April 2003

LEAP -Australia

ALTAIR - Western Region US

DYNAMAX - US

Cril Technology Simulation - France

GISSETA - India

MFAC -Canada

DYNA*more* - Germany

FLOTREND - Taiwan

KOSTECH - Korea

ERAB - Sweden

THEME - Korea

ALTAIR - Italy

CAD-FEM -Germany

Numerica SRL - Italy

ANSYS - China

Prof Gennaro Monacelli - Italy

Dr. Bhavin V. Mehta - US

Dr. Taylan Altan - US

Dr. David Benson - US

Dr. Alexey I. Borovkov - Russia

Prof. Ala Tabiei - US

Dr. Ted Belytschko - US

FEA Information Inc. Worldwide News

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Announcement: New Participant

NEC	**A global leader in high technology. A Global Fortune 500 company, NEC has a history of more than 100 years of leadership and innovation in the core high-technology sectors of communications, computers and electronic components. NEC's headquarter is in Japan, but 'Worldwide' is more reflective on NEC's culture and how NEC operates.**

Summary of ANSYS Beijing, China's Advanced Technical Seminar on Feb. 24, 2003

Recently, Dr. John O. Hallquist, made his first four-day visit to China, invited by ANSYS China. During his visit, ANSYS China held an LS-DYNA Advanced Technical Seminar on Feb. 24, 2003 at the Asia Hotel Beijing. It provided an opportunity for LS-DYNA users and interested parties in China to communicate directly with Dr. Hallquist.

ANSYS China invited several native and overseas experts and scholars in the FEA software industry to give presentations to the attendees from Aerospace, Auto, Petroleum defining, Electronics, Shipping Industries etc. They shared advanced FEA simulation results, analysis capabilities and success stories of product development using LS-DYNA.

At the seminar, Dr. Hallquist, the developer of LS-DYNA and the founder of LSTC gave a presentation on the current and future developments of LS-DYNA. Today, LS-DYNA is broadly accepted in China in the Auto, Metal molding, Aerospace, Electronics, Consumer products, Civil engineering and Ocean petroleum industries, etc. for its advanced solid analysis, liquid analysis, thermal analysis and multi-physics coupled solver capabilities.

Additionally, Arthur Tang, Vice president of ETA, and Philip Ho, Visualization Software Developer for LSTC gave presentations. LS-DYNA users shared their opinions and advice on the study and use of LS-DYNA in the Aerospace, Car crash field in China. After the meeting, John. Hallquist, Philip Ho and Chen Tsay had a interview with China Medias.

HP’s innovative PRS team invents a computer recycling solution

Reprinted from the website www.hp.com

Mar. 2003 -- The Product Recycling Solutions (PRS) team started 15 years ago in the Worldwide Customer Support Organization (WWCSO). More recently, PRS was unable to find an existing solution for recycling and disposal of computing equipment. Ultimately everything inside a computer is a raw material that can be used to make something new. However, there are toxic substances that need to be controlled when the product is disposed of — such as batteries, mercury lamps, switches and the lead in the solder.

HP's decisive response to invent a solution and create a full-service computer recycling plant has resulted in industry leadership in computer recycling technology and solutions. In many ways, HP now leads the charge in changing the way computers are recycled around the world.

The dust from the entire recycling operation is collected in this baghouse, where flakes of gold and silver can be found.

Inventing A Solution

The PRS team began talking with several people in the industry, but found that no one had a solution. They also spoke with Noranda, a large Canadian mining company that HP was already working with. Noranda's US subsidiary, Micro Metallics, was grinding HP circuit boards and sampling for precious metals.

Plastic separated from the Eddy Current is collected in a box.

Together, Noranda and HP played with different models — applying HP's knowledge of product materials and Noranda's knowledge of shredding and separation technology. "We began testing various shredding technologies and material yields," says Renee St. Denis, product recycling solutions manager, IPG Americas Supply Chain Operations. "We also investigated many different kinds of equipment and spoke with numerous experts."

