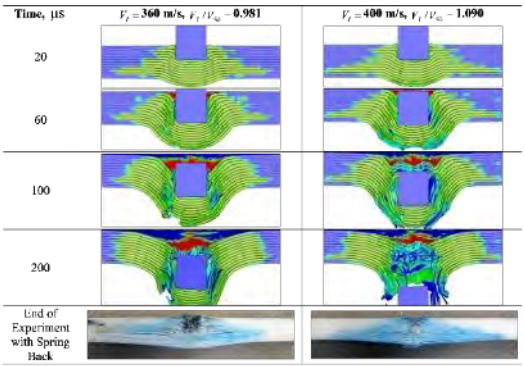
Final 2020 Webinar Course Date
November 17, 2020

Cost: $695 per person
Includes: USB with Course Content

Description:

Progressive damage modeling of composites under low velocity impact, and high velocity impact is of interest to many applications including car crash, impact on pressure vessels, perforation and penetration of thin and thick section composites. This course will provide a comparison between available composite models in LS-DYNA for shell and solid elements, e.g., MAT2, MAT54, MAT59, & MAT162. Among these material models, rate dependent progressive composite damage model MAT162 is considered as the state of the art. This short course will include the theory and practice of MAT162 composite damage model with applications to low and intermediate impact velocities, understanding the LS-DYNA programming parameters related to impact-contact, damage evolution, perforation and penetration of thin- and thick-section composites. Printed copies of all lecture notes will be provided along with a CD containing all example LS-DYNA keyword input decks used in this short course.Topics Covered in this Short Course:

Impact and Damage Modeling of Composites
Application of MAT162 in Engineering and Research Problems
Introduction to Composite Mechanics
Introduction to Continuum Mechanics and Composite Mechanics
Composite Material Models in LS-DYNA for Shell and Solid Elements
Discussion on MAT2, MAT54, MAT59, & MAT162
Theory and Practice in MAT162 Progressive Composite Damage Model for Unidirectional and Woven Fabric Composites
MAT162 User Manual – Version 15A 2015
Progressive Damage Modeling of Plain-Weave Composites using LS-Dyna Composite Damage Model MAT162
Unit Single Element Analysis
Comparison between Different LS-DYNA Composite Models
Sphere Impact on Composite SHELL & SOLID Plates
Low Velocity Impact and Compression after Impact Applications
Modeling the Low Velocity Impact and Compression after Impact Experiments on Composites Using MAT162 in LS-DYNA
Perforation Mechanics of 2-D Membrane and Thin Composites
Penetration Mechanics of Composites and Soft-Laminates
Introduction to LS-DYNA (Document Only)



To register, please click here.

Oasys Ltd is the software house of Arup and distributor of the LS-DYNA software in the UK, India and China. We develop the Oasys Suite of pre- and post-processing software for use with LS-DYNA.

Oasys Suite version 17.1 now released!

Click here to download

Webinar to watch again

Oasys PRIMER - Introduction and Demonstration of Automotive Tools

Oasys PRIMER is used worldwide to pre-process LS-DYNA models. As well as the core tools for model creation and checking, Oasys PRIMER contains many tools to make it easier to setup automotive models/loadcases.

This webinar introduces these tools and demonstrates how to use them.

View here

Upcoming webinar
3rd December 2020
12:30 - 01:30 GMT

Learn how to use Oasys REPORTER to accelerate your LS-DYNA post-processing. REPORTER is now seamlessly integrated with the Oasys Suite, so you can quickly add images and key results data directly into reports, for sharing with your team

Register here

Oasys LS-DYNA

Social Media Channels

We would like to invite you to join our Oasys LS-DYNA Environment Software LinkedIn Group. It's a channel to share content with other Oasys LS-DYNA software users, from interesting simulations to information about our webinars and training courses.

Please join us.

Predictive Engineering provides FEA and CFD consulting services, software, training and support to a broad range of companies

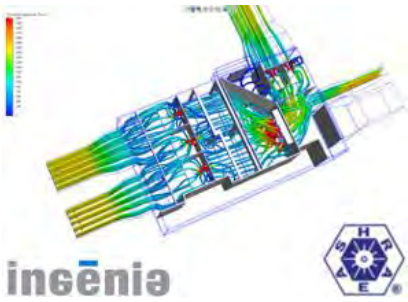
Predictive Engineering – Western States ANSYS LS-DYNA Distributor – Your Free Coffee Cup is On Its Way!

LS-DYNA has been one of Predictive's core analysis tools pretty much since we got started in 1995. It is an amazing numerical workhorse from the basic linear mechanics (think ANSYS or Nastran) to simulating well nigh the impossible. At least that is the way I feel at times when the model is not solving and spitting out arcane error messages and I'm basically questioning my sanity for accepting this project from hell that has a deadline at the end of the week. Which brings me to my favorite project management image – "trough of despair followed by wiggles of false hope then crash of ineptitude and finally the promised land" but I'll leave that for another blog.

For now, let's talk about those free coffee cups. Predictive is now the western states distributor of ANSYS LS-DYNA and provides complete sales, training and services for ANSYS LS-DYNA clients in this region. It is a continuation of our prior setup with LSTC (now ANSYS LST) with the addition of Predictive's ability to offer ANSYS Workbench with LS-DYNA and other ANSYS software tools. So where's my free coffee cup? If you are a current Predictive ANSYS LS-DYNA client, we'll be shipping'em out to you at the end of February and for our new client's – just send us an email or give us a call.

View our portfolio

FEA, CFD and LS-DYNA consulting projects



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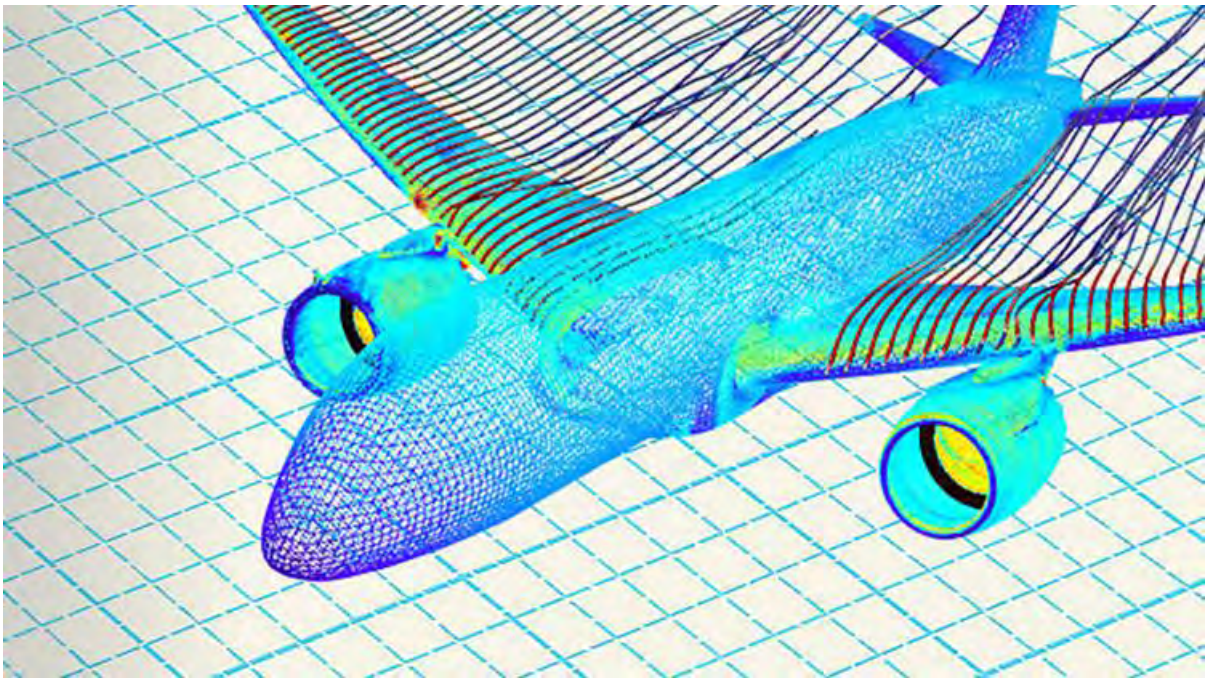
Suite 205
Portland, Oregon 97202
USA

