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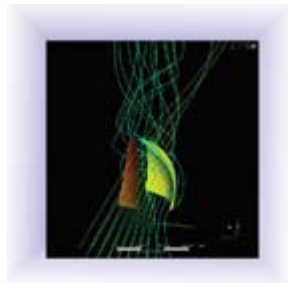
SUN MICROSYSTEMS

Sun Customer Ready
HPC Cluster
for Crash Analysis



ANSYS

Salutes Winner
Alinghi of the
32nd America's Cup



BETA CAE Systems S.A.

μETA Post Processor





Announcements:

"A Phenomenological High Strain Rate Model with Failure for Ice" is the 2006 Glenn Distinguished Publication Award winner

The Research Advisory Board has selected the paper titled "A Phenomenological High Strain Rate Model with Failure for Ice" authored by Dr. Kelly S. Carney, Dave Benson, Paul DuBois, and Ryan Lee as the winner of the Glenn Distinguished Publication Award (DPA) for 2006.

Paper is located on FEA Publications sidebar Featured – march news

10th International LS-DYNA[®] Users Conference

June 8-10, 2008 in Dearborn, Michigan

LSTC invites you to participate in their 10th International LS-DYNA Users Conference as a Sponsor or Exhibitor

For Sponsorship/Exhibitor Opportunities contact:

[Marsha Victory - LSTC](#)

Sincerely,

Art Shapiro
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Simulating the Complete Forming Sequence for a Roll Formed Automotive Bumper Beam

[COMPLETE PAPER](#)

Additionally archived on [FEA PUBLICATIONS SIDEBAR FEATURED](#)

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Wagon Automotive plc

ABSTRACT:

As part of the development of a new automotive bumper beam, a complete simulation of the entire forming process was carried out using LS-DYNA. The material for the beam was an ultra high strength steel presenting many challenges for the forming process. The sequence of forming operations was roll-forming (including forming a sweep in the initially straight roll-formed section), local annealing, forming of an initiator in the wall of the section and then crushing the end of the previously rolled section. The forming results (geometry, thinning and work hardening) were all transferred to the simulation of the bumper performance under various impact conditions.

The paper describes the development of certain novel simulation techniques, particularly for the roll-forming for which the implicit analysis options of LS-DYNA were used, representation of the annealing process, as well as the method in which data was transferred between the various simulations. Above all, we describe how the simulations were used

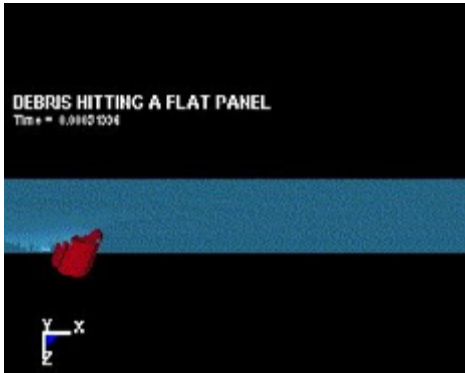
to guide the design of the bumper beam system up to the point of prototype manufacture and test.

Keywords:

Roll forming simulation, implicit analysis, automotive bumper beam design, Ultra High Strength Steel

AVI skin penetration analysis

Courtesy of: Tim Hasselman , Director, Engineering Mechanics Division
ACTA Inc. - (310) 530-1008 x 123



[AVI Library 80](#) [Aerospace Information Site](#)

The avi demonstrates an aircraft skin penetration analysis. The blue plate in the avi represents a portion of the horizontal surface (as viewed from an angle slightly below the surface) of a commercial jet transport flying at cruising altitude and speed, moving from right to left (only the right edge of the plate can be seen).

The red cylindrical object represents a small fragment of space debris falling vertically at terminal velocity and impacting the aluminum skin of the aircraft.

The avi shows the debris fragment penetrating and perforating the skin of the aircraft, and as it does, acquiring some horizontal velocity as it begins to tumble. Our project involved performing a risk analysis to determine the penetration threshold for different parts of an aircraft structure, in terms of the smallest debris fragment capable of penetrating, and the resulting probability of casualty, or fatality to people on board.

The study was motivated by the debris cloud generated by the Columbia Space

Shuttle accident, and the realization that a commercial transport or business jet passing through such a debris cloud could be at risk. Similar debris clouds can be generated by kinetic hit-to-kill tests performed by the military, as part of the U.S. missile defense program. Such tests generate many small fragments because of the high kinetic energy of impact. By determining the minimum size fragment that can penetrate an aircraft at the relative velocities given, the FAA can determine safe zones around a test site and keep aircraft out of danger during the tests.

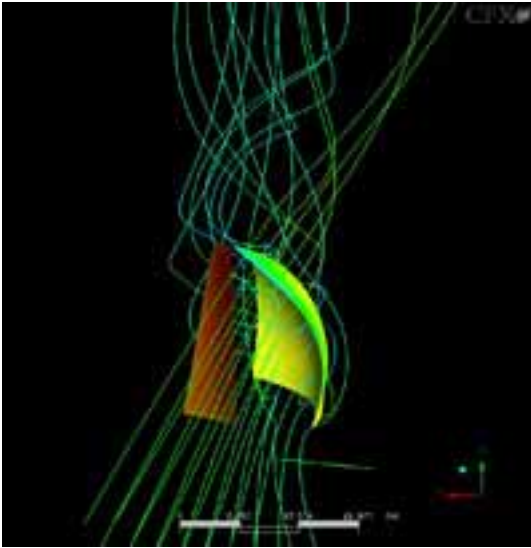
Two of the things that make the problem unique are the small size of fragments of interest and the high angle of obliquity (e.g. 70 - 80 degrees) at which impact occurs. No relevant experimental data exist for this range of fragment-target impact conditions, forcing us to rely on analytical simulations which we later plan to validate experimentally. Existing empirical models are based on tests involving normal or near normal impact and are not applicable to this problem

ANSYS Salutes Winner Alinghi of the 32nd America's Cup

News Release © Copyright, ANSYS Inc.