After several months of collaboration, HP and Noranda realized that together, they could build a solution. Noranda built HP's plant in Roseville, California, consisting of two massive shear shredders and a large granulator. The granulator turns the strips into pieces about the size of a

quarter, which can then be separated. Shredding is not the only solution — evaluation and re-use plays an important role in the recycling process as well.

The second shredder and the granulator pulverize the computers into 3/4".

Because of this technology, HP can recycle 100% of the materials in our computer products, meaning that none of the materials used to make our computer products go into the disposal chain when HP takes them back. The goal is to manage the hazardous waste properly. Currently, HP is the only manufacturer in the world to own and operate a full-service computer recycling plant.

Intellectual Capital

HP is also learning more about recycling and gaining the knowledge to make it less expensive. New environmental legislation is geared toward making the manufacturer pay for all or part of the costs associated with the end of a product's life (collection, transportation, recycling) so HP has created a significant competitive advantage.

Copper, gold and silver fall through the 8mm screen holes

But why would an inventive spirit stop there? The final piece of the puzzle involves getting the materials back into our own products. This should reduce the cost of the supply chain for all materials, increasing our competitive advantage and reducing the environmental impact. In fact, every HP division has a product steward who is charged with making sure that the environmental impact of each product continues to decrease from one generation to the next. HP product stewards take part in "Design for Environment" seminars that focus on designing products for the end of their life — such as using two plastics instead of 15 or placing all the hazardous materials in one corner of the circuit board to make it easier to remove and thus less expensive to handle.

HP's PRS team loves their work. They take pride in what they do and are passionate about helping to change the world, one small step at a time.

Innovative British Firm Puts New Spin in Market with Help from DesignSpace

Introduction: A new phrase entered the English language in the 1990s - "doing a Dyson" - meaning to take a standard action and work out a way of doing it better.

British entrepreneur James Dyson took the humble act of vacuuming, complete with clogged bags, fading suction and dowdy designs, turning it upside down. Or rather, round and round. Dyson's patented dual cyclone technology, which promises no loss of suction together with innovative and attractive design, was launched in 1993. Since then, the company remained the market leader and has made the company the UK market leader since its launch in 1993, and led to a worldwide turnover of more than $450 million.

Challenge: Dyson Ltd. (Tetbury Hill, Malmesbury, U.K.) has now turned its attention to a new area in the home, launching an innovative washing machine, the Contrarotator. It is the only washing machine on the market with 2-drums rotating in opposite directions to give the cleanest wash results, with the largest load, in the fastest time. Since the CR-01 uses a single high-performance sports car bearing to support the drums instead of two lower grade bearings, engineers needed to know if the supporting "spider" could handle the load.

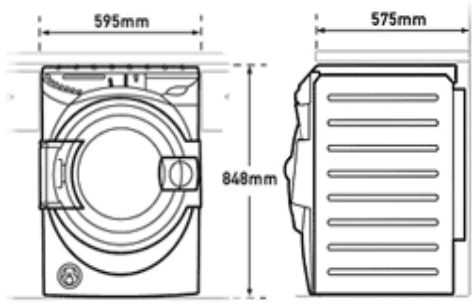
"James Dyson built more than 5,000 prototypes of the original dual cyclone," explains Stefan Kukula, head of the Analytical Services Group at Dyson. "With products such as a washing machine it's more difficult and costly to make that number of prototypes, so we made much more use of analytical techniques."

Solution: Using DesignSpace®-distributed by ANSYS Inc. (Canonsburg, Pennsylvania, U.S.A.), the global innovator of CAE solutions-engineers at Dyson determined that a single bearing instead of two could support the CR-01 drum.

FEA allows design engineers to construct computerized models of linear, planar and solid engineering structures and components. The concept of the method is that a structure or component is optimized as an interconnected assembly of elements. These elements are designed to model specific engineering phenomena and to respond under loading conditions accordingly.

