

PACE IN ACTION

Partners for the Advancement of Collaborative Engineering Education

THIRD/FOURTH QUARTER 2004



Lutz and Others Welcome Georgia Tech to PACE



Bob Lutz, GM

On August 18, Georgia Tech was announced as the 27th PACE Institution. The in-kind contribution, which included computer-aided design, manufacturing, and engineering software, as well as hardware and training, has a commercial value of more than \$208 million. The featured speaker of the event was Bob Lutz, GM Vice Chairman, Product Development and Chairman, GM North America.

The PACE contribution represents a significant investment in Georgia Tech and also complements Tech's multi-disciplinary approach to innovation, according to Georgia Tech President Wayne Clough.

"Our partnership with PACE strengthens Georgia Tech's relationships with each of these top companies," said Clough. "And in the hands of more of our students and faculty across many disciplines, the contributed technology will strengthen Tech's push to innovate through collaboration."

For General Motors, the new partnership with Georgia Tech is an investment in the company's future.

"Today, working in the automotive product development arena demands a firm grasp of computer-based design and analysis tools," said Lutz. "General Motors is pleased to be a part of investing in the intellectual capital of tomorrow's engineers."

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Howard University Joins PACE

On October 5, hundreds gathered at the Ira Aldridge Theater at Howard University as the school was publicly announced as a PACE Institution, receiving an in-kind contribution of software and other technology valued at \$70.6 million.

In an interview with The New York Times, Howard University President H. Patrick Swygert said, "This contribution will enable our design students in engineering and in the division of fine arts to literally be trained and taught on the very same equipment and software that's used by engineering studios at GM sites around the world. It's real-time education with real-time equipment."

Howard will receive modeling and simulation software that includes programs such as Unigraphics, MSC.Nastran, and FLUENT. These programs will enable students to design everything from airplanes to hybrid vehicles to biomedical devices. Additional software includes Teamcenter, E-factory, and Solid Edge.

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H. Patrick Swygert, Howard University; Ed Welburn, GM

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Partnering Globally With:



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Lutz and Others Welcome Georgia Tech to PACE



Buzz, Georgia Tech's mascot, poses with the event speakers



One of the largest corporate in-kind contributions ever given to Georgia Tech, the PACE contribution will provide students with access to the same programs used by leading industry professionals, including those at General Motors.

“This contribution will allow us to train our students using the latest and greatest technology. Our students will be in very high demand because they’ll be using all the same programs that many of the top companies are using,” said Tord Dennis, PACE Program Integrator at Georgia Tech.

Georgia Tech will receive modeling and simulation software such as FLUENT, HyperWorks, Unigraphics, and MSC.Nastran. With these programs, students will have new, powerful tools to design everything from hybrid vehicles or airplanes to biomedical devices. FLUENT, for instance, allows the user to design and run simulations of blood flowing through arteries and veins, or fluids moving through an engine. Other contributed software includes UGS’ Teamcenter, E-factory, and Solid Edge.

Although the software and other contributed technologies will be primarily used by engineering students and faculty in areas such as aerospace, mechanical engineering, and biomedical engineering, many other students of Georgia Tech’s six colleges will find the programs useful, as well.

The Georgia Institute of Technology is one of the nation’s premiere research universities. Ranked among U.S. News & World Report’s top 10 public universities, Georgia Tech educates more than 16,000 students every year through its Colleges of Architecture, Computing, Engineering, Liberal Arts, Management, and Sciences. Tech maintains a diverse campus and is among the nation’s top producers of women and African-American engineers.

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Howard University Joins PACE

“Digital sculpting, the creation of computer designs for three-dimensional objects, has become one of the hot skills for designers around the world,” said Ed Welburn, Vice President, Design, GM North America and Key Executive for Howard.

“Whether designing new cars or creating fantastical worlds on the movie screen, digital sculptors are literally changing the way the world looks. So it is important that students have the opportunity to work with the latest math-based tools. Helping provide these resources to schools like Howard University is what makes PACE such an important program.”

PACE’s contribution supports “The Campaign for Howard: Leadership for America and the Global Community,” a five-year initiative to raise \$250 million. Launched in March 2002, the campaign aims to harness resources to enhance the University’s academic programs and create new facilities for research and learning. To date, the campaign has gathered more than \$163 million in contributions.