- Complete Article and additional Graphics can be viewed on the ANSYS Website

Alinghi Overcomes Stiff Challenge by Emirates Team New Zealand: Both Teams Sailed on the Strength of ANSYS Simulation



This Alinghi simulation of a typical downwind sail geometry illustrates the way air flows over the sails. A large vortex is created behind the spinnaker, a billowing sail used when the wind is behind the boat

"Image courtesy of ANSYS, Inc"

SOUTHPOINTE, Pa., July 5 /PRNewswire-FirstCall/ -- ANSYS, Inc. (Nasdaq: ANSS), a global innovator of simulation software and technologies designed to optimize product development processes, today announced that the winner of the 32nd America's Cup, Alinghi, used ANSYS technology to predict the effects of design changes on yacht performance. With both finalists' yacht designs optimized with ANSYS simulation software, Alinghi and its challenger were each prepared to take home the Cup, but Alinghi successfully crewed their racing yacht to defend the America's Cup, the most prestigious and elite competition in the yachting calendar.

ANSYS, Inc. has a track record of success in the America's Cup. Alinghi as well as the winners from recent cup challenges have benefited from ANSYS software, illustrating the essential role ANSYS technology plays in world-class

racing (as well as other performance-demanding fields).

"ANSYS software has proven to be a key tool in the design of our winning yacht. From a multiphysics perspective, the insights the finite element analysis modeling gave us regarding the stiffness distribution design of the yacht and mast delivered a noticeable performance edge. The design improvements that we made as a result of the computational fluid dynamics analyses conducted with ANSYS software significantly increased the speed of the boat - and aided us considerably in defending the America's Cup," said Michael Richelsen of the Alinghi design team.

The leading America's Cup teams expend more than 150,000 labor hours to optimize the design of their boats - analyzing, for example, the power generated by the sails, the drag produced by the boat's hull and the air resistance of the deck. Multiphysics

simulation has shown that hulls, masts and keels clearly are not rigid and behave differently under varying and extreme hydrodynamic conditions. Minute changes in these areas can make the difference between winning and placing second.

Using software from ANSYS, Alinghi performed a series of complex, leading-edge computer-aided engineering (CAE) simulations designed to understand yacht performance down to the smallest details. The racing team utilized ANSYS(R) CFX(R) computational fluid dynamics (CFD) software to evaluate nearly every portion of the boat, including hydrodynamic flow (for the underwater portion of the hull), aerodynamic flow (for the sails) and the stiffness of parts of the vessel (for deck details such as winch placement and pillar shapes).

To analyze and optimize structural aspects of the yacht, Alinghi employed ANSYS Mechanical(TM) software. This finite element analysis (FEA) encompassed everything from global modeling and optimization of the composite hull and mast down to detailed analysis of hardware components on the yacht. In the end, Alinghi identified an optimal hull design that minimized the weight of the yacht while ensuring it remained capable of withstanding the extreme loads experienced during competition.

Engineering simulation is playing a crucial role in today's boat design process. Since this year's America's Cup races have been very close (with the yachts separated in most races by less than 30 seconds), tiny improvements become that much more critical. "An

event such as the America's Cup calls for some of the most technologically demanding multiphysics simulations involving all aspects of the boat's air and water conditions," said Chris Reid, vice president of marketing at ANSYS, Inc. "From the simulation work Alinghi has done, we see that our technology can handle the most complex problems, especially as they push the limits of multiphysics. Most of the leading boats now use engineering simulation in some way; since 2003, we've been working with Alinghi to leverage the broad suite of products from ANSYS to their competitive, winning advantage."

About the America's Cup and Alinghi: The America's Cup is the most famous and most prestigious regatta in the sport of sailing and the oldest active trophy in international sport, attracting top sailors and yacht designers. Although the most salient aspect of the regatta is its yacht races, it is also a test of boat design, sail design and management skills. Swiss team Alinghi won the previous America's Cup in 2003, becoming the first team since the inaugural race in 1851 to return the cup to Europe and the first team to win the cup on a first attempt.

About ANSYS, Inc.: ANSYS, Inc., founded in 1970, develops and globally markets engineering simulation software and technologies widely used by engineers and designers across a broad spectrum of industries....

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LS-DYNA at the 25th CADFEM Users' Meeting

November 21 – 23, 2007, Dresden, Germany

CADFEM will hold the 25th edition of its Users' Meeting together with the German ANSYS Conference. The conference program around ANSYS will be organized by CADFEM in cooperation with its partners ANSYS Germany and Fluent Deutschland. CADFEM will host a broad additional conference program focussing on topics such as LS-DYNA, biomechanics, and nanotechnologies.

In 2007, the ANSYS Conference & 25th CADFEM Users' Meeting will be one of the most comprehensive expert conferences on numerical simulation in product development in the world.

LS-DYNA at the 25th CADFEM Users' Meeting

On November 22 a full-time session with lectures from commercial and academic users, as well as latest technical details on LS-DYNA, LS-OPT, and LS-PrePost is scheduled. On November 23, two workshops of special LS-DYNA

applications, are planned. Moreover, LSTC's president and CEO, Dr. John Hallquist has already confirmed to attend the conference and to hold a keynote lecture.

Embedded

The program dedicated to LS-DYNA will be embedded in one of this year's most comprehensive expert conferences. 800 or even more engineers are expected to attend the event with a special emphasis on structural mechanics, computational fluid mechanics and fluid-structure-interaction. It will be accompanied by a large CAE exhibition with probably more than 40 companies.

So LS-DYNA users benefit twice from attending the conference: They take advantage of an effective and detailed technical content on LS-DYNA, AND additionally, they have access to a broad variety of complementary CAE information!