Phone:
503-206-5571
Fax: 866-215-1220
E-mail:
sales@predictiveengineering.com

Offering industry-leading software platforms and hardware infrastructure for companies to perform scientific and engineering simulations. Providing simulation platforms that empower engineers, scientists, developers, and CIO and IT professionals to design innovative products, develop robust applications, and transform IT into unified, agile environments.



Platform Updates and Software Release Notes – October 2020

October 12, 2020

Automotive, English, Product Info & Tutorials

Jolie Hales

Rescale now works with more than 600 applications.

Here are a few **recent highlights**:

Siemens Simcenter STAR-CCM+ – v. 15.04.010 – Simcenter STAR-CCM+ is a complete multiphysics solution for the simulation of products and designs operating under real-world conditions. Learn more here.

CONVERGE 3.0.16 – CONVERGE CFD by Convergent Science is revolutionary CFD software that eliminates the grid generation bottleneck from the simulation process. Learn more here.

ThreeParticle/CAE – ThreeParticle/CAE by Becker 3D is a Multiphysics Discrete Element Method (DEM) simulation platform for bulk materials with complex shapes and built-in MBD, FEA & Fluids in a comprehensive and powerful environment. Learn more here.

Ansys Q3D Extractor (2020R2) – Ansys Q3D Extractor efficiently performs the 3D and 2D quasi-static electromagnetic field simulations required for the extraction of RLCG parameters from an interconnect structure. Learn more here.

Ansys SIwave (2020R2) – Ansys SIwave is a specialized design platform for power integrity, signal integrity and EMI analysis of IC packages and PCBs. Learn more here.

Fire Dynamics Simulator v. 6.7.5 – Fire Dynamics Simulator (FDS), developed by the National Institute of Standards and Technology (NIST) of the United States Department of Commerce in cooperation with VTT, is free large-eddy simulation (LES) code for low-speed flows, with an emphasis on smoke and heat transport from fires. Learn more here.

Particleworks – Particleworks by Prometech Software, Inc., is CFD simulation software for evaluating the behavior of liquids such as water and oil. Learn more here.

Our full software catalog is available here.

Interested in learning more or about application availability?

CONTACT AN EXPERT

LS-DYNA China, as the master distributor in China authorized by LST, an Ansys company, is fully responsible for the sales, marketing, technical support and engineering consulting services of LS-DYNA in China.

仿坤软件 LS-DYNA China

China SAE Congress & Exhibition 2020

The 2020 China SAE Congress & Exhibition will be held in Shanghai Auto Exhibition Center on 27th -29th, October. As the most recognized platform for technical exchange and display in the automotive industry in China, the conference will focus on the future development trend and innovative technologies of the automobile industry. There will be four sessions including intelligent network connected, intelligent manufacturing, new energy, bodywork and lightweight materials and will cover more than 60 thematic forums for speakers and attendees to communicate and share with each other.

As Gold Sponsor, Ansys China & Shanghai Fangkun will have a booth onsite and hold a session spotlight 'Security': Crash, EMC, Battery, Software. Welcome to attend this conference and visit our booth at the site. Conference website: http://www.saecce.org.cn/en/home/

For more LS-DYNA related information please follow our official Wechat Account "LSDYNA".

Contacts: training@lsdyna-china.com. Website www.lsdyna-china.com.

2020 Annual Training & Workshop

Dear LS-DYNA users,

To help users to better understand LS-DYNA software and use LS-DYNA more efficiently, Shanghai Fangkun releases 2020 annual training and workshop plan as following tables. We welcome those who are interested to attend.

Date	Topic	City	Duration
20-21,Feb.	Introduction to LS-DYNA (basic training)	Shanghai	2 days
Mar.	Product design with LS-OPT	Shanghai	1 day
Apr.	Crashworthiness in LS-DYNA	Shanghai	2 days
May	Material models in LS-DYNA (composite, non-metal)	Shanghai	2 days
Jun.	Introduction to LS-DYNA (basic training)	Chongqing	2 days
Jun.	Restraint system in LS-DYNA	Shanghai	2 days
Jul.	Battery multi-physics simulation with LS-DYNA	Shanghai	1 day
Sep.	Implicit analysis in LS-DYNA	Shanghai	1 day
Oct.	Fluid structure interaction with LS-DYNA (ALE, ICFD)	Shanghai	2 days
Nov.	Introduction to LS-DYNA (basic training)	Beijing	2 days
Dec.	User-Defined Materials in LS-DYNA	Shanghai	1 day

2020 LS-DYNA online workshop plan			
Date	**Topic**	**Duration**	**Fee**
13rd Jan.	Introduction to MPDB	3 hours	Free
Apr.	Contact Modeling in LS-DYNA	2 hours	Free
May	SALE method in LS-DYNA	2 hours	Free
Jun.	Introduction to Q series dummies	2 hours	Free
Jul.	NVH, Fatigue, & Frequency Domain Analysis in LS-DYNA	2 hours	Free
Aug.	SPG method in LS-DYNA	2 hours	Free
Sep.	Introduction to LS-PrePost	2 hours	Free
Sep.	Introduction to LS-OPT	2 hours	Free
Oct.	Introduction to LS-Form & Stamp forming	2 hours	Free
Oct.	Performance analysis of bus with LS-DYNA	2 hours	Free
Nov.	LST Dummy & Barrier	2 hours	Free
Nov.	EM method in LS-DYNA	2 hours	Free
Dec.	Summary of fluid structure interaction method in LS-DYNA	2 hours	Free
Dec.	Virtual Proving Ground training	2 hours	Free

Contact: Elva Yu Tel.: 18221209107, 021-61261195 for more detail information
Email: Training@lsdyna-china.com

CAE software sale & customer support, initial launch-up support, periodic on-site support. Engineering Services. Timely solutions, rapid problem set up, expert analysis, material property test Tension test, compression test, high-speed tension test and viscoelasticitiy test for plastic, rubber or foam materials. We verify the material property by LS-DYNA calculations before delivery.

TERRABYTE Co.,Ltd.
Customer Satisfaction by Computer Solution & Computer Simulation

CAE consulting - Software selection, CAE software sale & customer support , initial launch-up support, periodic on-site support.