Howard University is one of 48 U.S. private, Doctoral/Research-Extensive universities and comprises 12 schools and colleges. Founded in 1867, students pursue studies in more than 120 areas leading to undergraduate, graduate, and professional degrees. Howard produces more on-campus African-American Ph.D.s than any other university in the world.

For more information on Howard University, visit their website at www.howard.edu.



Speakers pose for a photo after signing a commemorative poster

Using Check-Mate in the Classroom

Last May, at the PLM World conference, Bob Chalou of Michigan State University presented a paper titled “Using Check-Mate in the Classroom.” With the help and support of Hulas King and Tavia Carson of UGS, PACE’S academic bundle now includes the modules for Check-Mate and Knowledge Fusion Author.

Check-Mate gives faculty the ability to quickly and accurately check one or many part files and assemblies against a set of standards that can be either predefined (out of the box) or customer defined. Check-Mate also has the ability to report results. The results of these checks can be assigned values, which then can be entered as grades for the students’ assessments. The Check-Mate module is an easy-to-use quality assurance utility. Faculty can also tailor the curriculum to meet the needs of their students in a timelier manner.

If you would like information on how this is being used at Michigan State University, please contact Bob at chalou@egr.msu.edu or 517-432-5260.

PACE Competition at University of Missouri-Rolla



Winning team with judges

PACE held its third student design competition on April 29 at the University of Missouri-Rolla. It was part of the PACE commitment to encourage student use of digital data in the product development and analysis processes that are critical to modern engineering practices.

This competition judged three critical areas of the virtual product development process:

- Parametric modeling
- Design concepts
- Product performance

Teamwork and collaborative design were stressed throughout these competitions. Judges for the contests included representatives from GM, Sun Microsystems, and UGS. Winners received prizes and commendation certificates.

The competition was held in the sophomore-level “ME 161 – Introduction to Design” class. This project provided the opportunity for teams to design and fabricate devices using the complete design process and design methodologies discussed in class with preliminary engineering analyses and detailed machining. Seven student teams competed in the PACE competition to parametrically design and manufacture a vehicle that transports tennis balls for a linear distance and is powered solely by, at most, three large-size binder clips.



Winning team demonstrates their design

Team B6, comprised of Michael Becker, Michael Hoffmann, Nicholas Langford, Janet Ragon, and Stephanie Schondelmeyer, won the competition. Their design included the use of a propulsion system composed of three clips stretched in series underneath the chassis. Their final design concept came from careful and comprehensive engineering analysis among many design concepts generated from the conceptual design techniques. The Unigraphics solid models and drawings of the assembly and all components completely and clearly represented their design. Their innovative design and manufacturing, and especially the team collaboration, allowed the group to earn the highest score in terms of product performance, which was measured by the distance traveled and the number of tennis balls transported.

“As indicated by many students, the questions, feedback and comments from the judges were especially valuable for enhancing a deeper understanding of the engineering design process and the importance of design tools – such as Unigraphics – in the real product development,” said Xiaoping Du, Mechanical Engineering Professor. “This competition also helped us to achieve the goal of simulating the real engineering design environment and fostering collaborative learning with an early exposure to industrial issues.”



Sun Offers Servers to PACE Institutions

Sun Microsystems, one of the original PACE partners has long provided its workstations to PACE Institutions. However, Sun is now taking on a new function with PACE focusing on servers. In its new role, Sun will make hardware and software available to PACE Institutions, thus easing the financial burden to the institutions as they work to improve their curriculum in PACE-related areas.

Sun Microsystems Complimentary Server Offer

To help the participating PACE institutions implement their curriculum in support of the PACE mission and goals, Sun is pleased to offer a limited number of Sun Fire V250 Servers to selected PACE Institution(s). This is a competitive grant process. Institutions will be notified by the PACE Office when this process begins each year.

Offering a reliable and secure two-processor platform, the Sun Fire V250 server comes preloaded with the Solaris Operating System.

Below-Educational-Discount Offer

To support PACE Institutions that need workstations, hardware, or software manufactured by Sun Microsystems, Sun has agreed to provide below-educational-discount pricing to PACE Institutions worldwide. PACE institutions can receive up to an additional 20 percent (varies by product category) discount on Sun hardware and software as an in-kind contribution in support of their PACE research and educational efforts. This is beyond the institution's normal discount.

Ordering Process

If you need assistance in selecting the appropriate product or configuration, Sun's product portfolio is available online at <http://store.sun.com>. You can also call 1-800-786-0404 or contact your local Sun Sales Representative.