More information: www.usersmeeting.com

BETA CAE Systems S.A. μETA Post Processor

μETA Post Processor is a thriving multi-purpose post-processor meeting post-processing needs of various CAE disciplines.

μETA Post Processor owes its success to its impressive performance, its innovative features and its capabilities of interaction between animations, plots, loaded videos, reports and other items. Its multidisciplinary nature can accommodate diverging post processing needs for Crash, NVH, Durability and other disciplines.

μETA Post Processor provides a broad range of functionality for analyzing results coming from the NASTRAN, ABAQUS, LS-DYNA, PAMCRASH, RADIOSS and MADYMO solvers. It also supports results in ascii PATRAN file format and in columns from ordinary ASCII files.

Both 3D display and 2Dplot post processing can be conducted at a high level within the same environment.

Correlation studies between simulation results and physical test data can be performed using various integrated tools such as video synchronization, video tracking, image matching and others.

The post processing chain concludes with the effortless generation of template-based reports within the same environment.

Further development of μETA Post Processor is envisaged to cover even more aspects of

post-processing, targeting on the provision of a single tool for all CAE sectors.

On top of the aforementioned features, the following characteristics are always present in the program: outstanding performance, simple and customizable user interface, high level of automation for routine processes and implementation of innovative advanced features to further enhance post-processing.

Why

μETA has gained a respectful position as an industrial CAE post-processor due to numerous advanced features and innovations. Some of these are:

Powerful, complete 2DPlot tool, integrated into the same software.

- Interoperating 2D-plot and 3D-display in a way that data can pass from the one to the other.
- Report tool, integrated into the same software.
- Lots of reporting capabilities, such as statistics, multi model / states statistics and powerful annotation tool.
- Effective video and image handling, with matching, video synchronization, video tracking and more.
- Linear combination as well as any other mathematical operation can be applied on results.
- High level of support of ABAQUS .odb files.
- High level of automating processes through session files, with variables and loops, user

toolbars and custom short-cuts.

- A scripting language same as in **ANSA**, which further extent automation capabilities.
- Completely customizable, user friendly, interface.
- Effective coupling into optimization cycles.
- Remote control of **μETA** process through the network

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[CONTACTS Worldwide](#)

An Event organized by carhs gmbh

Managing Director: Rainer Hoffmann

A 2-day seminar 'SafetyUpdate' in Graz, Austria.

Organized in conjunction with Prof. Steffan at University of Graz.

www.carhs.com/gsu For Complete Information

The event language is German with simultaneous translation of the lectures into English, if needed by our international attendees.

Attending will be Prof. Schelke from Porsche, one of the early LS-DYNA users in Germany; Prof. Schaub, who is heading the testing at DaimlerChrysler in Stuttgart, and many other renowned experts in their respective fields.

The idea behind SafetyUpdate is to provide the latest news in automotive safety covering biomechanics, global law & regulations, simulation and testing, as well as development strategies.

Knowledge Congress SafetyUpdate – vehicle safety is the future.

The annual Knowledge Congress SafetyUpdate has already become a tradition: in 2007 the congress takes place for the fifth time in a row in Aschaffenburg/Germany and the second time in a row in Graz/Austria. As a participant you receive a compact and practice-related knowledge up-date in selected main-topics in vehicle safety from our top-experts in legislation, research and automotive industry

The dynamics of today's market development require the readiness for a continuous and effective knowledge transfer. carhs' recipe for success, to offer knowledge in a compact, practical and prompt manner, has set new standards in knowledge transfer.

The following topics are being given special attention at the SafetyUpdate 2007:

Biomechanics, crash laws, NCAP-tests, frontal and side impact, pedestrian protection, simulation, testing and active safety. All lectures presume a sound basic knowledge and corresponding professional experience, since the speakers focus on the most recent and most relevant pieces of information. Following the special lectures, you have the possibility to discuss topic-related questions with the speakers at specially arranged meeting-points.

Every year almost 300 vehicle safety-experts choose the SafetyUpdate in Aschaffenburg or Graz for their personal training.

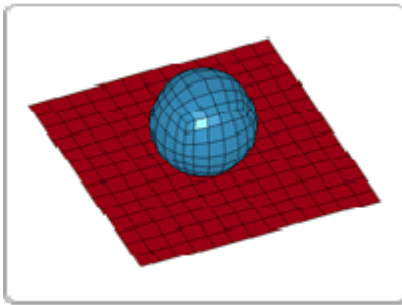
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LS-PrePost® Online Documentation News
www.lstc.com/lsp Copyright © 2007 LSTC

LS-PrePost is free to download from LSTC. A special support site with tutorials is on line for easy access. [LS-PrePost Tutorials](#) A free demo version of LS-DYNA is available after filling out a short demo form – write to [Marsha Victory](#) to get started using LS-DYNA today.

[Tutorial 1](#): Create an LS-DYNA input deck for a ball impacting a plate.



Ball: solid elements, rigid material

Plate: shell elements, edges constrained

Ball Initial Velocity: 10mm/s

Files Required: none

Yahoo Group Yammerings

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

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

Questions:

1. Why use solid elements?
2. Combining Lagrange, ALE, and SPH solution techniques?

1. Why use solid elements?

A full vehicle model for frontal crash is represented by shell elements. What is the implication of using solid elements instead of shells for the entire structure, other than the fact that the run time will be significantly higher? Would the results be any better/worse and why?

Reply by Nick Harle: There are at least 3 considerations when modeling thin structures with solid elements. These are aspect ratio, through thickness integration points and time step.

Aspect Ratio: The ideal aspect ratio is 1. If your sheet panel thickness is say 1mm, then to keep an aspect ratio of at least 2 you have an in-plane element size of 2mm. As often 5 mm is used for shells in automotive work, you can see there is now a considerable increase in element count.