Engineering Services - Timely solutions, rapid problem set up, expert analysis - all with our Engineering Services. Terrabyte can provide you with a complete solution to your problem; can provide you all the tools for you to obtain the solution, or offer any intermediate level of support and software.

FE analysis

- LS-DYNA is a general-purpose FE program capable of simulating complex real world problems. It is used by the automobile, aerospace, construction, military, manufacturing and bioengineering industries.
- ACS SASSI is a state-of-the-art highly specialized finite element computer code for performing 3D nonlinear soil-structure interaction analyses for shallow, embedded, deeply embedded and buried structures under coherent and incoherent earthquake ground motions.

CFD analysis

- AMI CFD software calculates aerodynamics, hydrodynamics, propulsion and aero elasticity which covers from concept design stage of aerocraft to detailed design, test flight and accident analysis.

EM analysis

- JMAG is a comprehensive software suite for electromechanical equipment design and development. Powerful simulation and analysis technologies provide a new standard in performance and quality for product design.

Metal sheet

- JSTAMP is an integrated forming simulation system for virtual tool shop based on IT environment. JSTAMP is widely used in many companies, mainly automobile companies and suppliers, electronics, and steel/iron companies in Japan.

Pre/ Post

- **PreSys** is an engineering simulation solution for FE model development. It offers an intuitive user interface with many streamlined functions, allowing fewer operation steps with a minimum amount of data entry.
- **JVISION** - Multipurpose pre/post-processor for FE solver. It has tight interface with LS-DYNA. Users can obtain both load reduction for analysis work and model quality improvements.

Biomechanics

- **The AnyBody Modeling System™** is a software system for simulating the mechanics of the live human body working in concert with its environment.




Next Phase of THEA's Connected Vehicle Pilot Brings Together Auto Manufacturers and Road Operators

October 15, 2020

TAMPA, Fla. (October 15, 2020) – Since September 2015, the Tampa Hillsborough Expressway Authority (THEA) has been working with the United States Department of Transportation (USDOT) as a Connected Vehicle Pilot site. The next step in the Connected Vehicle space is to begin working with the auto industry manufacturers. To that end, THEA is proud to announce that it is collaborating with Honda R&D Americas, LLC, Hyundai America Technical Center, Inc. (HATCI) and Toyota Motor North America to deploy vehicles with connected vehicle technology already installed. Original Equipment Manufacturer (OEMs) vehicles and hardware provide the next evolution of delivering safer transportation.

This collaboration is among the first of its kind where multiple OEMs are coming together in an existing Connected Vehicle (CV) deployment. The OEM vehicles will not only interact with one another but also the existing CV Pilot participants. Each of the OEMs has selected DENSO, a leading mobility supplier with over 15 years of vehicle-to-everything (V2X) experience, as its onboard unit (OBU) provider. Building on the CV Pilot apps, DENSO will develop a common set of CV apps for the OEMs, enabling the rapid communication between vehicles and surrounding infrastructure.

This is an important step in continuing the testing of transportation safety applications to provide drivers with the best information possible. THEA's CV Pilot applications have proven that information from connected infrastructure can benefit drivers, automakers, and road operators as a means to transmit crucial safety information. In the past 18 months, the THEA CV Pilot has warned 14 wrong-way drivers on interchange ramps, nine potential trolley crashes, and has given over 1,500-speed advisories a month on freeway exit ramps, to state a few examples.

This collaboration with Honda, Hyundai and Toyota is the next step in making connected roadways a reality in Tampa Bay. Connecting roadways and infrastructure lays the foundation toward a technology-based transportation system – a true "Smart City."

"Through connected vehicle and infrastructure deployment like our Smart Intersection technology in Ohio, Honda has gained an understanding of the early benefit of vehicle-to-everything (V2X) from the infrastructure side," said Sue Bai, chief engineer, Automobile Technology Research Division, Honda. "The Tampa CV Pilot offers another great opportunity to collaborate with government entities and road operators to expand V2X deployment and help bring safety and mobility benefits to our customers and society sooner, ultimately working toward Honda's vision for a collision-free society."

"The Tampa CV pilot provides an opportunity for Hyundai Motor Group to continue research the safety, mobility, and ecological benefits of a connected vehicle in a real world environment," said John Robb, director, Electronic Systems Development, Hyundai Motor Group. "Deployment of prototype OnBoard Units (OBUs) by retrofitting them into participants' vehicles in Tampa enables us to collect data and understand customers' experiences of this V2X technology."

"Toyota is excited to support the V2X deployment initiative in Tampa because realization of cooperative transportation systems, with V2X technologies is important for creating a more safe and eco-friendly mobility future," said Jeff Makarewicz, group vice president — Advanced Mobility Research & Development, Toyota Motor North America.

In September 2020, phase 4 of the THEA CV Pilot kicked off to begin the planning for incorporating the OEMs into the pilot. The current plan is for the OEMs to deploy six of the CV Pilot apps. One new app will be added as well. A demonstration showcase will likely be held in Q4 of 2021. At that time, Honda, Hyundai, Toyota and THEA will highlight how OEM vehicles, equipped with prototype CV technologies, can interact with the CV Pilot vehicles and roadside units.

"This next step – integrating multiple auto manufacturers onboard technology, will show how connected vehicle technology can be incorporated into the cars coming off the line," said Bob Frey, innovation director and CV Project Manager. "Honda, Hyundai and Toyota have been great to work with and have always put safety of their customers first. This new collaboration shows just how much they are willing to work together to achieve their goal."

About DENSO

DENSO is a $47.6 billion global mobility supplier that develops advanced technology and components for nearly every vehicle make and model on the road today. With manufacturing at its core, DENSO invests in its 221 facilities in 35 countries to produce thermal, powertrain, mobility, electrification, & electronic systems, to create jobs that directly change how the world moves. The company's 170,000+ employees are paving the way to a mobility future that improves lives, eliminates traffic accidents, and preserves the environment. Globally headquartered in Kariya, Japan, DENSO spent 9.9 percent of its global consolidated sales on research and development in the fiscal year ending March 31, 2020. For more information about global DENSO, visit https://www.denso.com/global.

In North America, DENSO is headquartered in Southfield, Michigan, and employs 27,000+ engineers, researchers and skilled workers across 51 sites in the U.S, Canada and Mexico. In the United States alone, DENSO employs 17,700+ employees across 14 states (and the District of Columbia) and 41 sites. In fiscal year ending March 31, 2020, DENSO in North America generated $10.9 billion in consolidated sales. DENSO is committed to advancing diversity and inclusion inside the company and beyond – a principle that brings unique perspectives together, bolsters innovation and pushes DENSO forward. Join us, and craft not only how the world moves, but also your career: www.densocareers.com. For more information, go to https://www.denso.com/us-ca/en/.

About Honda R&D Americas, LLC

Honda R&D Americas, LLC (HRA) began operations in America in 1975 as Honda Research America in California. Today, HRA operates 10 facilities in the U.S., responsible for creating advanced products and technologies that provide new value to Honda and Acura customers. HRA conducts all phases of product development in the U.S., from market and technology research and styling through engineering design to prototype fabrication and testing, local parts procurement and support for mass production preparation. With major facilities in California, Ohio, North Carolina and Florida, HRA is engaged in the development and testing of Honda and Acura automobiles, Honda powersports and power equipment products, and also plays a lead role in the development of leading-edge safety, driver assistive and environmental technologies. Learn more at http://www.hondaresearch.com/.