Dyson places great emphasis on the design of products, and is keen not to stifle creativity. "DesignSpace is the ideal tool for this. We can allow trained engineers to do preliminary analyses and checks locally, straight from CAD models on our Unigraphics system, before later stage designs, or trickier problems, are qualified by more specialist software, such as ANSYS, if required," said Kukula. "This method was used on Dyson's latest cleaner, the DC07, which extends the original dual cyclone concept to eight cyclones to produce the Root8, the most powerful upright cleaner on the market. "We used DesignSpace to check the structural integrity of key components as the product was being designed, reducing the number of surprises we came across during user trials."

Benefit: The mix of dispersed design level and concentrated specialist tools offers great advantages for a creative company such as Dyson, and Kukula is keen to stress the opportunities.



"In many ways it (DesignSpace) is a natural extension of physical prototyping. With virtual prototyping provided by finite element analysis (FEA) complementing our test program, we could run through hundreds of designs before settling on suitable candidates to check physically," said Kukula. "The capability to tie in the different powerful analysis physics available in ANSYS with the design friendly front end of DesignSpace has been very exciting."

"We also used FEA to help design fatigue test rigs, ensuring that the stresses produced mirrored those we expected the components to see in service. After all, there's no point in doing a test if it isn't helping you design a better product."

LS-DYNA Dummy Modelling
Matthias Firl – DYNAmore GmbH
Slides 1-5 of 22 slides in this presentation

Presentation Slides 1- Injury criteria, side impact

EuroNCAP

- Tanking
- Modifier
- ES2 Modell

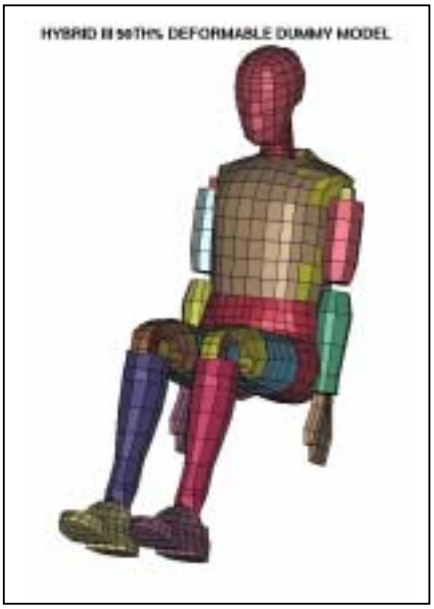
NCAP

- ……
  Detailed Information in the web available

Slide 2: Dummy models in LS-DYNA, front crash

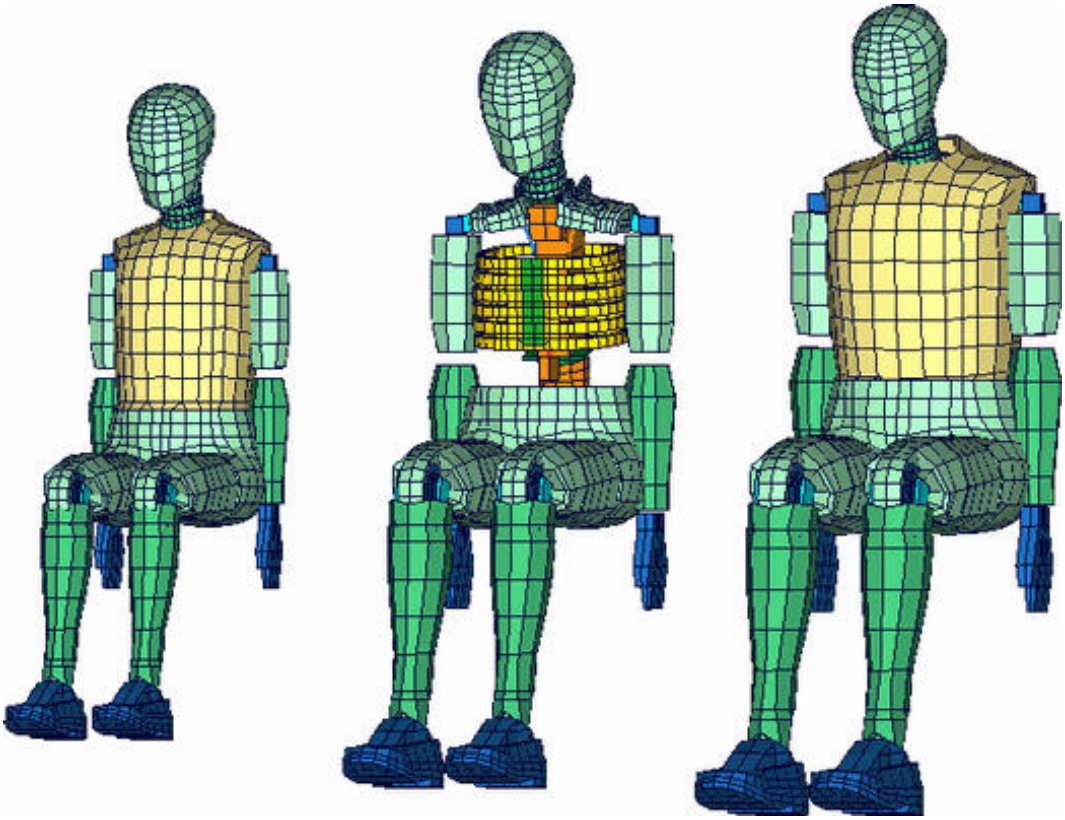
Front crash models (LSTC and FTSS Dummies)
- •LSTC Dummies for structure analyses
  - •Differenced in rigidize and deformable dummy
  - •5%, 50% and 95% models available
  - •Calculation of injury criteria not possible
  - •Free for LS-DYNA users
  - •Usable for seat and seatbelt analyses
  - •Positioning and seatbelt fitting in LS-INGRID
  - •Contain part inertia formulations
  - •Contact shells on the thorax and the pelvis
  - •Rigid body skeleton connected with joints

