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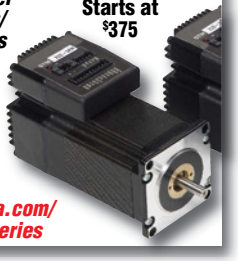

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by Steve Robbins

800 MPH or 100 MPG

Americans have interesting relationships with their cars. My wife, for example, still has her 1985 Volkswagen Jetta diesel under a tarp in front of one of our barns. I had it restored for her a few years ago, and even with 155,000 miles on it, it ran pretty well. She loves that vehicle and although it doesn't see much use, it won't be going anywhere any time soon.

I am totally the opposite. I look at an automobile as a tool. When it reaches the end of its design lifecycle, I gladly exchange it for another. A lot of factors come into play when I make a decision on what to drive. Living in New Hampshire on a dirt back road, I look at ground clearance and AWD traction. My Volvo XC70 is a tank, but has much better fuel efficiency than one of those SUV beasts weighting around 4 tons. It even drives like a sports car.

Neither of these projects would have been possible without the use of fast computers and analysis software.

Going to Extremes

A couple of years ago we ran a cover story on a team of North American engineers who designed and built a vehicle that could break the world land-speed record of 763mph. This "car," built by North American Eagle (NAE), was designed on the converted airframe of an F-104 Starfighter. This vehicle would never make it to my home in the middle of a New Hampshire winter, but if it could my usual 50-minute commute to work would only take me about 3 minutes and 15 seconds. That's something I would be very interested in.

Last week I was at a Siemens event where I had the good fortune to meet the design team who won the Automotive X-Prize a year ago. They walked away with a cool $5 million for designing and building a mainstream car that could hold four adults with luggage, get more than 100 miles per gallon and have a range of 200 miles. Oh yeah, and it had to have four wheels, pass Consumers Union dynamic safety standards and Tier 2 Bin 8 emissions.

Edison2 with doors open. ***Image courtesy of Siemens.***

My present car averages about 24 mpg, so my 84-mile daily round trip costs me around $12.77 at today's fuel prices. If I owned an Edison2 VLC (Very Light Car) I would only be shelling out $3.07 a day. This adds up to a savings of $2,425 a year, just for my commute. OK, I'm interested, but it probably isn't going to get me home in the winter either.

These vehicles are designed for extremes of speed and fuel efficiency. One is a bit more practical. We do need 100-mpg cars as soon as possible. On the other hand, I doubt you or I will ever even see an 800-mph car in our future, and it's not just because the NAE speed demon burns 31 gallons of fuel a mile. Still, as the Chinese and Indian consumers begin buying more cars, even 12-mpg SUVs will become art objects.

Weight and Drag

What is interesting is that neither of these projects would ever have been possible without the use of fast computers and analysis software. Early in the design phase, the Edison2 team realized there were only two variables that they needed to pay attention to if they were going to win that prize: weight and low aerodynamic drag. Multiple designs and computational fluid dynamics (CFD) simulations later, Edison rolled out an 850-lb sleek machine that was one of the most aerodynamic automobiles ever tested. And, it was designed to be converted into a vehicle you or I can afford to use. Target price for a consumer model is under $20,000! Not too bad for a fuel-efficient car that runs on a 250cc turbocharged, one cylinder engine that can drive the VLC from 0-60 in 15 seconds. You know, if I lived in California, I think I would buy one.

The NAE used CFD and finite element analysis (FEA) to keep the car on the ground. Also, on a car going that fast, brakes become very important. It took new technology to keep the brakes from melting and catching on fire. I don't think weight was a factor as they weren't into the fuel efficiency game.

Looking back on the purchase of my wife's 1985 Volkswagen, it was very innovative for the time. It normally gets more than 50 mpg, twice that of my Volvo. Maybe I should talk her into giving it to me. It will make it up my road in all but the worst of weather, and I would keep the XC70 for snowy days. DE

Steve Robbins *is the CEO of Level 5 Communications and executive editor of* DE. *Send comments about this subject to DE-Editors@deskeng.com.*

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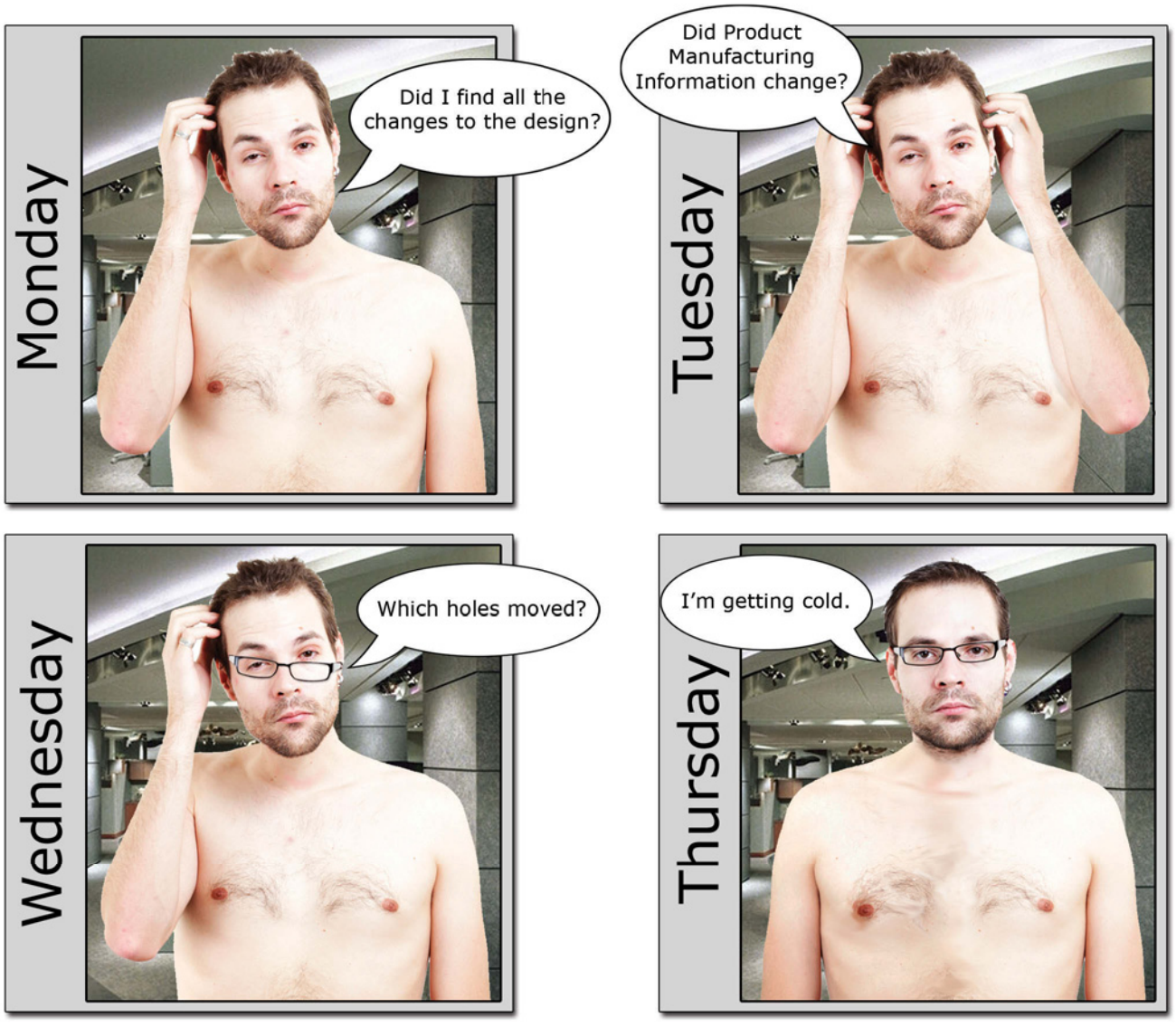