Through Thickness Integration Points: To capture out of plane bending in your structure you really need at least 2 through thickness

integration points (elastic bending). Using 1 through thickness integration point means it is placed on the neutral axis, and hence will return zero stress when pure bending is applied, i.e. membrane response. For thicker structures more than 2 through thickness integration points are required to capture the plastic moment. This requires integration points away from the neutral axis to pick up the plastic stresses.

Hence can you see that for a 1mm thick sheet, if using single integration point solid elements, you really need 2 elements through the thickness as a minimum and hence a 0.5 mm element size. To keep the aspect ratio at 2, these elements now need to have a 1mm in-plane dimension.

Time step: The number of elements in the model has increased and the minimum side length of an element has been reduced. This reduction in element size means the maximum allowable time step for the explicit analysis has been reduced. A 5 mm element size gives an allowable time step of under 1 microsecond. Reducing

the element shortest side to 0.5 mm means the time step is reduced by a factor of 10.

Summary: Meshing a 100 x 100 x 1mm sheet with 5 mm shells gives 400 elements. Using 1 mm x 1 mm x 0.5 mm solids for the same sheet gives 20,000 elements, and the time step is reduced by 10. Hence the solid model could take $(20000/400) \times 10 = 500$ times as long to run.

2. Combining Lagrange, ALE, and SPH solution techniques?

There are Lagrange, ALE, and SPH representations for modeling parts in LS-DYNA. If we use multiple representations in one simulation, we need to address the interactions between these representations. Generally, *CONTACT is used to define interactions between multiple Lagrange parts, merged nodes between multiple ALE parts, *CONSTRAINED_LAGRANGE_IN_SOLID between Lagrange and ALE parts, and nodes-to-surface contact between Lagrange and SPH parts. However, if we have to introduce both ALE and SPH parts in a model, how do we define the interaction between SPH and ALE parts?

Summary of Replies by Jim Kennedy, Len Schwer, Isaac Lottati, and Mark Wan Yew Kong

LS-DYNA does not presently offer an interface between ALE and SPH.

About The LS-DYNA Yahoo Group

- The archives contains a wealth of information that can be helpful to any LS-DYNA user.
- There are over 2240 subscribers from all over the world, and grows by a hundred new subscribers ever few months. The group currently averages about 300 message per month, i.e. about 10 message per day.

How To Subscribe:

- Send an email request to LS-DYNA-subscribe@yahoogroups.com
- Visit the Yahoo Groups web site <http://groups.yahoo.com> This group is LS-DYNA (you must use the hyphen in LS-DYNA or you will join the wrong group)

How To Benefit from the Group

- Review the archives when you are seeking help on any topic related to LS-DYNA. NOTE: Questions and responses may have been edited for clarity & brevity.
- Generally, the quickest/best responses are to those questions posed with the most specifics.

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

Linux Supercomputing Products



Linux Networx delivers a full range of clustered Linux Supersystems that deliver industry-leading price/performance value to our customers. LS Series systems are designed and configured to optimize application performance, system availability, and user productivity. Our systems feature the most cost-effective and proven hardware and software components, teamed with our expertise and commitment to customer satisfaction.

The LS series of Linux Supersystems includes:

- LS-1 - Highly scalable clusters that deliver the maximum computational performance and work throughput, and feature a wide variety of CPUs, interconnects, and data storage options.
- LS-V - High performance visualization systems that provide the latest in superior distributed rendering performance, based upon our record-setting visualization technology and expertise.
- LS-P - Performance Tuned Supersystems deliver industry-leading application throughput for selected applications, while dramatically reducing ownership costs and deployment complexities.
- High Performance Storage - Best-in-class storage and parallel file system solutions that have been optimized to meet specific application requirements as part of a total high performance clustered system.

- Clusterworx - Our comprehensive systems management suite designed to efficiently manage

Linux Supercomputing clusters. Clusters are managed as fully integrated systems, eliminating the cost and complexity associated with clusters.

Pure performance isn't enough for today's supercomputing users. We know that over 40% of supercomputing lifetime costs are dedicated to the operation and administration of these sophisticated machines, and that's too much. We're committed to simplifying the complexity of clusters and reducing costs - so that customers spend their budgets on performance power - not management overhead. To that end, every LS system is delivered ready for "Production at Power-Up" - fully integrated hardware, software, applications, and our Clusterworx system management application. Linux Networx complements every Supersystem delivery with available High Performance Storage, Professional Services, and Training - ensuring total customer satisfaction.

Fujitsu PRIMERGY Blade Servers Deliver Better Performance, Consume Less Energy

PRIMERGY Blade Ecosystem Includes Optimized PRIMERGY BX600 S3 Blade Chassis With Improved I/O Performance

PRIMERGY BX620 S4 Blade Server With Quad-Core Intel(R) Xeon(R) Processor Sets World Record Benchmark

SUNNYVALE, CA -- (MARKET WIRE) -- 06/26/07 -- Fujitsu Computer Systems Corporation today announced improved performance and reduced energy consumption for its PRIMERGY(R) BX600 S3 ecosystem. The ecosystem includes the PRIMERGY BX600 S3 blade chassis and the quad-core PRIMERGY BX620 S4 blade server, which recently set a world record benchmark for a dual-socket server.

Server blades are increasingly being used for more applications throughout the data center for such applications as CRM, middleware, and Microsoft Exchange. These applications, often running on multiple virtual servers on the physical server, demand much greater blade and I/O performance, and more flexible connectivity to handle the separate local area network (LAN) and storage area network (SAN) demands for each application and virtual server. The new PRIMERGY BX620 S4 blade server running in the new PRIMERGY BX600 S3 blade chassis provides enterprises with the power and efficiency they need to scale their applications for today's virtualized, high-demand environments.

The PRIMERGY BX600 S3 blade chassis features a new midplane, which serves as the interface between the server blades in the chassis and all the other system components making it an optimal consolidation and virtualization platform. Users experience high I/O

throughput at all server levels, faster access to data, quicker applications as well as efficient and stable communication between the server blades and the other system components.