Slide 4 LSTC HYBRID III DEFORMABLE DUMMY



Dh3-deformable dummy
- •8525 nodes
- •5688 elements
  - •3864 solid elements
  - •1788 shell elements
  - •36 beam elements
  - •967 elastic elements
  - •452 foam elements
  - •549 plastic kinematic elements
  - •1975 rigid elements
  - •Only skeleton
- •100 parts

Slide 5: LSTC Hybrid III Deformable Dummy



The 4th European LS-DYNA Conference will be held May 22-23rd in Ulm, Germany.

Sessions:

Crash/Automotive Applications
Occupant
Occupant/Pedestrian Safety
Occupant/Airbag
Material

Aerospcae/Fluid-Structure Interaction
Drop Test/Impact
Optimization
Metal Forming
LS-DYNA Environment
MPP/Linux Cluster/Hardware

For information contact: info@dynamore.de Phone: 49 (0) 7 11 - 45 96 00 – 0

Information and conference agenda visit: www.ls-dynaconferences.de

Special Announcements and Highlights of News Pages

Posted on FEA Information in March

March 03	**MSC.Software –**	MSC/DYTRAN
	JRI - JMAG	JMAG
	MFAC	Distributor - CANADA
March 10	**SGI**	SGI Altix 3000 family
	ETA	eta/VPG
	DYNAMAX	Distributor - USA
March 17	**OASYS**	Oasys Primer
	HP	HP and Intel Accelerator Program
	ERAB	Distributor - Sweden
March 24	**INTEL**	Compilers
	CEI	EnSight
	THEME	Distributor in Korea
March 31	**FUJITSU**	PRIMEPOWER family
	AMD	AMD's processors
	ANSYS-CHINA	Distributor - China

Events & Courses from the Events page on www.feainformation.com

May 08	**One Day Course: Using Composite Materials with LS-DYNA. Theory, Usage of the 5 LS-DYNA models, criteria for the choice of the appropriate model and related trade-off. Workshop on real cases. numerica – www.numerica-srl.it Phone: 39.055.432010**	**Italy**
May 13	**14th annual technology trends in automotive engineering**	**USA**
May 19	**BETECH 2003 –**	**USA**
May 22 – 23	**4th European LS-DYNA Conference –**	**Germany**
June 3-5	**Testing Expo – Stuttgard - Germany**	**Germany**
June 17-20	**2nd M.I.T Conf. on Computational Fluid & Solid Mechanics**	**USA**
Early Oct.	**Int'l Conference on CAE**	**Italy**
Oct 29-31	**Testing Expo North America**	**USA**
Nov 12-14	**CAD-FEM User Conference**	**Germany**