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DE October 2011 VOLUME 17/ISSUE 2

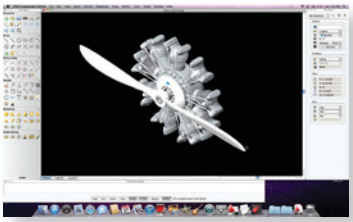
COVER STORY

14 Get a Grip on EMI

Electromagnetic interference is highly problematic for designers of all types of products and systems—and it's growing, thanks to the proliferation of electronic components. Any object that carries rapidly changing electrical currents or voltages can generate EMI, which has the potential to degrade the performance of another electrical device. And EMI issues are so complex, it's difficult for software tools to resolve them—though they can help. Barbara Goode interviews EMI experts for their take on what engineers can do to combat EMI.

ON THE COVER: Images in photo illustration courtesy of iStock International.

COMPUTER-AIDED DESIGN



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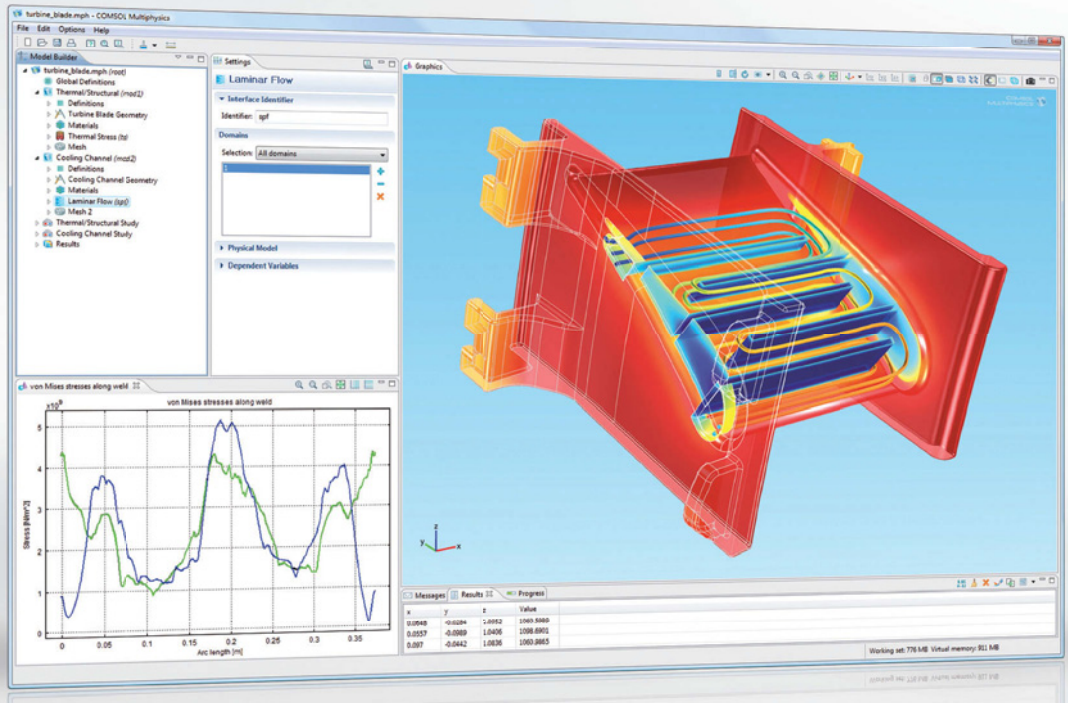

A stator blade in the turbine stage of a jet engine is heated by the combustion gases. To prevent the stator from melting, air is passed through a cooling duct in the blade.