"Sun, together with General Motors, EDS, UGS and the growing list of PACE Contributors, is committed to helping universities around the globe develop the product lifecycle team of the future," said Fred Edwards, Client Executive Director for Sun Microsystems and PACE Executive Sponsor Council member.

"Businesses are not alone in looking for a better computing environment to allow them to securely do more with less. PACE institutions have similar concerns over security, as they too are being hammered relentlessly by viruses and other security issues. They're also concerned about growing costs and complexity, as more and more computing services are being delivered through network computing technologies. Through the PACE Server Grant and Education Discount Offerings, we can help enable schools of higher learning meet these challenges so they can focus on the students and the learning environment," Edwards concluded.

- (2) 1.28-GHz UltraSPARC IIIi Cu-Processor
- 1-MB L2 Cache per Processor
- 2-GB Memory
- (2) 73-GB 10000 RPM UltraSCSI Disk Drive
- 1 DVD-ROM
- 2 Power Supply Unit
- 3 66-MHz, 64-bit Wide PCI Slots
- 3 33-MHz, 64-bit Wide PCI Slots
- System Configuration Card
- Sun Advanced Lights Out Manager (ALOM) Pre-Installed
- Solaris 8 Operating System Pre-Installed



University of Waterloo Human Body Modeling Project

The University of Waterloo is working with GM Canada on a PACE Project titled “Numerical Analysis of Advanced Human Body Models.” The goal of this project is to advance nonlinear finite element techniques to predict human body response in automotive crashes. These techniques will ultimately be used as development and design tools for the improvement of vehicle crash safety. Specifically, advanced human body models are being developed to investigate thoracic and head/neck trauma from frontal and side impacts. This project is currently in its second year, and the advanced human body models developed in the first year are being validated against experimental impact data. These models will also be integrated with a finite element vehicle model to study the occupant impact responses and injury mechanisms.

Professor Duane Cronin is working on this project with graduate students Patrick Forbes and Matthew Panzer (from the University of Waterloo) and close cooperation with Dr. Yih-Chang Deng (Technical Fellow, General Motors) and Marc Boismenu (General Motors of Canada Limited). In addition to the PACE funding, this project is funded by a Natural Sciences and Engineering Research Council of Canada – Collaborative Research and Development Grant. This research is further complemented by an undertaking to improve injury criteria using numerical techniques funded by the Premier’s Research Excellence Award (Ontario, Canada) with General Motors of Canada Limited.



“This is a very exciting time for us and our Impact Biomechanics research. Advances in computer power and bio-materials knowledge now allow us to understand fundamental aspects of trauma and realize the use of virtual humans to evaluate vehicle crash safety,” said Duane Cronin.

“We’re very pleased to tap into the talent and expertise of the University of Waterloo to work on this important subject,” said Yih-Chang Deng. “Good progress has been made in the past year, and we look forward to seeing more ground-breaking work in the second year and beyond. We deeply appreciate all the support we have received from PACE, GM management, and the Canadian Government for this effort.”

Altair Provides Training in Mexico



On September 21–22, Altair Engineering held its first free training course in coordination with the PACE Institutions in Mexico at the ITESM campus in Toluca. The focus of the course was Altair HyperMesh and OptiStruct, and participants received a

basic understanding of the use and application of these products.

The primary goals of this training were to make local companies aware of the new Research Center at ITESM-Toluca, demonstrate the impact of the PACE Program on the Toluca campus, and introduce some of the Altair products.

Attendees received training in basic Finite Element Modeling (FEM) techniques using HyperMesh, as well as the setup of models to perform conceptual optimizations using Topology, Topography, and Size and Shape methodologies available in Altair’s OptiStruct product.

All in attendance commented on how excited they were to have this opportunity to touch a product before its purchase. Elvis Zavaleta of Global Support commented, “I think it was a good training, and the instructor has good capabilities. Concerning the software, it fulfilled the expectations we were looking for.”

“We would like to personally thank Jose Carlos Miranda, PACE Program Integrator at ITESM-Toluca, for making the PACE lab available for this event, and for his tireless efforts on behalf of the university,” said Chuck Higgins, Regional Managing Director – South Central, Altair Engineering.

“Additional thanks go to Jose Luis Garcia of dptec for providing the excellent instruction for these two days,” Higgins continued. “And last, but certainly not least, the student aides that truly made it all happen: Mauricio Carmona Garcia, Victor Andres Acosta Santamaria, Alejandra De Avila Rubio, and Gabriel Fernandez Davila.”