About Hyundai America Technical Center, Inc.

As one of Hyundai Motor Group's (HMG) seven global centers focused on research and development (R&D), HATCI was established in 1986 in Ann Arbor, Michigan. HATCI is HMG's design, technology and engineering division for North America. As HMG solidified its position as one of the top five global OEMs, HATCI has grown to include a strong network of engineering disciplines and increased business-focused activities to support North America's Voice of the Customer.

HATCI supports new model development for HMG's North American operations and global programs from our dedicated engineering facilities and support staff at affiliate sites located throughout the United States (Alabama, California, Georgia, Michigan, and Washington D.C.). HATCI's success in satisfying the demands of increasingly sophisticated consumers is a direct result of HMG's commitment to the future of American automotive engineering. HATCI upholds a strong R&D philosophy hinged on the creative and passionate input of all team members. This philosophy is paramount to HMG's North American operational strategy and serves as the foundation for engineering excellence and technological advancement.

More information about Hyundai Motor and its products can be found at www.hatci.com, http://worldwide.hyundai.com, or http://globalpr.hyundai.com

About THEA

A public agency led by local citizens and operating with no tax dollars, the Tampa Hillsborough Expressway Authority (THEA) provides safe, reliable, and financially sustainable transportation services to the Tampa Bay region while reinvesting customer-based revenues back into the community. From being the owner and operator of the Lee Roy Selmon Expressway to offering real-time testing and showcasing of connected vehicle and autonomous vehicle technologies, to the design and operation of the world's first reversible all-electronic toll road, THEA continues to drive the conversation on cutting-edge transportation solutions. For more information, visit www.tampa-xway.com.

The THEA CV Pilot employs state-of-the-art technology that allows vehicles to communicate to roadside infrastructure and other vehicles about traffic, hazards, and other potential factors affecting pedestrian, vehicle, and bicycle safety.

About TMNA R&D

Toyota Motor North America Research & Development (TMNA R&D) aims to redefine next-generation cars as not simply a form of transportation, but as a fully connected vehicle. In fact, since 2003, Toyota has been awarded more patents than any other automaker, including autonomous vehicle patents (more than 1,400). Centered in Ann Arbor, Michigan, Toyota puts the brightest thinkers from all across America together to focus on letting people live more safely and comfortably. Globally, Toyota spends approximately $1 million per hour on R&D to ensure that Toyota rapidly and continuously develops cutting-edge, high-quality, and appealing vehicles.

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LS-DYNA - Resource Links

LS-DYNA Multiphysics YouTube

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A TWO-SCALE APPROACH FOR THE DROP SHOCK SIMULATION OF PCB PACKAGE CONSIDERING THE REFLOWED SOLDER BALL GEOMETRIES

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In this paper, we introduce a new computational approach for linking the information of mesoscale solder ball shapes to the macroscale drop test of a printed circuit board (PCB). The approach starts with a numerical prediction of mesoscale solder bump profiles using a novel full-implicit Lagrangian particle method to approximate the Navier-Stokes equations and efficiently simulate the incompressible free surface reflow soldering process. The surface tension of the molten solder and the wall adhesion between the solder and the substrate are considered in the simulation. Subsequently, the predicted solder ball shapes from the reflow analysis are used in a chip package model for the drop shock analysis. The mesoscale solder joint model is coupled concurrently with the macroscale chip package model using the co-simulation to achieve the non-intrusive scale-bridging effect. To attend practical explicit-explicit two-scale co-simulations, an algorithm that handles properly the load-balancing, heterogeneity of processors and memory also has been developed. We present four numerical examples that showcase the effectiveness of the new approach.

1. INTRODUCTION

The objective of this study is to develop a new computational approach via a co-simulation technique that addresses the three critical needs in higher-level modeling of chip scale drop tests. In essence, an effective modeling of drop shock reliability of solder joints demands an accurate solder ball reflow simulation using a solid element formulation for the prediction of mesoscale solder ball geometry as well as a meso-macroscale coupling method for the explicit dynamics analysis.

2. A FULL-IMPLICIT ISPG FORMULATION WITH SURFACE TENSION AND ADHESION EFFECTS

Incompressible smoothed particle Galerkin (ISPG) method (Pan et al., 2020) is a semi-implicit fluid-dynamics version of smoothed particle Galerkin (SPG) method (Wu et al., 2017; Wu et al., 2018). As one of the new CFD methods, ISPG method differs from others in several important aspects. Unlike Eulerian finite element or finite volume methods, ISPG method solves the Navier-Stokes equation in a Lagrangian fashion for free

surface fluid flow problems. This eliminates the need of using the expensive surface-tracking techniques to locate the free surface. ISPG method utilizes a momentum-consistent velocity smoothing algorithm (Pan et al., 2019; Wu et al., 2020) from SPG method to stabilize the velocity field. This is different from existing Lagrangian particle methods such as incompressible smoothed particle hydrodynamics (ISPH) (Asai et al., 2012) and moving particle semi-implicit method (MPS) (Koshizuka and Oka, 1996) which usually rely on *ad hoc* techniques based on particle shifting, artificial viscosity or density-invariant conditions for stabilization (Pan et al., 2020). ISPG also incorporates a pressure correction method which employs a second-order rotational incremental pressure-correction scheme (Guermond et al., 2006) to stabilize the pressure field and to enforce the consistency of Neumann boundary condition; see e.g., (Pan et al., 2020) for the ISPG method in detail. In order to model the solder reflow process more efficiently and accurately than the semi-implicit ISPG method, a full-implicit ISPG method is developed in this study. Additionally, we supplement the full-implicit ISPG formulation with the surface tension for molten solder. We also consider the wall adhesion between the solder and the substrate to better predict the reflowed solder ball shape. Usually the solder reflowing process takes several minutes, and the implicit approach should be used in the structural analysis for the efficiency reason. A coupling algorithm between the implicit ISPG solver and the implicit structure solver is developed, which is summarized in a flowchart shown in Fig. 1.