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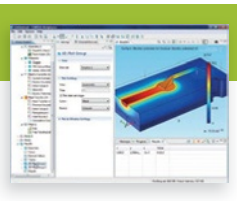

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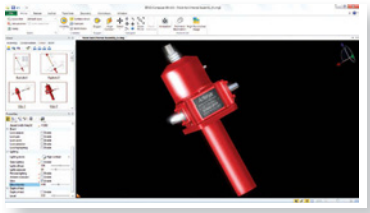

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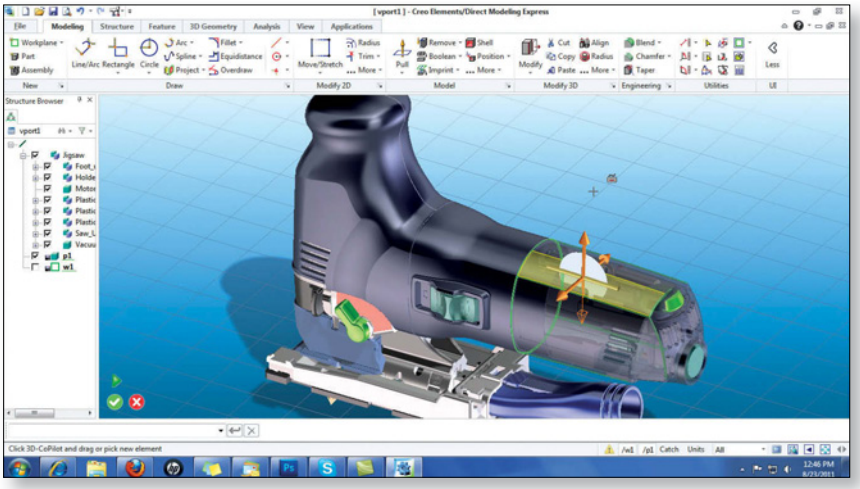
by Kenneth Wong

PTC Creo Apps for Sketching and Direct Modeling

Shifting its strategy from all-inclusive CAD and product lifecycle management (PLM) packages to Apple app-style modules, PTC began rolling out the first of its Creo family apps. The company released Creo Sketch in August, followed by Creo Elements/Direct Modeling Express in September.

Creo Sketch is not meant to be a precision-drafting program, like Autodesk's AutoCAD LT or Dassault Systèmes' DraftSight. Creo Sketch may be closer to Autodesk SketchBook Designer, a fun, creative drawing program powered by flexible splines. You'll find that stock 2D objects in Creo Sketch—circles, lines, arcs and rectangles—can easily be edited as spline objects. Once you terminate a command (by clicking on the middle-mouse button), your 2D object turns into an editable spline profile with control points—ready to be pinched, poked, stretched and reshaped to your heart's content.

If you've used Co/Create, PTC's push-pull CAD modeler, you'll find yourself in semi-familiar territory in Creo Elements/Direct Modeling Express. Launching the software, you'll be reunited with CoCreate's CoPilot (the control arrows for moving and rotating features). You may think of CE/Direct Modeling Express as a trimmed down version of CoCreate, derived from the same underlying technology. The software allows you to push, pull, rotate and move faces and features with little concern for feature or parametric history.



PTC Creo Elements/Direct Modeling Express is part of PTC's Creo strategy.

The software's present import, or 3D reading, is limited mostly to neutral formats. So if you want to work on a SolidWorks, Inventor or Solid Edge file, you'll have to convert it from its native format to a neutral format (IGES, STEP). CE/Direct Modeling Express has Realism Enhancement options for you to activate ground reflections, shadows, background colors and rendered surfaces. It's not as refined as ray-traced rendering, but it's sufficient to give you a good idea of the finished product's aesthetic appeal.

CE/Direct Modeling Express offers more functions than you might expect from a free program. There is, however, a 60-part limit to the number of parts you can work with in assembly. The limit is removed once you upgrade to the commercial version, Creo Elements/Direct Modeling. The commercial version also gives you sheet metal tools, along with decal (embedding 2D images in your design), photorealistic rendering, and exporting STEP and IGES files.

PTC Creo Sketch and CE/Direct Modeling Express serve to reinforce the company's commitment to its Creo strategy, set a year ago: Brian Shepherd, PTC's executive vice president of product development, famously borrowed Apple's marketing slogan by saying, "There's an app for that." DE

Teamcenter Mobility 2.0: From Passive Consumption to Active Participation

As a fitting homage to the rise of iPad 2, Siemens Product Lifecycle Management (PLM) Software swiftly followed up its debut mobile app Teamcenter Mobility 1.0 with an upgrade. The first version was confined almost entirely to remote data access. Simply put, it was a mobile app for iPad users to sign into a Teamcenter database, perform searches, review pending tasks and change orders, and view 3D designs in lightweight JT format. Teamcenter Mobility 2.0, available for download at Apple's App Store since September, adds limited editing and markup functions, along with task initiation options.

In the new version, the app's Facebook-style notification shows pending operations with a number (corresponding to the number of tasks and change orders that need attention) displayed over its icon. The app allows you to access online data from its interface, but it also offers an Offline Cache mode, which allows you to download the design file to your iPad's local storage. When going back online, the app will synch your offline changes to update the database.

Most notably, Teamcenter Mobility 2.0 includes several basic markup functions. These let you red-line and annotate Office documents, design files and digital photos taken with the iPad. It also lets you play .mov files, which could be used to deliver assembly and repair instructions. Pending tasks and changes can be displayed by due dates and assigned owners, giving you an easy way to monitor progress. You may also sign off or submit problem reports to Teamcenter from the iPad app.

Two months after the release of Teamcenter Mobility 1.0, Siemens PLM Software updates the iPad app to version 2.0, adding basic markup tools and work initiation options.

Siemens PLM Software's Active Workspace, currently still in development, is expected to drive the company's vision for HD-PLM, a visual data management environment. (For more, read "Visualizing the Forest of Data Beyond the Trees," *DE*, April 2011.)

Eric Sterling, Siemens PLM Software's senior VP of global marketing, revealed that the company is considering adding multi-touch support for Active Workspace. If the company follows through, it raises the possibility that some HD-PLM functions can be delivered through a mobile app. The company is also hard at work on an Android version of Teamcenter Mobility, currently in prototype phase.

Teamcenter Mobility is available in two editions: free and paid ($19.99). Some functions available in the paid version are not in the free version. The free version serves primarily as an evaluation copy, preloaded with a set of sample data.