FEA Information Participants

Headquarters	Company	
Australia	Leading Engineering Analysis Providers	www.leapaust.com.au
Canada	Metal Forming Analysis Corp.	www.mfac.com
China	Ansys - China	www.ansys.com.cn
France	Cril Technology Simulation	www.criltechnology.com
Germany	DYNAmore	www.dynamore.de
Germany	CAD-FEM	www.cadfem.de
India	GissEta	www.gisseta.com
Italy	Altair Engineering srl	www.altairtorino.it
Italy	Numerica srl	www.numerica-srl.it
Japan	The Japan Research Institute, Ltd	www.jri.co.jp
Japan	Fujitsu Ltd.	www.fujitsu.com
Japan	NEC	www.nec.com
Korea	THEME Engineering	www.lsdyna.co.kr
Korea	Korean Simulation Technologies	www.kostech.co.kr
Russia	State Unitary Enterprise - STRELA	www.ls-dynarussia.com
Sweden	Engineering Research AB	www.erab.se
Taiwan	Flotrend Corporation	www.flotrend.com
UK	OASYS, Ltd	www.arup.com/dyna
USA	INTEL	www.intel.com
USA	Livermore Software Technology	www.lstc.com
USA	Engineering Technology Associates	www.eta.com
USA	ANSYS, Inc	www.ansys.com
USA	Hewlett Packard	www.hp.com
USA	SGI	www.sgi.com
USA	MSC.Software	www.mscsoftware.com
USA	DYNAMAX	www.dynamax-inc.com
USA	CEI	www.ceintl.com
USA	AMD	www.amd.com
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USA	Dr. D. Benson	Univ. California – San Diego
USA	Dr. Bhavin V. Mehta	Ohio University
USA	Dr. Taylan Altan	The Ohio State U – ERC/NSM
USA	Prof. Ala Tabiei	University of Cincinnati
Russia	Dr. Alexey I. Borovkov	St. Petersburg State Tech. University
Italy	Prof. Gennaro Monacelli	Prode – Elasis & Univ. of Napoli, Federico II

Solutions Brief

MCAE Application Productivity with SGI® Altix™ 3000 Technology

SGI® Altix™ 3700 Supercluster
Scalable to hundreds of processors, with up to 64-processors and 512GB memory per node

SGI® Altix™ 3300 Server
4, 8, or 12 processors, up to 96GB memory

The combined forces of mechanical computer-aided engineering (MCAE) application software and HPC system technology provide engineers with an increasingly competitive advantage in today's global manufacturing market of product development. Manufacturers and suppliers in automotive, aerospace, and a variety of general manufacturing sectors benefit from MCAE applications that enable reduced design-cycle time and costs and overall improvements in design quality.

This article examines the MCAE productivity benefits of a new HPC system technology, the SGI Altix 3000 family of servers and superclusters, which was developed to advance the current capabilities of technical HPC. The design of SGI Altix 3000 combines the open-source 64-bit Linux® operating system, the Intel® Itanium® 2 microprocessor, and the SGI® NUMAflex™ shared-memory system architecture design. With this new server technology introduction, SGI offers the MCAE community a dual-platform roadmap based on UNIX® and Linux.

SGI Altix 3000 Introduction

Recent developments in HPC technology continue to rapidly advance the MCAE simulation capabilities of engineers across all disciplines. SGI is an established and leading supplier of HPC technology for MCAE simulation with the company's SGI® Origin® server family, based on the company's proprietary MIPS® microprocessors and IRIX® operating system. On January 7, 2003, SGI expanded its HPC offering with the introduction of SGI Altix 3000, the industry's first global shared-memory cluster that combines SGI NUMAflex supercomputing architecture with Intel Itanium 2 processors and the 64-bit Linux operating system.