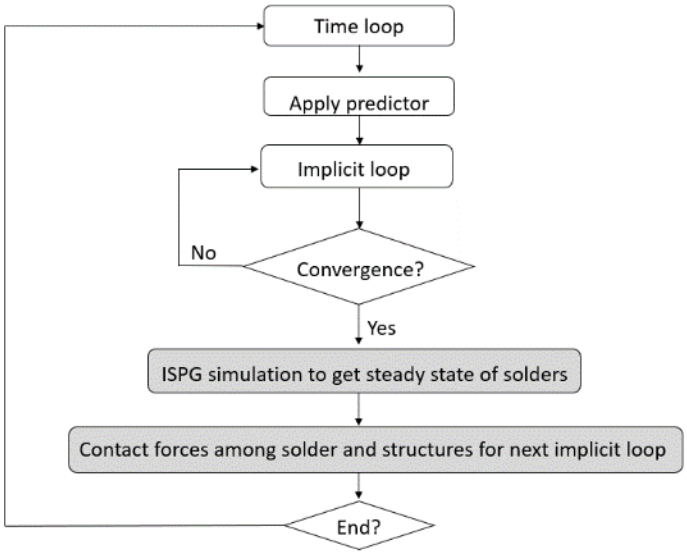


FIG. 1: Flow chart for coupling of the ISPG solver and implicit structure solver

3. TWO-SCALE CO-SIMULATION FOR DROP TEST SIMULATION

In explicit dynamic simulation of drop test, the critical time step in Δt^L needed in mesoscale solder joints model will be much smaller than Δt^{G} required in macroscale chip package model. Therefore, instead of imposing the same small time step size on the whole structure, we isolate the computation in mesoscale model

but make it run simultaneously with macroscale structures using the co-simulation. The co-simulation is performed using global/local setup, where the collective communication between global and local jobs is carried out at synchronization points currently through MPI. An adaptor is called by two local jobs to exchange data and synchronize the time integration so that the main structure of existing finite element code needs no change to be adopted in both jobs. Fig. 2 shows the flowchart of proposed co-simulation using central difference time integration scheme.

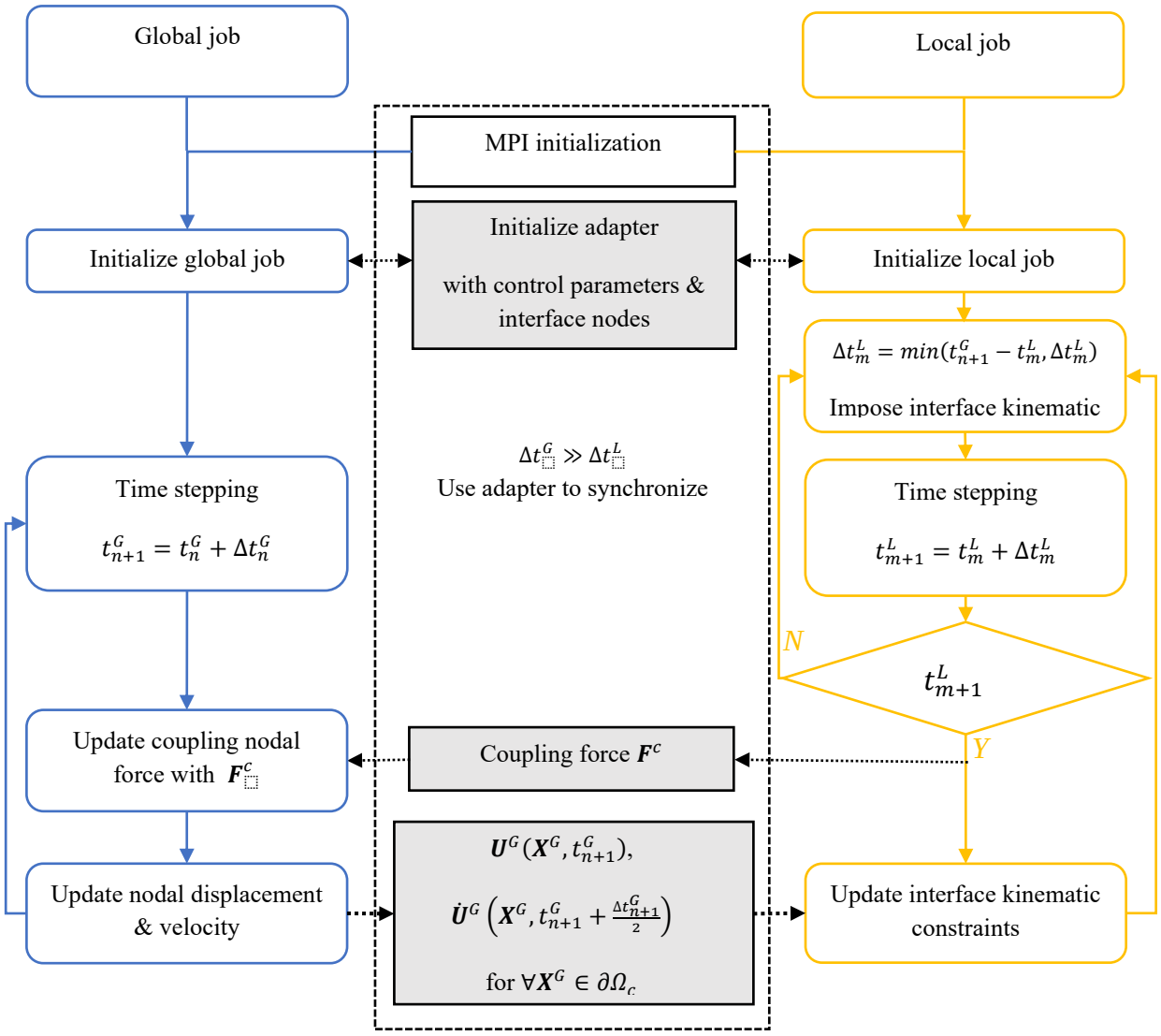


FIG. 2: The co-simulation flowchart

4. NUMERICAL EXAMPLES

4.1 ISPG for Solder Ball Shape Prediction

In this example, we will investigate the assembly of BGA with solder joints. The assembly consists of 100 SAC405 solder joints shown in Fig. 3. All solders are modeled with Solder Mask-Defined (SMD) at the device. Due to symmetry of the assembly geometry, only one-quarter of the assembly is modeled, and the symmetrical boundary conditions are applied at the corresponding boundaries. The original geometries of the solder joints are modeled as cylinders with diameter of 0.48mm and height of 0.4mm. The solder will be deformed under the surface tension and the pression of the copper traces, which are simplified as two thin plates with 0.02mm thickness. The applied velocity at the corner point of the silicon die shown in Fig. 3 is $\bar{v} = 1.6667 \times 10^{-6}\text{mm/ms}$ from 0ms to 60,000 ms, and the total displacement is 0.1 mm.

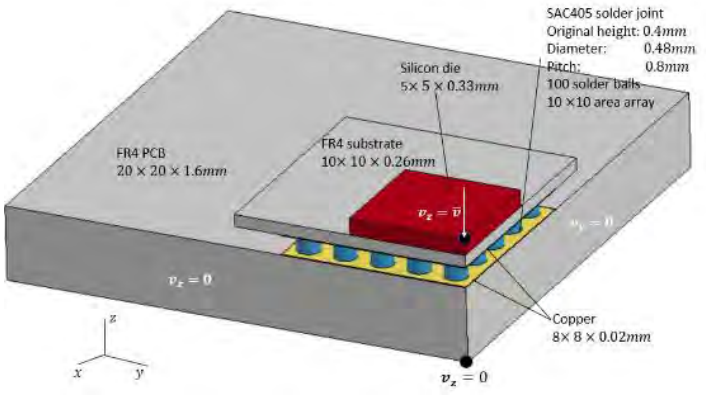


FIG. 3: Sketch view of the quarter model of the BGA assembly

The FR4 PCB, FR4 substate, copper traces and silicon die are discretized with hexahedron element (element formulation -1 in LS-DYNA) with 0.5mm size in x and y direction, and with 4, 2, 1 and 2 elements in thickness direction as show in Fig. 4. Each solder joint is discretized with 1560 hexahedron elements and 1819 nodes, then they are transferred to ISPG elements. Finally, there are totally 49277 nodes in the model.