For more on Teamcenter Mobility and the impact of mobile devices on PLM, read "Get Ready for RLM" on page 36. DE

by Kenneth Wong

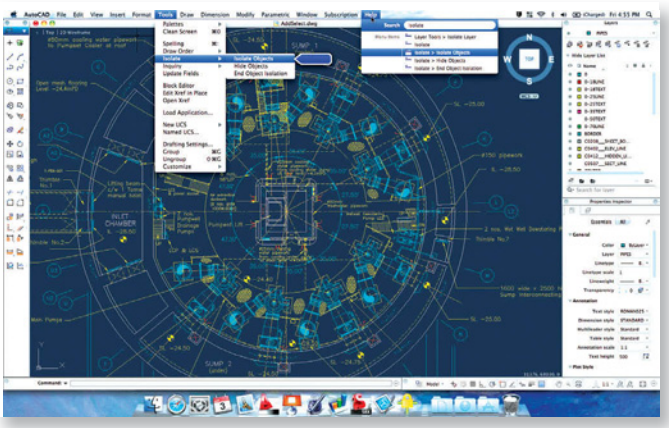
More Mac Titles from Autodesk at App Store, Amazon.com

A year after the release of AutoCAD for Mac, Autodesk decided to take a bigger bite of the Apple market. Last month, the company released not only an updated version of AutoCAD for Mac, but also AutoCAD LT for Mac and AutoCAD WS for Mac.

"Since the release of AutoCAD for Mac last year, customer feedback has been overwhelmingly positive, further validating the need for professional design and engineering software on the Mac platform," said Amar Hanspal, senior vice president, Autodesk Platform Solutions and Emerging Business. "Bringing AutoCAD LT and AutoCAD WS to the Mac shows our continued commitment to making design more accessible for an ever-greater number of people to shape the world around them."

According to the announcement, "AutoCAD LT for Mac follows common native Mac application user interface guidelines, with a familiar Apple menu bar together with a number of workflow-based palettes. AutoCAD LT for Mac also supports native Mac OS X behavior, including Cover Flow navigation and Multi-Touch gestures." Licensing options for AutoCAD for Mac now includes network licensing. AutoCAD LT is not available for network licensing.

Whereas the company's flagship drafting and drawing program AutoCAD remains a professional title, its lighter, nimbler cousins AutoCAD LT and AutoCAD WS can comfortably fit into the "prosumer" market, which straddles the consumer and professional markets. AutoCAD WS, the company's DGW viewing and markup app, has been available for some time for Apple iPhone and iPad users and Android users. The latest version released is intended for Mac machines running Apple OS X Lion. The software is free.



With the release of AutoCAD 2012 for Mac, Autodesk begins experimenting with atypical distribution methods, including Apple's App Store and Amazon.com.

The company continues to distribute AutoCAD for Mac through its reseller channel, but it is also selling products through Apple's App Store. Autodesk has been selling its free and modestly priced products, such as AutoCAD WS for iPhone and iPad and Autodesk SketchBook Mobile, through App Store for some time. However, distributing AutoCAD LT (priced $899) through App Store is a gamble for the company, as App Store buyers are more accustomed to purchasing products with micro-pricing (for instance, $1.99 for a song, $4.99 for a game). Depending on the success of its experiment with AutoCAD LT on App Store, the company may push more semi-professional and consumer-usable software titles through this venue. In addition, Autodesk began offering select titles through Amazon.com in September.

Offering its titles through App Store and Amazon.com may be an educational experience, both for buyers and for Autodesk. App Store, for instance, doesn't support software subscription—a method Autodesk has been using to peddle some of its most popular titles. For the version of AutoCAD for Mac offered through Amazon.com (available for subscription licensing), Autodesk can't rely on resellers to provide technical support.

The move to go beyond its traditional distribution channel (Autodesk authorized resellers) and venture into consumer-friendly territories reflects the company's aspiration to explore the outskirts of professional market. A few months ago, Autodesk released 123D, a lightweight 3D design program based on its direct-editing technology Inventor Fusion. The product targets tinkerers, hobbyists, crafters and homegrown inventors—all part of the do-it-yourself movement fueling online commerce at sites like Etsy and attendance at trade shows like Maker Faire. This month, Autodesk acquired Instructables.com, an online portal where ordinary people share project ideas and collaborate.

In addition to selling AutoCAD as an independent title, Autodesk also includes the product with many of its industry-specific suites, such as Autodesk Design Suite (for general design), Autodesk Product Design Suite (for mechanical engineering and industrial design), and Autodesk Building Design Suite (for architecture and construction). By default, buyers get a Windows version of AutoCAD. However, the new dual-platform activation method will give suite buyers access to a Mac version of AutoCAD without having to purchase another license. DE

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by Kenneth Wong

HP's Future: What About the Workstation Market?

HP TouchSmart 520, part of HP's new line of All-in-one PCs.

In 2002, HP bought Compaq in a $25 billion merger that created the PC market's de facto leader. Nine years later, HP is contemplating what amounts to a U-turn in its strategy: It is thinking of leaving the PC business altogether.

In August, HP's president and CEO Leo Apotheker announced, "We believe exploring alternatives for PSG [Personal Systems Group] could enhance its performance, allow it to more effectively compete and provide greater value for HP shareholders." The alternative he's considering is "the separation of its PC business into a separate company through a spin-off or other transaction."

So what might PC-less HP pursue? The company's plan to acquire software maker Autonomy suggests it hopes to buy its way into the enterprise software business. To explain the $11.7 billion bid, Apotheker said, "Autonomy has an attractive business model, including a strong cloud-based solution set … We believe this bold action will squarely position HP in software and information to create the next-generation Information Platform." HP's new plan is to "focus on its strategic priorities of cloud, solutions and software, with an emphasis on enterprise, commercial and government markets," the company outlined.

In the announcement of its strategy for PSG, HP noted, "The personal computing market is quickly evolving with new form factors and application ecosystems." One of the notable "form factors" is the tablet, now threatening to take over a chunk of the computing market previously owned by the PC.

Apotheker himself acknowledged, "'Consumers are changing the use of their PC. The tablet effect is real, and sales of the TouchPad are not meeting our expectations" ("HP to Apple: You Win," *TechCrunch*, Aug. 18, 2011).

HP tried to step up to the tablet market with the launch of its own HP TouchPad. But even with a marketing campaign involving Britain's funny man Russell Brand and Glee's Lea Michele, HP's device couldn't seem to wrestle away enough market share from the iPad. Consequently, HP is killing off its webOS and TouchPad business—"a difficult but necessary decision," according to HP's online FAQ document.