The SGI® NUMA (nonuniform memory access) architecture was introduced in the SGI® Origin® 2000 server in 1995 and later advanced with the SGI NUMAflex modular design concept of the SGI® Origin® 3000 servers. This is the same high-bandwidth and low-latency NUMA architecture that is available in SGI Altix 3000, yet with a significant cost-performance advantage for MCAE applications. This advantage is achieved by, among other factors, contribution to and leverage of investments in Linux by the open-source community, and the Itanium 2 microprocessor roadmap from Intel.

SGI Altix 3000 is recognized by the Linux community as the first Linux cluster that scales to 64 processors and 512GB of shared memory within each single Linux OS-image node and the first cluster of any variety to allow global shared-memory access across nodes. These 64-processor single nodes can be clustered with a choice of scalable interconnect networks, including the proprietary SGI® NUMAlink™ interconnect technology, to much larger system configurations—up to 2,048 processors and a total of 16TB of memory—that make up an SGI Altix 3000 supercluster. The high-bandwidth SGI NUMAlink interconnect fabric of SGI Altix 3000 superclusters delivers information between cluster nodes up to 200 times faster than conventional clustering switches.

SGI Altix 3000 is binary compatible with the industry-standard 64-bit Linux distribution, currently based on the 2.4.19 kernel. In addition, SGI offers differentiated middleware and other functionality to enhance demanding HPC workloads in a bundle called SGI ProPack™. SGI ProPack is a set of user tools that ride on top of Linux and is similar to other commercial software packages. SGI ProPack is used to boost the performance of Linux and user applications on the Altix 3000, not to alter Linux itself. Such enhancements are commonplace in the industry and are also offered by other Linux system providers.

The performance of the SGI Altix 3000 family has set new records with many industry-standard benchmarks. In particular, the SPECfp®_rate_base2000 benchmark, a measure of a systems compute performance, and STREAM Triad benchmark, a measure of memory bandwidth performance, show SGI Altix 3000 easily outperforming all of the top-end UNIX OS-based systems that are popular with MCAE applications today.

MCAE Software and Industry Practice

Rapid progress in MCAE simulation performance has been influenced by advanced developments in both application software algorithms and HPC hardware systems. From a software algorithm and hardware perspective, there are three MCAE disciplines to consider for their requirement on HPC resources: implicit and explicit finite element analyses (FEA) for structural analysis and computational fluid dynamics (CFD) for fluid flow simulation.

The three MCAE disciplines exhibit a range of HPC resource demands and highlight the importance of a balanced HPC system architecture. The features desired most of a balanced system include (1) high-speed processors with large cache; (2) large addressable memory; (3) high memory-to-processor bandwidth

rates; (4) high disk-to-memory I/O rates; and (5) a low-latency interconnect that provides efficient parallel scalability to hundreds of processors.

By far the most important HPC advancement in recent years for MCAE applications is the parallel scalability of MCAE software. Most commercial MCAE software employs a distributed-memory parallel (DMP) technique for compatibility across the range of available HPC architectures. Other techniques include shared-memory parallel (SMP) and hybrid parallel schemes that take advantage of both DMP and SMP within a single computation.

While each discipline has inherent complexities with regard to efficient parallel scaling depending upon the particular parallel scheme and HPC system architecture, CFD can scale efficiently to hundreds of CPUs, explicit FEA can scale to more than 50 CPUs, and implicit FEA can scale to up to 10 CPUs.

Single-job turnaround of MCAE simulations on SGI Altix 3000 has been impressive, with many ISV applications showing a performance level that exceeds high-end UNIX systems. For some MCAE applications, Altix 3000 demonstrates efficient parallel scalability as high as 64 CPUs. This stand-alone job performance is critical for success of any new server today, but true commercial success requires the additional capability of job throughput, which more closely captures the industry's true MCAE practice. Industry practice most often combines the use of moderate single-job scalability with multi-job throughput. That is, a single job typically uses 12 CPUs on average, in a mix that combines several disparate jobs that require a throughput level of productivity.