Altair, in conjunction with all PACE sites in Mexico, plans future events to showcase these PACE Institutions and the array of Altair products available through them. Altair would like to thank everyone that made this an event to remember.

University of Michigan Completes Parametric Bushing Project



Student team with GM Sponsors

The University of Michigan (Ann Arbor) completed a PACE project for GM titled “Parametric Elastomer Bushing Design for Automotive Suspensions.”

The problem

Elastomer bushings have many purposes in automobiles – from attaching suspension components to keeping engine vibration away from passengers. Often representing a tough design problem, bushings must have the right stiffness and isolation qualities while satisfying strict packaging space and cost constraints. Bushing suppliers and GM engineers often go through numerous iterations in an attempt to satisfy the conflicting requirements. Even so, bushing geometries are relatively simple – essentially cylindrical or donut shaped with small details – and material selection is pragmatically limited to a few dozen types. Given these restrictions, the possibility of constructing a software tool that can automatically scan hundreds of potential bushing designs, or potentially even synthesize a new one, was recognized.

Proposed solution

Four University of Michigan students created a prototype software system, which interconnected several tools in use at GM (Unigraphics, Hypermesh, and Abaqus) and defined a parametric bushing model that could be morphed into a myriad of potential designs. They worked out the many details involved with getting the output of one program to feed the next and succeeded in getting the system to run automatically. By adopting some pragmatic standards upfront, they set up the code to inherently focus on practical designs, but were sure to leave open some doors for the computer so that unique combinations of parameters could be found that lead engineers to more successful bushings. Analysis managers at GM and suppliers estimate that the tool, when fully developed and deployed, could save thousands of engineer hours.

The students involved with this project were Gonca Esin, Darren Keese, John Oleniczak and Traci Westerlin. They formed a team in Professor Albert Shih’s Senior Design class at the University, and PACE provided the connection with General Motors.

“This project gave our team an opportunity to go beyond learning individual software packages,” said John Oleniczak. “In engineering, nothing exists in isolation. By working with multiple software packages, we could see the entire problem from a design standpoint, which allowed us to use these tools to find a real-world solution.”

“The PACE program created a unique opportunity for us at GM to tap the creativity and talent of U-M students and apply it to one of our toughest projects. We all certainly benefited from the chance to work together,” said Todd Vest, Engineering Group Manager, CAE, GM of Canada.



ACTIVITY CORNER

The 2005 PACE Annual Meeting will take place in Mexico next spring or summer. The Planning Committee is working to confirm the details, including speakers, locations, and travel. The PACE Team looks forward to seeing representatives from all PACE Institutions to discuss curricula, integrated product development processes, and other critical topics.

The annual PLM World 2004 Conference will be held May 2-6, 2005, at the Wyndham Anatole in Dallas, Texas. Check out www.plmworld.org for more information.

PACE SOFTWARE - CURRENT VERSIONS

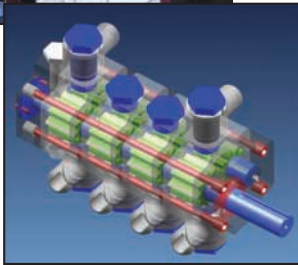
Below are the current versions of the software that PACE Institutions should be utilizing effective September 30, 2004.

SOFTWARE	VERSION
Unigraphics	UG NX v2.0.3
Teamcenter Engineering	v8.1 (moving to v9 April, 2005)
E-Factory Toolkit	Factory CAD: v7.1
MSC.ADAMS	V2003
MSC.Nastran	v2004.0.0
MSC.Akusmod	v1.4
Altair Hypergraph	v5.1
Altair Hyperview	v5.1
Altair Motionview	v5.1
Fluent	V6.1.22

PACE Competitions Ready for Deployment

As part of its commitment to encourage students to use digital data in the product development and analysis processes that is critical to modern engineering and design practices, PACE is providing student design competitions in appropriate courses within PACE Institution curricula. PACE has successfully piloted these PACE Competitions at three institutions over the last year: Michigan State University, Michigan Technological University, and the University of Missouri-Rolla.

Now PACE is planning to make these available to other institutions around the world!