Soon after the announcement, HP slashed the prices of its TouchPad from $399 (16 GB) and $499 (32 GB) to $99 and $149, respectively. The devices were sold out in a matter of hours.

Though HP's strategy to focus on software is clear, the company's plan for the PC business is not so clear-cut. Even as it explores options for its long-established PC business, HP recently rolled out a new line of PCs, described as the "largest investment in the all-in-one desktop PC market to date." The All-in-one PCs, as HP calls them, target home users and businesses. They use the company's TouchSmart technology to deliver multi-touch support in its monitors.

HP's popular line of workstations are part of the company's PSG group, but we'll have to wait and see what alternatives emerge for HP's hardware future. DE

Kenneth Wong *writes about technology, its innovative use, and its implications. One of* DE's *MCAD/PLM experts, he has written for numerous technology magazines and writes DE's Virtual Desktop blog at deskeng.com/virtual_desktop. You can follow him on Twitter at KennethwongSF, or email him via de-editors@deskeng.com.*

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Get a GRIP on EMI

Electromagnetic interference is highly problematic for designers of all types of products and systems—and it's growing, thanks to the proliferation of electronic components.

BY BARBARA G. GOODE

"Everybody has to pass. And everybody has trouble," says Steve Newson of Newson Consulting Inc., a specialist in the field of electromagnetic interference (EMI; also called radio frequency interference, or RFI) with clients in almost every industry. Newson is referring to the fact that all products need to meet standards for electromagnetic emissions—and that EMI can be a significant problem for systems designers.

An Increasing Problem

Any object that carries rapidly changing electrical currents or voltages can generate EMI, which has the potential to degrade the performance of another electrical device.

Dr. Bruce Archambeault, an IBM Distinguished Engineer, lead author of the *EMI/EMC Computational Modeling Handbook* and author of the book *PCB Design for Real-World EMI Control*, notes that EMI is a subset of electromagnetic compatibility (EMC), a field that studies how devices and systems can perform without generating unacceptable EMI levels. Of course, any work with printed circuit boards (PCBs) requires the generation of signals, and Archambeault says it is best to reduce EMI at its source.

"Emissions start on circuits and leak out through seams and cables, which radiate them," he explains, saying that faster rise time leads to higher frequency of emissions. As frequency increases, slots and seams become more effective leakage points.

"At 10 MHz, you might not see much effect, but at higher frequencies—especially in the gigahertz (GHz) range—it is a different story," he says.

If the product you are designing is a small pager or similar device running at a relatively low frequency (say, below 10 to 50 MHz) with no wires attached, it is pretty safe as far as emissions go, says Archambeault. But radios and telephones are extremely sensitive. In general, the larger the device or system, the more wires and cables are involved—and the higher the frequency range, the more potential for EMI trouble. A product operating in the GHz range becomes almost impossible to shield, explains Archambeault, adding, "High-speed digital electronics can radiate enough emissions to be received by their own internal antennae."

In addition, Archambeault says, a cable can become the most important part of an antenna. Newson agrees: "A lot of people think that the most difficult EMI problems are related to PCBs and box shielding, but the biggest problem is cables," he says. "Cables act as antennae."

As Newson explains, the potential for trouble is increasing. "In the past 20 years, there has been a proliferation of electronic products, which has caused regulatory agencies to tighten and add requirements around EMI," he says. (See

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Answers for industry.

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"Regulating EMI" below) "In addition, circuitry is faster, and is running at lower voltages."

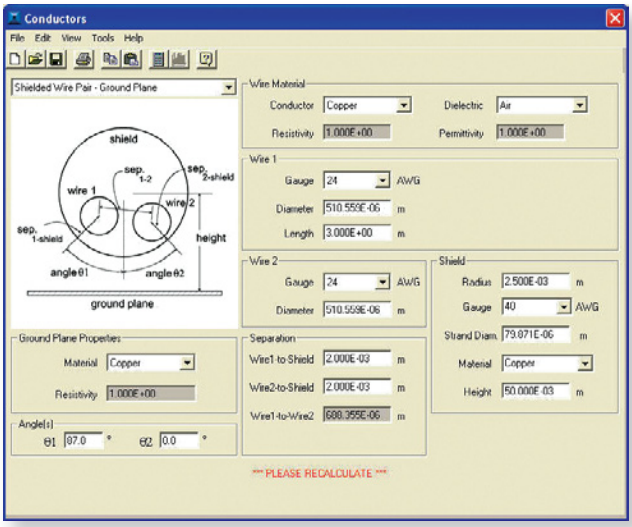
"You do need to worry about static electricity," warns Archambeault. As an example of what can go wrong, he points to the devastating fire and series of explosions that killed 134 sailors and injured even more when, in 1967, an electrical problem accidentally discharged a rocket on the flight deck of the *USS Forrestal*. He says you can find many other examples, collected under the name "EMC banana skins," on Compliance-Club.com, the website of the U.K.'s *EMC Journal*.

Tools and Confusion

"There's a lot of confusion out there" about EMI, says Newson. "And lots of misconceptions."

Indeed, Archambeault points out, "most electrical engineers come out of college with no knowledge of EMI or EMC. Few schools offer education in this area." He says that the Missouri University of Science and Technology (Rolla, MO), Oklahoma State University (Stillwater, OK), Clemson University (Clemson, SC) and a few others are notable exceptions.

It seems that while faculties want to teach the topic, they would need to give up another important topic to enable students to complete their coursework in the standard timeframe—and students are increasingly eager to begin turning their tuition investment into income, so they are not generally willing to extend their education. The result is that novice engineers seek specialized training, "after they have been burned badly with a project," says Archambeault.



The Conductor Form is an input screen used to define the dimensions of the cable for the system being analyzed. It is typical of many of the EMI Analyst input screens. *Image courtesy EMI Software LLC.*

But aren't there tools to help product and system designers overcome EMI problems? Well, yes: Tools are available from both large developers—such as ANSYS, which offers suites of software to address EMI in the context of other issues—and from small companies launched specifically to address this area. Be warned, though, there is confusion and controversy even in this area. "People will fail a test and hop online to search for EMI software," says Newson, who notes that "products are being called EMI analysis tools that are not."