Throughput is the domain and responsibility of hardware vendors, and SGI leads the industry in this critical HPC industry requirement. The NUMAflex system architecture was designed for a combination of single-job turnaround and multi-job throughput. Based on this architecture, SGI Altix 3000 offers MCAE simulations a high-availability, nondegrading, and efficient application environment to ensure that turnaround and throughput are delivered in support of hundreds of simultaneous users with a demanding mix of disciplines.

Multi-job throughput has been demonstrated on SGI Altix 3000 with a range of MCAE commercial software applications and industrial-sized customer jobs that exhibit an average throughput degradation of 10% compared with their turnaround times. This means that a single job, on average, requires just 10% more time to complete when that job is included in the mix of jobs.

SGI Altix 3000 Technology Benefits for MCAE

SGI continues to invest in the MCAE community's shared vision with the introduction of SGI Altix 3000, an HPC server that will enable further advancements for MCAE applications. SGI Altix 3000 delivers the existing application advantages of NUMA with complete 64-bit Linux compatibility, but in a shared memory capability that is not available in conventional clusters.

Unlike conventional clusters, the SGI Altix 3000 scalable memory architecture can conduct memory-resident MCAE analyses with the data as a whole entity, without breaking the data into smaller partitions to be handled by individual processors. Consequently, a programmer or user does not need to spend time developing rules to divide the data into smaller sets, as is required with domain decomposition techniques for distributed parallel MCAE.

The primary reason for efficient multi-job throughput capability with SGI Altix 3000 is the latest Linux kernel scheduler that performs well with large memory, an advantage SGI Altix 3000 has over commodity clusters. The trend of cheap and abundant commodity DRAM means this advantage will grow over time.

Another important advantage is I/O performance, a requirement for throughput of implicit FEA applications that simulate dynamic response of a structure. SGI Altix 3000 offers I/O rates of more than 2GB per second, well beyond the typical Linux barrier of 500MB per second.

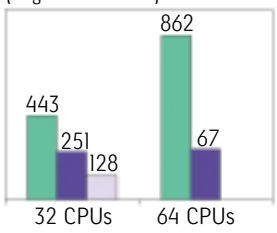
MCAE Technology Directions

The design breakthroughs of SGI Altix 3000 offer the industry a shared-memory choice for open-source computing with the cost-effectiveness of conventional clusters. With SGI Altix 3000, the entire suite of MCAE applications can now achieve capability levels that are equivalent to the most mature UNIX platforms, but at less than half the cost. This capability, along with its economic benefits, will further expand the use of MCAE to include a variety of new applications and practices that will become routine for product development.

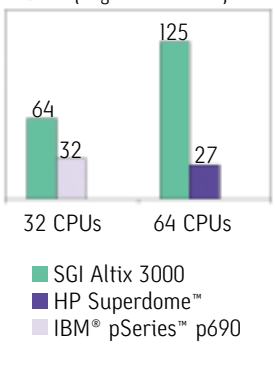
The capabilities of SGI Altix 3000 create opportunities for increased innovation, such as expanded use of time-dependent and time-accurate MCAE simulations. Additionally, there are opportunities for more production-level coupling of applications for multidisciplinary design optimization. The shared-memory, multipurpose architecture of SGI Altix 3000 is a platform that is well suited to the simultaneous demands of all three MCAE disciplines. SGI Altix 3000 provides the ability to capture more realism in simulations.

The record-setting performance levels of the SGI Altix 3000 systems will be at the forefront of performance because SGI designed the Altix 3000 servers with the ability to upgrade to the future Itanium 2 architectures code-named Madison and Montecito. Perhaps of even greater significance is the fact that SGI has accomplished these technological breakthroughs by working closely with the Linux open-source community and continues to offer much of its work back to the community, to be incorporated into later versions of the Linux kernel. These investments will ensure success of the new SGI Altix 3000 technology and the company's continued commitment to the MCAE community in delivering valuable leadership in HPC advancements for the manufacturing industry.

SPECfp_rate_base2000 benchmark scores (higher is better)



STREAM Triad Benchmark results in GB/sec (higher is better)



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