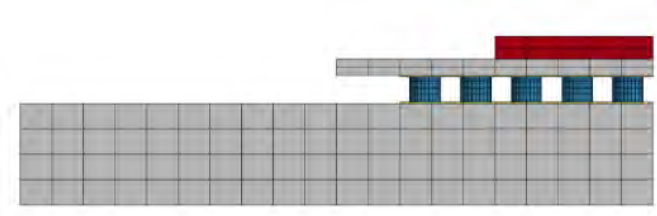


FIG. 4: Meshing of the quarter model of the BGA soldering

The initial temperature is set as 25℃, and linearly increased to 200℃ from 0ms to 60,000 ms. Currently the thermal effects in the solder joints is not considered. The density and surface tension of the solders are $8.93 \times 10^{-6} g/mm^3$, $4.985 \times 10^{-6} kN/mm$, and the dynamic viscosity ϑ is $2.27 \times 10^{-7} kN\ ms/mm^2$. The material property of the FR4, copper trace and silicon die are listed in Tables 1-3.

TABLE 1: Material property of FR4 PCB and substrate

Poisson's ratio v_{xv}	0.11
Poisson's ratio v_{vz} and v_{xz}	0.39
Thermal expansion α_x and α_v [ppm/°C]	16
Thermal expansion α_z [ppm/°C]	84
Young's modulus E_x and E_v [MPa]	27,924
Young's modulus E_z [MPa]	12,204
Shear modulus G_{xv} [MPa]	12,600
Shear modulus G_{xz} and G_{vz} [MPa]	5,500

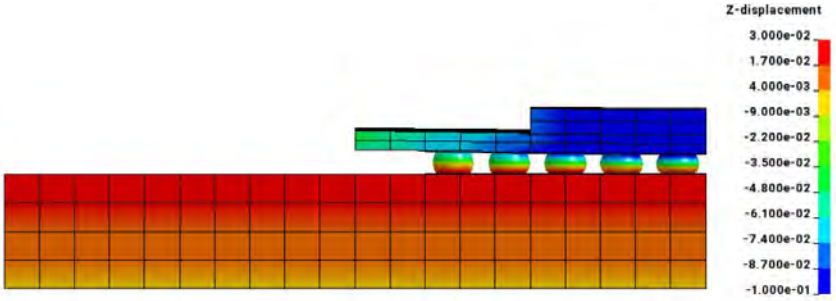
TABLE 2: Material property of silicon die

Poisson's ratio v	0.28
Thermal expansion α [ppm/°C]	2.113
Young's modulus E [MPa]	132,460

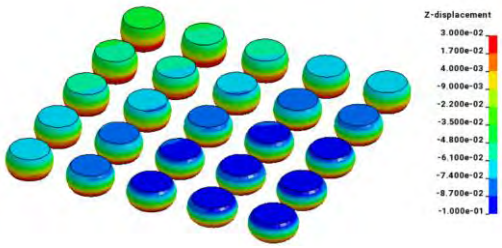
TABLE 3: Material property of copper trace

Poisson's ratio v	0.35
Thermal expansion α [ppm/°C]	15.64
Young's modulus E [MPa]	141,920

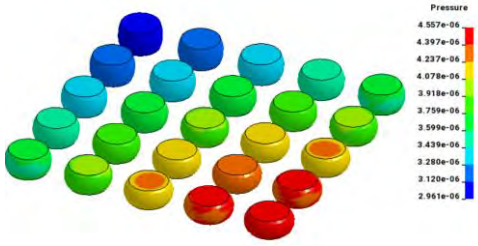
Fig. 5 (a) shows the final configuration of the BGA assembly where the warpage can be observed in the FR4 substrate, which is caused by the mismatch of the thermal expansion coefficient between the FR4 substrate and the silicon die. The warpage of the FR4 substrate leads to different geometries of the solders as shown in Figs. 5 (b) and (c) displayed in the z-displacement and pressure contours, respectively.



(a)



(b)



(c)

FIG. 5: Final configuration of the BGA assembly
(a) front view of the final deformation; (b) view of the deformed solders: z-displacement contour (mm); (c) view of the deformed solders: pressure contour (Gpa)

4.2 A PCB Package Drop Test Using Global-Local Co-Simulation

JEDEC Test Standard describes the procedures and conditions to conduct a board-level drop test on electronic packages (JEDEC Standard JESD22-B111). The PCB is mounted at each corner to a base plate that is secured to the drop table. The drop table is released to freely impact the strike table from a prescribed height. A half sine impulse is produced when the table strikes the rigid base and the impulse generates stress wave that propagates through the mounting positions of the PCB to the solder joints in the center of the board (Tamin and Shaffiar, 2014). Using the dissimilar reflowed solder ball geometries in Example 4.3, the drop shock reliability of board-level PCB package is assessed with two-scale co-simulation in this section. The characteristic deformation of solder balls is quantified and compared in two-scale co-simulation system and direct numerical simulation (DNS) method. To produce the desired half-sine input loading, an input G method with large mass is employed in this simulation (Dhiman et al., 2008; Syed et al., 2005). In this method, a large mass element is attached to the position of the mounting holes and the acceleration is converted into force input by multiplying the acceleration with large mass. This large mass method is capable of applying acceleration on the mounting points effectively. An equivalent drop height of $H = 1.12\text{m}$ is selected and the impulse duration is 0.5ms, which corresponds to a peak acceleration of 1500G $(14716\ \text{m/s}^2)$ at time 0.25ms (Tamin and Shaffiar, 2014).

Considering the stress wave propagation from mounting points to solder joints, the deformed model of PCB assembly is extended to 200mm by 100mm in the length and width direction, respectively. The schematic view of the quarter PCB assembly in board-level drop test is shown in Fig. 6.

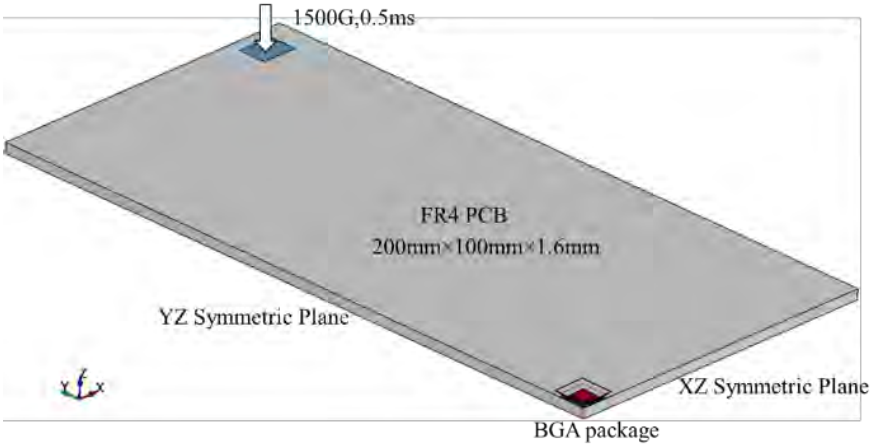
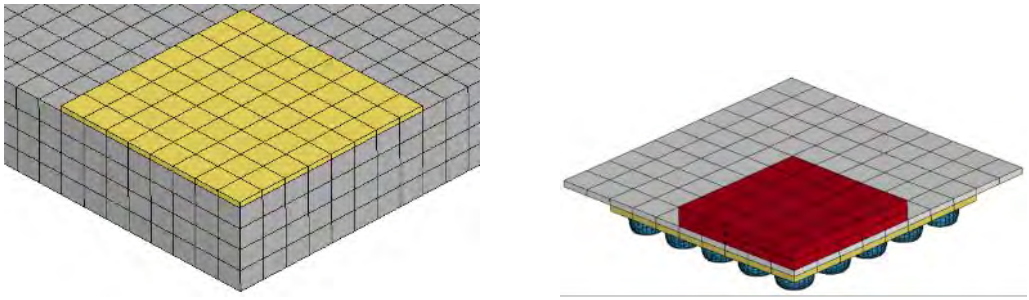