Dr. Howard Johnson of Signal Consulting Inc., an inventor, author and noted expert in high-speed digital design, still stands by the statement he made in 1998 in *EDN* magazine: "Real, live EMI problems are much too complex for even the best software tools. As much as I wish the situation were untrue, at this point the best tool is still experience," he wrote.

Johnson told *Desktop Engineering* that the comment "is as true today as it was then. Real EMI problems are still too complex for even the best software tools to accurately predict exact EMI levels."

He does point to one major change, the fact that there are now two groups of tools available—one from Dr. Todd Hubing at Clemson University, and another from Archambeault that is marketed through Moss Bay.

"They are both expert system-type tools. That is, they give you advice about best practices, and they give you general ideas about things," Johnson says. "But they do not attempt to predict exact EMI levels; that's the thing that's still too difficult to do."

Regulating EMI

In the U.S., the Federal Communications Commissions (FCC) sets standards for a range of product types, and many industries—such as automotive, airline and medical—have their own requirements that address particular vulnerabilities and situations. The military has separate specifications.

On an international level, the International Special Committee on Radio Interference, also known as CISPR (for the French *Comité International Spécial des Perturbations Radioélectriques*) is a committee of the International Electrotechnical Commission (IEC) that sets civilian standards for domestic, commercial, industrial and automotive sectors regarding radiated and conducted electromagnetic interference (copies of all CISPR standards are available online at IEC.ch). These standards form the basis of other regional and national standards, such as the European Norms (EN) written by the European Committee for Electrotechnical Standardization (CENELEC, for the French *Comité Européen de Normalisation Électrotechnique*).

Newson says he began software development in 1995 precisely because "there were no good analysis tools for predicting outcomes." He says EMI problems resulting from ICs, PCBs, and enclosures, while quite difficult to model accurately, "account for fewer EMI failures and are generally easier to identify and correct." And although there is "still no tool that can adequately model a complete electronic system," Newson notes that "what can be accurately modeled is the circuitry and cabling ... which is the cause of most EMI test failures." This, he says, is the strength of EMI Analyst, a tool he offers through his software company, EMI Software LLC.

EMI Analyst combines all four facets of EMI analysis through four integrated programs:

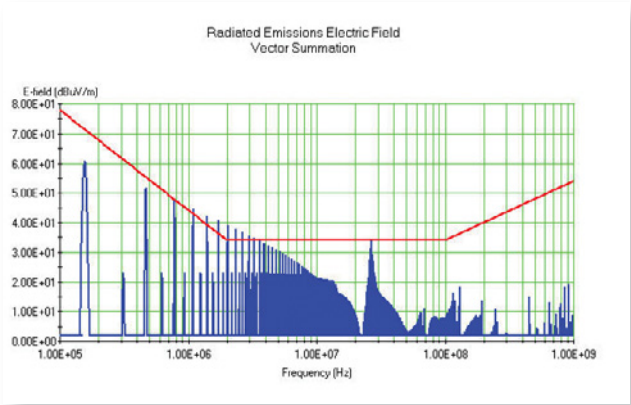
- the Conducted Emissions Analyst program calculates the amplitude of radio frequency current and voltage conducted on electric circuit wiring;
- the Conducted Susceptibility Analyst calculates voltage and current amplitude induced in circuits by voltage or current waveforms that are injected on the conductors to which the circuits are connected;
- the Radiated Emissions Analyst calculates the amplitude of electric and magnetic fields radiated from conductors carrying radio frequency current; and
- Radiated Susceptibility calculates voltage and current induced in circuits when an electromagnetic field strikes the conductors to which the circuits are connected.

Each provides templates that model waveforms, filtering and conductors using values designers fill in on pages that come up on screen. Then, when the user hits the calculate button and the software overlays the limit line, he or she "can do apples-to-apples comparison," explains Newson. "The software becomes a learning tool."

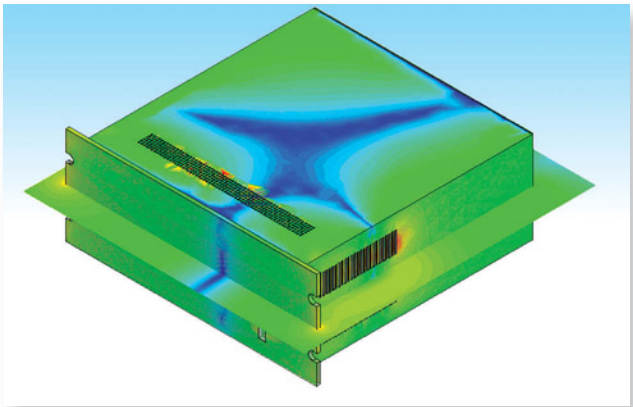
For instance, Newson offers, "resonance in the filter components is a common problem, so the designer can look at every point in the circuit to see which filter components are working and which are interacting."

An updated release of this software, which should be out by the time you read this, provides more sophisticated modeling of noise sources, representing subtle characteristics of differential and common mode noise to determine what effects they have on emissions and susceptibility.

Markus Kopp, product manager, Electronics at ANSYS Inc., says many people would be surprised to learn how far simulation software has come in just the past five years. While he agrees that EMI issues can be "very complex," and



The Radiated Emissions graph is a plot of typical results from the program's calculations. It shows predicted radiated emissions (blue) compared to the radiated emissions limit (red). *Image courtesy EMI Software LLC.*



Ansoft Designer 6.0 enables visualization of the electrical field that exists at a particular frequency on a PC enclosure. You can see the fields on the "cut-plane" that bisects the model; a PCB inside is the source. *Image courtesy ANSYS.*

says that a single software package cannot predict all EMI and sources thereof, he also notes that for engineers—who tend to look at problems in a methodical way—such tools can still be very helpful. "If you judiciously use the available ANSYS tools, you can get clear insight into the causes of EMI issues and problems that are likely to arise," he says.