The new midplane enables three times faster I/O throughput, essential for today's high-performance virtualized infrastructures, and offers interfaces for 60, 1-gigabit cables and end-to-end Fiber Channel connections with speeds of up to 4 Gbits per second. Unlike new midplanes offered by other vendors, the PRIMERGY BX600 S3 is 100 percent compatible with previous generations of both Intel-based and AMD Opteron-based BX600 blade servers, providing customers with the greatest choice for how to build out their data centers.

The PRIMERGY BX600 S3 comes equipped with the PRIMERGY BX620 S4 blade server, based on the latest Quad-Core Intel(R) Xeon(R) 5300 series processor, which offers very low power consumption and improves upon PRIMERGY's already excellent performance-to-energy-consumption ratio. The BX620 S4 recently set a world record SAP SD Standard Application Benchmark for dual-socket servers with a result of 1,870 users and an average dialogue response time of 1.95 seconds.(1) This is merely the latest top score for the PRIMERGY server line, which has long been a performance leader.

"PRIMERGY blade servers have always provided customers with the performance and flexibility they need to adapt their systems to evolving data center requirements," said Richard McCormack, senior vice president of marketing at Fujitsu Computer Systems Corporation. "This latest generation of PRIMERGY proves once again that Fujitsu remains committed to continual performance improvement and to leading the industry in features, functionality and service."

Pricing & Availability

The PRIMERGY BX600 S3 chassis and PRIMERGY BX620 S4 blade server are available now. Pricing for the BX620 S4 blade server starts at \$1,948. Pricing for the BX600 S3 chassis starts at \$7,176.

(1) The benchmark was conducted with a BX620 S4 blade server running two Quad-Core Intel Xeon processors X5355 2.66 GHz (8 Cores, 8 Threads) with SAP ERP 2005, Windows Server 2003 Enterprise Edition and SQL Server 2005. For details please refer to: www.sap.com/benchmark (certification 2007032).

About Fujitsu Computer Systems Corporation

Headquartered in Sunnyvale, Calif., Fujitsu Computer Systems is a wholly owned subsidiary of Fujitsu Limited (TSE: 6702) committed to the design, development and delivery of advanced computer systems, application infrastructure software products, and managed services for the business enterprise. Through its TRIOLE(R) strategy, the company offers a complete line of scalable and reliable servers, storage and middleware solutions, high-performance mobile and client

computers, as well as professional services. Fujitsu Computer Systems has established itself as a strategic solutions provider to the world's leading organizations by offering technology innovation, customer choice, exceptional product quality and reliability, as well as outstanding customer service. See <http://us.fujitsu.com/computers> for further information.

About Fujitsu

Fujitsu is a leading provider of customer-focused IT and communications solutions for the global marketplace. Pace-setting device technologies, highly reliable computing and communications products, and a worldwide corps of systems and services experts uniquely position Fujitsu to deliver comprehensive solutions that open up infinite possibilities for its customers' success. Headquartered in Tokyo, Fujitsu Limited (TSE: 6702) reported consolidated revenues of 5.1 trillion yen (US\$43.2 billion) for the fiscal year ended March 31, 2007. See <http://www.fujitsu.com> for further information.

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LSTC California & Michigan Training Classes

A complete list of dates can be found on the LSTC website

August

20-21 **MI** Contact

Sept

11-14 **MI** Introduction to LS-DYNA
18-21 **CA** Advanced – Impact Analysis
24-25 **CA** Blast & Penetration

October

22-25 **MI** Introduction to LS-DYNA

November

01-02 **CA** Concrete Modeling and Geomaterial Modeling
12-15 **CA** Introduction to LS-DYNA
27-30 **CA** Introduction to LS-OPT

December

10-11 **MI** Contact
12-13 **MI** Implicit

For Class Details:
www.lstc.com

Seminars & Hands-On Workshops - AUSTRALIA

LEAP AUSTRALIA - Link: [Leading Engineering Analysis Providers](#)

EVENT	DATE	Location	Venue	Contact
ANSYS Hands-On Workshop	Aug 21, 2007	Clayton, Vic	LEAP Office	Rebecca Wylie
ANSYS Hands-On Workshop	Aug 29, 2007	Clayton, Vic	LEAP Office	Rebecca Wylie
ANSYS CFX Hands-On Workshop	Aug 30, 2007	Clayton, Vic	LEAP Office	Rebecca Wylie
CAE Awareness for Managers workshop	Aug 31, 2007	Clayton, Vic	LEAP Office	Rebecca Wylie
ANSYS Hands-On Workshop	Oct 3, 2007	Clayton, Vic	LEAP Office	Rebecca Wylie
ANSYS CFX Hands-On Workshop	Oct 4, 2007	Clayton, Vic	LEAP Office	Rebecca Wylie
CAE Awareness for Managers workshop	Oct 5, 2007	Clayton, Vic	LEAP Office	Rebecca Wylie
ANSYS Hands-On Workshop	Nov 28, 2007	Clayton, Vic	LEAP Office	Rebecca Wylie
ANSYS CFX Hands-On Workshop	Nov 29, 2007	Clayton, Vic	LEAP Office	Rebecca Wylie
CAE Awareness for Managers workshop	Nov 30, 2007	Clayton, Vic	LEAP Office	Rebecca Wylie

Participant Benchmarks On TopCrunch.
TopCrunch.org For Complete Vendor Submitted Benchmarks