FIG. 6: Schematic view of the quarter PCB assembly for board-level drop test simulation

There are 194,611 nodes and 155,878 hexahedron elements in the whole simulation model, which is composed of macroscale model and mesoscale model as shown in Figs. 7 (a) and (b), respectively. The macroscale model consists of FR4 PCB board and lower copper traces with 116,664 elements, while solder balls, upper copper traces, FR4 substrate and silicon die are included in the mesoscale model with 39,214 elements for detailed structural analysis. The material properties of the FR4, copper trace and silicon die follow the values in Table 1-3 without considering the thermal effect in the drop simulation. The material property of solders is

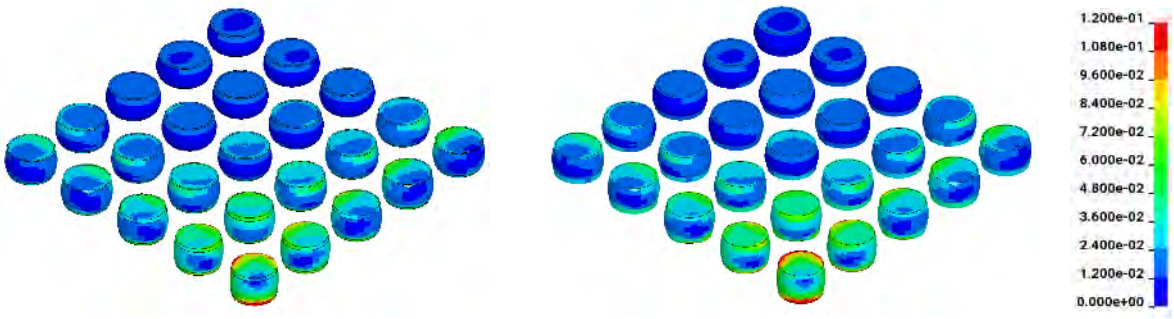
identical to that in reflow analysis. The analyses of macroscale model and mesoscale model are performed in two separated simulation jobs with information exchange using the framework shown in Fig. 2. The co-simulation duration is 1.5ms.



(a) (b)

FIG. 7: Finite element mesh of macroscale and mesoscale model:
(a) macroscale model; (b) mesoscale model

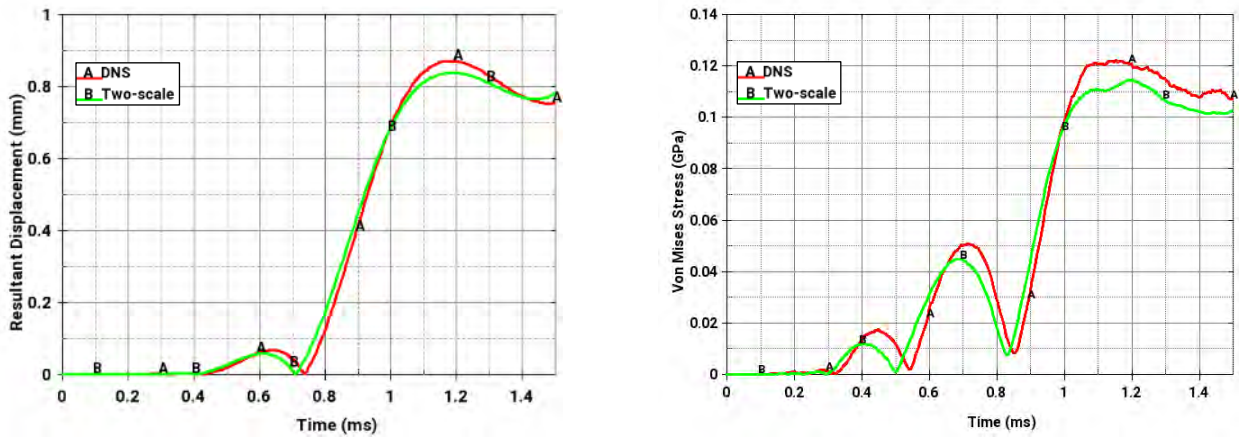
The predicted distribution of von Mises stress in the solder balls at $t = 1.085ms$ by two-scale co-simulation and DNS is compared in Fig. 8. Both the distribution and the magnitude of von Mises stress match very well. It is clear that the corner solder ball has the largest von Mises stress and is the most critical solder ball.



(a) (b)

FIG. 8: Von Mises stress distribution at the upper interface of solder balls at $t = 1.085ms$:
(a) Two-scale co-simulation (GPa); (b) DNS (GPa)

The displacement evolution at the center of silicon die by two-scale co-simulation and DNS is compared in Fig. 9 (a). The evolution of von Mises stress at one of elements in the most critical solder ball is also compared in Fig. 9 (b). Excepting local oscillations, the results using two-scale so-simulation match well with DNS. An initial delay with initial input impulse is observed in both methods due to the stress wave propagation from the mounting points of PCB to the solder ball.



(a) (b)

FIG. 9: Comparison of displacement and Von Mises stress evolution
(a) resultant displacement at the center of silicon die; (b) Von Mises stress of the most critical solder ball

In terms of computational cost, two-scale co-simulation costs around 39 minutes with 24 CPU cores (8 for macroscale model and 16 for mesoscale model), while DNS takes around 137 minutes using the same number of CPU cores. A high efficiency can be achieved by two-scale co-simulation system with great accuracy. The Intel(R) Xeon(R) Silver 4116 CPU @ 2.10GHz is used for the computation. The comparison of normalized computation time and the CPU usage are summarized in Table 4.

TABLE 4: Comparison of normalized computation time and CPU usage

DNS	Present method
1.0	0.285
24 CPUs	8 CPUs for macroscale model + 16 CPUs for mesoscale model

5. CONCLUSIONS

This paper presents a new computational approach that utilizes multiple software and separate runs via co-simulation based on the bridging domain and multi-time-step techniques in explicit dynamics analysis. It links the information of dissimilar mesoscale solder ball geometries to the macroscale drop test of a printed circuit board (PCB) for an accurate, efficient and convenient multi-scale analysis. Two key developments are disclosed in this study. First, a fully implicit ISPG formulation incorporating the surface tension and cohesion force terms is developed for simulating the free-surface solder reflow process. This new method allows engineers to efficiently establish the geometry of solder ball in the mesoscale level prior to performing solder joint reliability analysis in the macroscale. Second, an explicit-explicit non-intrusive two-scale coupling method via the co-simulation technique is introduced to the two-scale system for the drop test simulation.