Last summer, ANSYS announced the release of Ansoft Designer 6.0 with new Solver on Demand technology, which promised to enable designers of electronic packages and PCBs to quickly and accurately analyze signal integrity, power integrity and EMI problems from a single schematic- and layout-based environment. Kopp explains that Designer in and of itself does not solve EMI type problems; it is part of ANSYS's methodology and works together with other ANSYS tools, specifically with SIwave (for board analysis) or HFSS (that is, High Frequency Structure Simulator for electromagnetic field simulation of full 3D enclosures). Briefly, the steps—beginning with PCB analysis—that are involved in using these tools together are:

1. Import the PCB layout into SIwave
2. Perform analysis of PCB in SIwave
3. Dynamically link SIwave results into Ansoft Designer
4. Attach drivers and receivers in Designer to linked SIwave model
5. Perform a time/frequency domain analysis of entire system in Designer
6. Push voltage/excitation levels back to SIwave
7. Dynamically link the SIwave model into HFSS
8. Solve the full system in HFSS (Those not doing PCB design would skip the first six steps.)

Getting Educated

According to Archambeault, there's really no one EMI modeling tool that the average engineer can use effectively. And a major stumbling block is that designers often don't know how to set up their problems correctly.

"One of my jobs is full-wave computer modeling," he says. "In one project, it took a week-and-a-half to predict how much extra shielding was needed. You really need an engineer with a solid EM background."

The question remains, then: How do you get this background without traveling the rocky road characterized by the bad burns and failures that Archambeault and Newson describe?

There are many options, including training and consulting from people like Archambeault, Johnson, Newson and others. Archambeault's books can be a good starting point, and he will bring his courses to any location. Johnson recommends sending a bright, ambitious engineer in your company for at least one in-person consultation, then arranging for phone or email followup as needed. Newson offers video-enhanced, Internet-based assistance through GoToMeeting.

The Clemson Vehicular Electronics Laboratory (CVEL) and the Missouri University of Science and Technology have collaborated to offer Hubing's "EMC Principles" course (36 videotaped lectures) on DVD (http://dce.mst.edu/noncredit/certificates/emc_2nd_ed_video.html). This is one of the classes that Missouri S&T offers for its EMC Certificate, which the university awards for the successful completion of two video non-credit courses. Others are available as well (http://dce.mst.edu/noncredit/certificates/emc_si_certificate_homepage.html). In addition, Clemson offers a number of short courses—on campus, at locations around the world, and by arrangement as in-house presentations at client locations.

A number of associations also offer help: The IEEE's EMC Society has chapters all around the world, and holds an annual conference. The Electrostatic Discharge Association,

Applied Computational Electromagnetics Society (ACES), and Electrostatics Society of America likewise offer publications and training through annual meetings.

First Rule for Sourcing

Archambeault recommends that designers who built products incorporating electronics "look for the FCC or CE mark" on the electronic equipment, "and make sure it's been tested in the environment in which you plan to use it."

To emphasize the importance of environment-specific testing, he tells about a recent project involving a CE-marked, solid-state disk drive that was purchased for use within a large system. Once the drive had been placed in a rack with about 35 additional pieces of equipment and all the components were tested, the disk drive failed. "The vendor showed us the results of emissions testing—which was fine. But putting all those pieces together caused a problem."

Archambeault points out that the U.S. has FCC rules for emissions—but does not have immunity requirements. DE

Barbara G. Goode *served as editor-in-chief for* Sensors *magazine for nine years, and currently holds the same position at* BioOptics World, *which covers optics and photonics for life science applications. Contact her via de-editors@deskeng.com.*

INFO ➜ **ANSYS Inc.:** ANSYS.com

- **Applied Computational Electromagnetics Society:** ACES.ee.olemiss.edu
- **Dr. Bruce Archambeault:** BruceArch.com
- **Clemson Vehicular Electronics Laboratory:** CVEL.clemson.edu
- **Electrostatic Discharge Association:** ESDA.org
- **Electrostatics Society of America:** Electrostatics.org
- **EMC Journal:** Compliance-Club.com
- **EMI Software LLC:** EMIanaylst.com
- **IEEE EMC Society:** EMCS.org
- **International Electrotechnical Commission:** IEC.ch
- **Missouri University of Science and Technology's Center for Electro Magnetic Compatibility:** EMC-Center.org
- **Moss Bay EDA:** MossBayEDA.com
- **Newson Consulting Inc.:** Newson-Consulting.com
- **Signal Consulting Inc.:** SigCon.com

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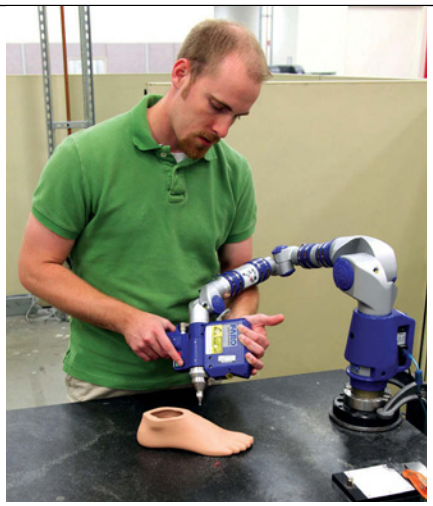
Laser Scanning Advances Rapid Prototyping, Manufacturing

Harvest Technologies uses laser scanners to expedite additive manufacturing and ensure their prototypes conform to CAD designs.

BY GREG RICHARDS



Generally speaking, engineers are pragmatists. Find the best way to complete your task accurately, quickly and easily (or easily enough), and then run with it. Many have used laser technologies for years to expedite and improve everything from cutting to measuring. These days, a growing number of engineers are using laser scanners to help create prototypes for new products and ensure their conformity to original CAD designs—and they're doing so more quickly and accurately than before.

In the process known as additive manufacturing (AM), which encompasses both rapid prototyping and direct manufacturing, complex 3D objects are created in a short period of time. Think days rather than weeks. There are many ways to produce and form the deliverable:

- Stereolithography (SL) uses a UV laser to photo-cure epoxy-based resins and grow objects, layer by layer, from 3D electronic data.
- Similar to SL, laser sintering (LS) also builds prototypes in layers, but instead uses a carbon dioxide laser to fuse myriad thermoplastic and metal powders to generate a finished product.
- Other processes, like computed numerically controlled (CNC) machining, are used to whittle down solid blocks of material to arrive at a finished part quickly and inexpensively.