SGI /Application Engineering – June 23, 2007
Intel 5160 Woodcrest DC 3.0GHz

Computer/Interconnect	#Nodes x #Processors per Node x #Cores Per Processor = Total #CPU	Time (Sec)	Benchmark Problem
Altix 1200/Voltaire HCA 410Ex InfiniHost III Lx SDR, OFED v1.2	16 x 2 x 2 = 64	404	neon refined revised
Altix 1200/Voltaire HCA 410Ex InfiniHost III Lx SDR, OFED v1.2	8 x 2 x 2 = 32	449	neon refined revised
Altix 1200/Voltaire HCA 410Ex InfiniHost III Lx SDR, OFED v1.2	4 x 2 x 2 = 16	805	neon refined revised
Altix 1200/Voltaire HCA 410Ex InfiniHost III Lx SDR, OFED v1.2	2 x 2 x 2 = 8	1492	neon refined revised
Altix 1200/Voltaire HCA 410Ex InfiniHost III Lx SDR, OFED v1.2	1 x 2 x 2 = 4	2911	neon refined revised
Altix 1200/Voltaire HCA 410Ex InfiniHost III Lx SDR, OFED v1.2	1 x 1 x 1 = 1	8081	neon refined revised

SGI /Application Engineering – July 15, 2007
Intel 5160 Woodcrest DC 3.0GHz

Computer/Interconnect	#Nodes x #Processors per Node x #Cores Per Processor = Total #CPU	Time (Sec)	Benchmark Problem
Altix 1200/Voltaire HCA 410Ex InfiniHost III Lx DDR, OFED v1.2	16 x 2 x 2 = 64	359	neon refined revised

NAFEMS Work Session on the Management of Simulation Data

Take Control of Your Analysis and Simulation Data

To be held on September 27, 2007

The Management Education Center,
Eli Broad Graduate School of Management,
811 West Square Lake Road - Troy, MI 28098

Today, many manufacturers are facing tremendous challenges related to the storage and retrieval of simulation data. Product Data Management (PDM) systems are not capable of handling the terabytes of information which are generated as a result of performing these complex simulations. Simulation Data Management (SDM) provides a mechanism for the storage, management, and retrieval of this performance-related data. This work session addresses this breakthrough technology by helping participants better understand the benefits gained from implementing a Simulation Data Management system and how to save time, reduce development costs, and improve time-to-market.

Objectives

- Define SDM
- Establish the importance of SDM
- Differentiate Product Data Management (PDM) from Simulation Data Management (SDM)
- Review benefits gained through the use of an SDM system
- Determine the typical environment in which data would be managed and where it would best be implemented

- Review various vendor strategies to address the management of simulation data

Location

The Management Education Center,
Eli Broad Graduate School of
Management,
811 West Square Lake Road
Troy, MI 28098

www.mectroy.com

Exhibition and Sponsorship Opportunities

We would like to extend an invitation to your company to be part of a NAFEMS Work Session on the Management of Simulation Data –

There are several outstanding opportunities available for your company to sponsor or exhibit at the work session, giving you maximum exposure to a highly targeted audience of delegates, who are all directly involved in simulation, analysis, and design

FEA Information Participant:

GOLD SPONSOR:



[NAFEMS FOR COMPLETE INFORMATION](#)

2007/2008 Worldwide Events

Aug 09-11	The 3rd edition of the "India/South Asia CAE Users Conference 2007" , at The Leela, Bangalore, India hosted by Altair India
Oct 11-12	German LS-DYNA Forum Frankenthal, Germany, hosted by DYNAmore Call for papers (pdf)
Oct 25-26	LS-DYNA Italian Users' Meeting will take place next October during the Annual EnginSoft Users' Meeting
Oct 30-31	Japan LS-DYNA Users Conference hosted by JRI
Nov 05	12th Korean LS-DYNA Users Conference hosted by THEME
Nov 21 - 23	CADFEM Users' Meeting 2007 Dresden, Germany, hosted by CADFEM
Dec 5-7	China International Simulation Industry Exhibition & Conference – Shanghai, China
Events 2008	
June 8-10	10th International LS-DYNA Users' Conference -The Hyatt Regency, Dearborn, MI , US -hosted by LSTC
May, 28-30	The 4th International Conference on Advances in Structural Engineering and Mechanics(AWAS'08) in Jeju, Korea

FEA Information China Participants

Arup China: LS-DYNA sales, support, training	Name: Li YuQiang Email: Yu-qiang.li@arup.com Tel 021 5396 6633 extn 151
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Engineering Technology Associates (China) Inc.	Martin Ma Tel: + 86-21-64385725 Contact: support@eta.com.cn

China Company Listings

Ansys-China, Inc.	Tel: 86-10-84085558 Website: www.ansys.com.cn Contact: China@ansys.com.cn
Hewlett-Packard Asia Pacific Ltd.	Jerry Huang Tel: +86-10-65645261 Contact: J.Huang@hp.com
IBM China	Ms. Ling WANG - Tel: +86-10-6539-1188 x4463 (T/L: 901-4463) Website: http://www.ibm.com/cn/ Contact: wangling@cn.ibm.com
MSC. Software Corp.	Tel: +86-10-6849-2777 Website: www.mscsoftware.com.cn Contact: mscprc.contact@mscsoftware.com
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Engineer's Market Place

FUJITSU PRODUCTS

LifeBook E Series notebook	LifeBook T3000 Notebook
Fujitsu LifeBook T4215 Notebook	New Fujitsu LifeBook® Q Series Notebook PC
New Fujitsu LifeBook® T4210 Tablet PC	New Fujitsu LifeBook® S7110 Notebook
New Fujitsu LifeBook® E8210 Notebook	New Fujitsu LifeBook® N3530 Notebook

BOOKS Available at Amazon

[The Finite Element Method: Linear Static and Dynamic Finite Element Analysis](#) -Thomas J.R. Hughes (Sept. 2000)

[Vibration Simulation Using MATLAB and ANSYS](#) - Michael R. Hatch -(Sept. 2000)

[Nonlinear Finite Element Analysis for Continua and Structures](#)
Ted Belytschko, et al/Hardcover/Published 2000