The PACE Competitions can easily be integrated into any institution's existing curricula (any CAD/CAM/CAE course with a project), so the work for faculty is minimal. These competitions provide great benefits to students, including:

- An opportunity to present to a cadre of industry representatives and receive feedback on their projects
- An opportunity to meet and talk with content experts from GM, EDS, Sun Microsystems, UGS, and, at times, other PACE Contributors
- A PACE company representative often gives a short presentation on some area of interest to the students
- PACE provides prizes to the winning team members, generally as part of a PACE-sponsored lunch or dinner
- Winners receive certificates of accomplishment to aid in job searches
- Company representatives can witness the capability of students firsthand, which may result in internship or employment opportunities

PACE Institution faculty members who are interested in requesting a PACE Competition for a course can contact Tanya Jordan at 586-947-2386 or tanya.jordan@gm.com. The projects need not be automotive, but must use PACE-sponsored software. They can occur as early as the freshman year. Students may work on the same project topic or totally different ones.

Faculty members report that these competitions are easy to co-host with PACE. Academic questions about PACE competitions can be directed to Professors Bob Chalou (chalou@msu.edu), Bernie Bettig (bettig@mtu.edu), or Xiaoping Du (dux@umr.edu).

PACE Project Saves GM de Mexico Time

ITESM-Monterrey recently completed a PACE Project with GM de Mexico. Jorge Garza and Anibal Murrieta, 9th semester students of Mechanical Engineering, worked through the objective of the project by designing a tool capable of manipulating data received from CMM and vision systems so that it can be fed into the VARIATION ANALYSIS SOFTWARE (3-DCS).

The information received from the coordinate machines can be viewed and analyzed by Microsoft Excel. A macro based on Microsoft Visual Basic was created in order to manipulate the worksheet data received by the CDIS Page into the desired format in the same file.

Heriberto Benitez, a 2.5 years Dimensional System Engineer at GMM Toluca and a fluent user of the Variation Analysis software, stated, "The idea was there but we didn't have the time to focus and do it. There were many benefits to this project, the most important being that it reduced the time needed to complete this task from three days to roughly 10 to 15 minutes (depending on the sample size)!"

Other benefits of this project include:

- 180 Dimensional Engineer hours were saved developing this macro
- Low-cost project (reflected directly into a GMM benefit)
- FTQ to almost 100 percent (human error eliminated when data from ASM Plants is transferred to the VSM Software)
- VA simulations allow more samples to be input into VSM Software

"We don't want to constrain our fresh and open-minded students within any GM boundaries that limit creativity," said Victor Zepeda, EGM Math Based-Processes and Dimensional Engineering, GMM. "We want to get different perspectives about the boundaries that we have created along the years. 'Keep it simple' is our motto, and we challenge the students to use this approach to be both on scope and on time while receiving good-quality results with this Excel macro. As the future of GM, these students support our current transformation from a good company to a great one."

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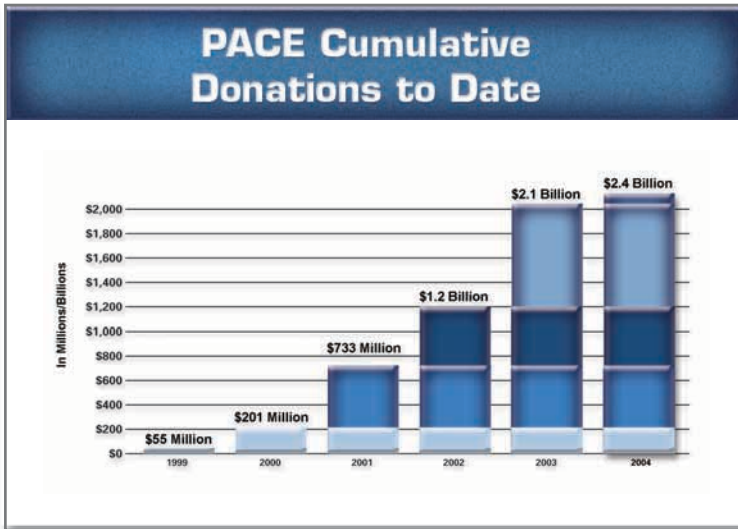
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We welcome your comments. Please send questions, comments and article suggestions to Tanya Jordan, PACE Marketing Coordinator and Editor, PACE in Action, GM Knowledge Center, MC 480-303-110, 6442 E. 12 Mile Road, Warren, MI 48090-9000; E-mail: tanya.jordan@gm.com; phone (586) 947-2386; fax (586) 947-2715

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