This multiscale approach permits a new two-way coupling between the mesoscale solder joint model and macroscale chip package model for the CSPs drop shock analysis. From the best of authors' knowledge, the multiscale method has not been made available in the electronics industry for the drop shock analysis. The present approach also avoids a tedious matching mesh issue and compromises the accuracy and efficiency requirements in the industrial application.

The results in first two numerical examples revel that the proposed implicit ISPG formation is able to accurately and efficiently predict the solder reflow profile. Unlike the existing approaches that only apply to specific solider joints, the new ISPG method provides an off-the-shelf solution to handle complex solder joint types in PCB packages. The last two numerical examples present a new multiscale simulation utilizing the reflowed solder ball shapes for the drop test of a chip-scale package. In comparison to the DNS result, the multiscale result indicates that the present method is capable of delivering an accurate and efficient solution. To further improve the accuracy of reliability analysis, the underlying microstructure of the lead-free solder ball will need to be addressed. This involves the modeling of solidification and grain growth process in reflow soldering which will be investigated in the near future.

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BETA
SIMULATION SOLUTIONS

BETA CAE Systems. www.beta-cae.com

BETA CAE Systems - ANSA

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 LST, an ANSYS company to provide an integrated solution in the field of optimization.

BETA CAE Systems μETA

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

ETA – Engineering Technology Associates www.eta.com
etainfo@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.

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.

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 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.

LST

Livermore Software Technology, an ANSYS Company
www.lstc.com

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 LST, an ANSYS company. 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.

LST, AN ANSYS COMPANY 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.

LST, AN ANSYS COMPANY Barrier Models

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

Material Sciences Corporation www.materials-sciences.com

Materials Sciences Corporation has provided engineering services to the composites industry since 1970. During this time, we have participated in numerous programs that demonstrate our ability to: perform advanced composite design, analysis and testing; provide overall program management; work in a team environment; and transition new product development to the military and commercial sectors. MSC's corporate mission has expanded beyond basic research and development now to include transitioning its proprietary technologies from the research lab into innovative new products. This commitment is demonstrated through increased staffing and a more than 3-fold expansion of facilities to allow in-house manufacturing and testing of advanced composite materials and structures.

Materials Sciences Corporation (MSC) MAT161/162 - enhanced features have been added to the Dynamic Composite Simulator module of LS-DYNA.

This enhancement to LS-DYNA, known as MAT161/162, enables the most effective and accurate dynamic progressive failure modeling of composite structures to enable the most effective and accurate dynamic progressive failure modeling of composite structures currently available.

MSC/LS-DYNA Composite Software and Database -

Fact Sheet: http://www.materials-sciences.com/dyna-factsheet.pdf

- MSC and LSTC have joined forces in developing this powerful composite dynamic analysis code.
- For the first time, users will have the enhanced ability to simulate explicit dynamic engineering problems for composite structures.
- The integration of this module, known as 'MAT 161', into LS-DYNA allows users to account for progressive damage of various fiber, matrix and interply delamination failure modes.
- Implementing this code will result in the ability to optimize the design of composite structures, with significantly improved survivability under various blast and ballistic threats.

MSC's LS-DYNA module can be used to characterize a variety of composite structures in numerous applications—such as this composite hull under blast.

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

www.predictiveengineering.com

Predictive Engineering provides finite element analysis consulting services, software, training and support to a broad range of engineering companies across North America. We strive to exceed client expectations for accuracy, timeliness and knowledge transfer. Our process is both cost-effective and collaborative, ensuring all clients are reference clients.

Our mission is to be honest brokers of information in our consulting services and the software we represent.

Our History

Since 1995, Predictive Engineering has continually expanded its client base. Our clients include many large organizations and industry leaders such as SpaceX, Nike, General Electric, Navistar, FLIR Systems, Sierra Nevada Corp, Georgia-Pacific, Intel, Messier-Dowty and more. Over the years, Predictive Engineering has successfully completed more than 800 projects, and has set itself apart on its strong FEA, CFD and LS-DYNA consulting services.

恒士达科技
Hengstar Tech.

Shanghai Hengstar www.hengstar.com

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..

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 focuses 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..

Cloud - HPC Services - Subscription JSOL

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 increased needs for additional LS-DYNA cores

In calculations of optimization, robustness, statistical analysis, we find that an increase in cores of LS-DYNA are needed, for short term extra projects or cores.

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

This service is offered to customers using Cloud License fee schedule, the additional fee is less expensive 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.

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

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

Cloud - HPC Services - Subscription RESCALE

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.

Cloud - HPC Services - Subscription RESCALE

Rescale Cloud Simulation Platform www.rescale.com

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

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

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.

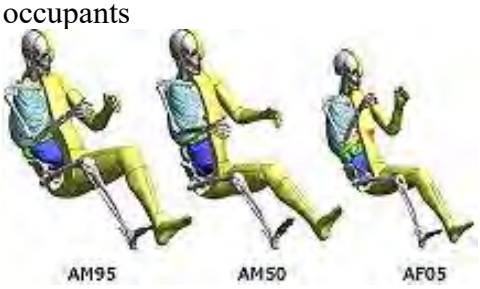
Key collaboration capabilities:

- 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

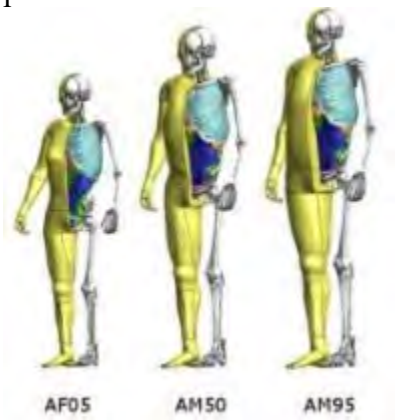
TOYOTA - Total Human Model for Safety – THUMS

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.

LST, An ANSYS Company – Dummy Models

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

LST, An ANSYS Company – 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

LSTC ODB and MDB models are developed to correlate to several tests provided by our customers. These tests are proprietary data and are not currently available to the public.

All current models can be obtained through our webpage in the LSTC Models download section or through your LS-DYNA distributor.

To submit questions, suggestions, or feedback about LSTC's models, please send an e-mail to: atds@lstc.com. Also, please contact us if you would like to help improve these models by sharing test data.

Social Media

FACEBOOK

BETA CAE Systems
CADFEM
ESI Group

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BETA CAE Systems
ESI Group
ETA
CADFEM

LINKEDIN

BETA CAE Systems
CADFEM
DYNAmore Nordic
ETA
ESI Group

YOUTUBE

YOUTUBE Channel	WebSite URL
BETA CAE Systems	www.beta-cae.com
CADFEM	www.cadfem.de
ESI Group	www.esi-group.com
ETA	www.eta.com
Lancemore	www.lancemore.jp/index_en.html

GOOGLE+

BETA CAE Systems