[Nonlinear Finite Element Analysis for Continua and Structures](#)
Ted Belytschko, et al/Paperback/Published 2000

LS-DYNA Resource Page - MPP Interconnect and MPI

FEA Information Inc. Participant's (alphabetical order)

Fully QA'd by Livermore Software Technology Corporation

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

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

LS-DYNA Resource Page - Participant Software

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

ANSYS - ANSYS/LS-DYNA

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

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

ETA – DYNAFORM

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

ETA – VPG

Streamlined CAE software package provides an event-based simulation solution of nonlinear, dynamic problems. eta/VPG's single software package overcomes the limitations of existing CAE analysis methods. It is designed to analyze the behavior of mechanical and structural systems as simple as linkages, and as complex as full vehicles

MSC.Software - MSC.Dytran LS-DYNA

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

MSC.Software - MSC.Nastran/SOL 700

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

duration, highly dynamic events with severe geometric and material nonlinearities.

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

MSC.Software – Gateway for LS-DYNA

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

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

Oasys software for LS-DYNA

Oasys software is custom-written for 100% compatibility with LS-DYNA. Oasys PRIMER offers model creation, editing and error removal, together with many specialist functions for rapid generation of error-free models. Oasys also offers post-processing software for in-depth analysis of results and automatic report generation.

EASi-CRASH DYNA

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

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

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

FEA Information Participants – Company name takes you directly to Website

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

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

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

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

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

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

Fujitsu Limited: Internet-focused information technology solutions.

AMD: Supplier of integrated circuits for the personal and networked computer and communications markets.

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

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

Engineering Technology Associates, Inc: Provides engineering & IT services & has

created the streamlined simulation software packages DYNAFORM and VPG

IBM: Invention, development & manufacture of advanced information technologies, including computer systems, software, storage systems & microelectronics

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

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

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

LNXI - Linux Networx. Blending the price performance advantage of Linux clusters with real-world supercomputing expertise and innovation

Sun Microsystems Inc., provides network computing infrastructure solutions that include computer systems, software, storage, and services.

Detroit Engineered Products: a Michigan based engineering consulting and software products firm specializing in the area of Product Development products and solutions.

Software Distributors

Alphabetical order by Country

Australia	Leading Engineering Analysis Providers
Canada	Metal Forming Analysis Corporation
China	ANSYS China
China	Arup
China	MSC. Software – China
Germany	CAD-FEM
Germany	DynaMore
India	Oasys, Ltd.
India	Altair Engineering India
India	Cranes Software International Limited (CSIL) ,
Italy	EnginSoft Spa
Japan	Fujitsu Limited
Japan	The Japan Research Institute
Japan	ITOCHU Techno-Solutions Corporation
Korea	Korean Simulation Technologies
Korea	Theme Engineering

Software Distributors (cont.)

Alphabetical order by Country

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

International Consulting and Engineering Services

(continued on next page)

Alphabetical Order By Country

<p>Australia Manly, NSW</p>	<p>Leading Engineering Analysis Providers (LEAP) Greg Horner info@leapaust.com.au 02 8966 7888</p>
<p>Canada Kingston, Ontario</p>	<p>Metal Forming Analysis Corp. Chris Galbraith galb@mfac.com (613) 547-5395</p>
<p>Germany Alzenau</p>	<p>CARHS. 49 6023 96 40 60 info@carhs.de</p>
<p>India Bangalore</p>	<p>Altair Engineering India Nelson Dias info-in@altair.com 91 (0)80 2658-8540</p>
<p>Italy Firenze</p>	<p>EnginSoft Spa info@enginsoft.it 39 055 432010</p>
<p>UK Solihull, West Midlands</p>	<p>ARUP Brian Walker brian.walker@arup.com 44 (0) 121 213 3317</p>

USA Consulting and Engineering Services

(continued)

<p>USA Austin, TX</p>	<p>KBEC L.C Khanh Bui kdbui@sbcglobal.net (512) 363-2739</p>
<p>USA Windsor, CA</p>	<p>SE&CS Len Schwer len@schwer.net (707) 837-0559</p>
<p>USA Troy, MI</p>	<p>Engineering Technology Associates, Inc: (248) 729-3010</p>
<p>USA Corvallis, OR</p>	<p>Predictive Engineering George Laird (1-800) 345-4671 george.laird@predictiveengineering.com</p>
<p>USA Troy, MI</p>	<p>Detroit Engineered Products</p>
<p>ETA Troy, MI</p>	<p>Engineering Technology Associates, Inc. (248) 729-3010 sales@eta.com</p>

Educational & Contributing Participants

Alphabetical Order By Country

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

Informational Websites

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

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

Sun Customer Ready HPC Cluster for Crash Analysis

Pre-integrated and pre-tested computing solutions



Highlights

- Greater throughput – Run more simulations, and computational jobs to get more work done faster
- Agile deployment – Systems are factory integrated for faster and easier installation
- Higher quality, lower risk – Help reduce installation issues by leveraging Sun's factory testing and real-world experience in MCAE and grid computing
- Flexible architecture – Standard interfaces, off-the-shelf components and a flexible Sun Rack solution make the system easy to adapt and scale as needs change
- Better utilization – Sun high-performance computing customers have reported up to 90 percent system utilization rates using Sun N1™ System Manager and Sun N1 Grid Engine software
- Easier to manage – Pre-loaded software and tools from Sun make grid provisioning and administration even simpler
- Save power and space – High-performance, energy-saving x64 processors in a rack configuration offers greater compute density and uses less power



Based on its long history of serving the needs of the engineering community, Sun has developed ready-to-deploy high performance computing (HPC) solutions that are specifically designed and tested to support Mechanical Computer-Aided Engineering (MCAE) applications such as crash simulation. Sun's MCAE solutions offer extremely scalable performance based on 4-way Sun Fire™ X2200 M2 servers with AMD Opteron® 2000 Series processors in a densely populated rack configuration. Factory-integrated through the Sun™ Customer Ready program, these solutions can also be custom-tailored to your unique requirements.

Integrated computing for MCAE

Crash simulations that predict vehicle collision behavior and occupant safety have become an important tool to help automotive companies improve time to market and save costs. Today's automakers are running more and more crash simulations and are building more realistic, higher resolution simulations that help reduce their dependence on physical prototypes. As a result, there is a greater need for computing solutions that can meet the demanding requirements of these simulations.

Sun has designed a comprehensive solution for parallel MCAE applications such as crash simulation. It is comprised of low cost Sun Fire X2200 M2 servers integrated into a compute grid in a single 19 inch rack. The pre-integrated solution comes in three suggested configurations—small, medium and large.

Each server in the compute grid is pre-loaded with Solaris™ Operating System and, optionally, with Sun HPC ClusterTools™ 7 software which

contains a full complement of tools for parallel processing including Sun Message Passing Interface (MPI). The “large” configuration also comes with Sun N1 Grid Engine 6 and Sun N1 System Manager software, which can be pre-loaded, making it easier to fully utilize the compute grid and greatly simplifying administration and management.

Faster time to results

Sun delivers these pre-integrated solutions through the Sun Customer Ready program which provides component software installation as well as factory integration and testing of the full solution. By leveraging Sun experts to perform the initial installation, integration and testing, you can greatly reduce your deployment time and start generating results more quickly.

Sun's pre-integrated solution also helps eliminate the complexity and risk inherent in designing and deploying an MCAE environment, enabling you to reduce the risk of installation and setup issues.

Sun x64 servers and workstations

- Sun Fire X2100 M2, X2200 M2, X4100 M2, X4200 M2, X4500, and X4600 M2 rack-mount servers
- Sun Blade™ 8000 and 8000 P modular systems
- Sun Ultra™ 20 M2 and Ultra 40 M2 workstations

Specifications

The major components of Sun's pre-configured MCAE solutions include:

Sun Customer Ready HPC Cluster – The Sun Customer Ready HPC Cluster gives you a ready-to-deploy, factory integrated system with Sun Fire servers, networking and interconnect options and grid-ready software, delivered in a Sun rack.

Sun Fire X2200 M2 Server – Based on AMD Opteron 2000 Series processors, the Sun Fire X2000 M2 server is the highest performing and most energy efficient 4-way x64 server. With up to twice the memory capacity and network connectivity of other servers in its class, it is ideally suited for the heavy workloads and large data sets that are common in MCAE applications.

Sun HPC ClusterTools 7 Software – Sun HPC ClusterTools 7 software is an integrated toolkit that provides developers with the Sun Cluster Runtime Environment (CRE) and the Sun Message Passing Interface (Sun MPI), enabling developers to create and tune MPI applications that run on clusters and SMP servers. It is also compatible with Sun N1 Grid Engine, LSF, and PBS distributed resource managers.

Solaris 10 Operating System – The free and open source Solaris Operating System is available on hundreds of x64/x86 platforms and supported for thousands of open source and ISV applications. It has the largest installed-base of any other commercial UNIX® or Linux distribution on the planet.

Sun N1 Grid Engine 6 Software – Sun N1 Grid Engine 6 software enables enterprises to build and manage grids that make employees more productive. You can monitor and select the optimal usage of system resources on most commercial operating systems and platforms.

Sun N1 System Manager – Sun N1 System Manager helps increase IT productivity by simplifying system discovery, provisioning,

Learn More

For more details about Sun x64 systems and Sun's HPC solutions contact your local Sun representative or visit:

- sun.com/x64
- sun.com/hpc
- sun.com/servers/cr/hpccluster

monitoring, and management functions. It is ideal for large scale horizontal environments such as technical compute grids. Sun N1 System Manager is also a component of the Solaris Enterprise System.

Pre-configured Solutions Available Through Sun Customer Ready Program

	Small	Medium	Large
Server node configuration	Sun Fire X2200 M2 Server <ul style="list-style-type: none"> • 2 AMD Opteron 2000 Series Dual Core 2.2 GHz processors • 8 GB memory • 250 GB 7200 RPM SATA disk 	Sun Fire X2200 M2 Server <ul style="list-style-type: none"> • 2 AMD Opteron 2000 Series Dual Core 2.6 GHz processors • 12 GB memory • 250 GB 7200 RPM SATA disk 	Sun Fire X2200 M2 Server <ul style="list-style-type: none"> • 2 AMD Opteron 2000 Series Dual Core 2.8 GHz processors • 24 GB memory • 250 GB 7200 RPM SATA disk
Rack type	Sun Rack 1000	Sun Rack 1000	Sun Rack 1000
Number of server nodes in rack	8	16	32
Total number of CPU cores in rack	32	64	128
Total memory in rack	64 GB	192 GB	768 GB
Total storage in rack	2 TB	4 TB	8 TB
Management node	Sun Fire X2100 M2	Sun Fire X2100 M2	Sun Fire X2100 M2
Keyboard, monitor, mouse	Optional	Yes	Yes
Interconnect	• Cisco 3750 Gigabit Ethernet 24 port switch	• Cisco 3750 Gigabit Ethernet 24 port switch • Voltaire ISR 9024 InfiniBand Switch Router	• Cisco 3750 Gigabit Ethernet 48 port switch X 2 • Voltaire ISR 9024 InfiniBand Switch Router X 2
Cables	Ethernet Cable Harness	InfiniBand Cables	InfiniBand Cables
Pre-installed software	• Solaris 10 OS • Sun HPC ClusterTools 7 software	• Solaris 10 OS • Sun HPC ClusterTools 7 software	• Solaris 10 OS • Sun HPC ClusterTools 7 software • Sun N1 System Manager software • Sun N1 Grid Engine 6 software