At the end of the day, though, even prototypes produced by the most accurate and advanced methods need to be measured and checked against CAD designs to ensure accuracy for the customer.

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Automation Makes the Difference

Petra Solar takes a smart approach to product development.

Petra Solar is a clean technology company, focused on providing reliable, cost-effective Smart Energy solutions to the electric supply industry. Founded in 2006, the South Plainfield, NJ-based manufacturer is the pioneer of SunWave, a new Smart Solar technology that combines distributed solar energy generation with Smart Grid communications and improved grid reliability features to create a comprehensive utility grade solution. Petra Solar provides utility-grade, grid-tied, distributed smart solar systems that can be installed on utility and streetlight poles, rooftops and other existing structures.

As a new company in a high-growth industry, Petra Solar needed to implement systems and processes to manage its large volume of engineering data. Growing from about 60 employees to more than 150 in just one year (a vast majority in engineering), Petra Solar found that its current environment for managing engineering activity needed to be more efficient and streamlined. The company's processes were manual, and all product-related data was stored on secured drives.

"Without having an automated system in place for product development, you end up duplicating efforts and have a greater chance for errors to occur," says Stephen Gillespie, program manager for Petra Solar. "Our engineering change process consisted of several manual steps, which cost the company both time and money."

Petra Solar wanted to become more mechanized with automated processes around document control, engineering changes and bill of material (BOM) management. Its team also wanted to improve their processes related to meeting compliance to ensure the use of compliant parts early in the design cycle. With previous experience using product lifecycle management (PLM), the team knew there was a need for a PLM system to be able to manage their complex engineering activity.

The company was looking for an affordable solution that could fulfill its requirements for automating processes within development (specifically, part creation and engineering change management); had flexible licensing options that allowed for scalability for a growing company; and had an easy-to-use interface so that employees could get up and running quickly.

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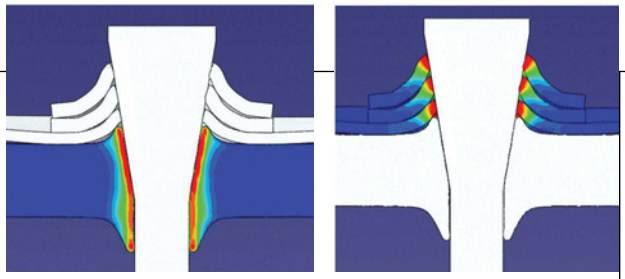

Fire, Fasteners and FEA

Structural engineers use Abaqus to investigate fastener strength and help satisfy stringent fire safety roofing standards.

From the first sign of smoke or scream of sirens as a building goes up in flames, there may only be minutes that separate a safe evacuation from a more serious scenario. The physical composition of construction materials and the building methods used to erect, fasten and anchor the components are all factors in determining this time-safety window.

Building codes in the European Union require that roofing systems remain structurally sound for 15 minutes when a fire breaks out, to give occupants time to evacuate. For example, commercial, industrial and residential sheet metal roofs—popular in Scandinavia for their snow-shedding properties—must be able to withstand normal weights and loads at temperatures as high as 1,100° F, close to the temperature at which aluminum starts to melt. Critical to their structural integrity is the performance of the powder-actuated fasteners (PAFs) commonly used to connect and install these roofing systems.

PAFs are basically nails, of numerous shapes and sizes, made of high-quality hardened steel with a tensile strength four to five times that of the base material. Using a small explosive charge, they are "shot" like a bullet from a nail gun at about 656 yards per second—a speed and force powerful enough to drive the fastener into the building's steel or concrete superstructure. This displaces the substrate material and anchors the fastener.

First developed for underwater ship repair in 1915, PAFs are still widely used today in the shipbuilding industry—as well as in roof and composite floor-frame-system construction. A simple, low-tech device, surprisingly similar to their century-old precursors, PAFs are the key to keeping modern metal roofs structurally secure under any conditions—including fire.

Using FEA on PAFs

While PAFs are relatively simple, much is still unknown about the characteristics and installation methods that contribute to their strength and durability. For instance, numerous tests have been conducted on pull-out forces, but there has been very little research on shear resistance.

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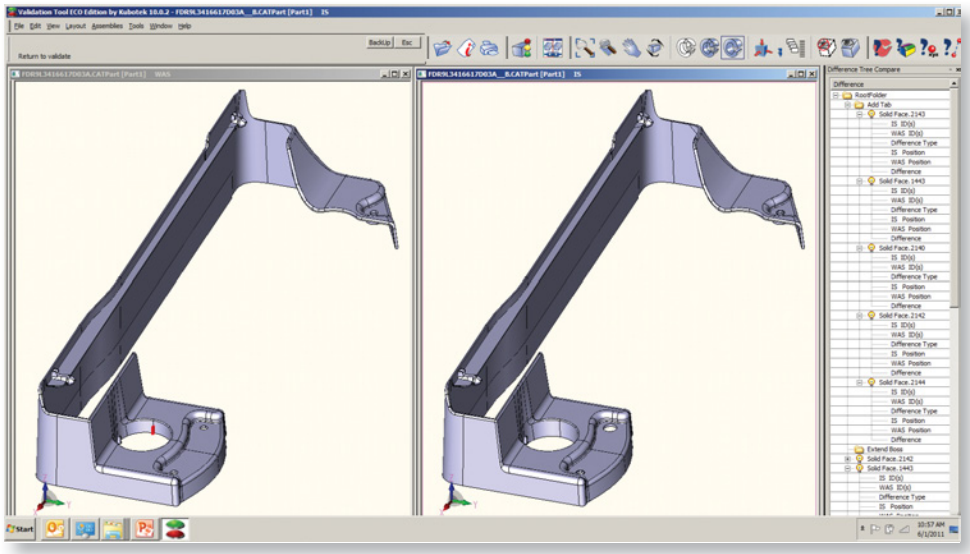
Change is Good

Parker Aerospace uses ECO Manager to streamline its engineering change order process.

BY JAMES GORDON



A part in an IS/WAS comparison in Kubotek's ECO Manager.

Parker Aerospace designs, manufactures and services hydraulic, fuel and pneumatic components, systems and related electronic controls for aerospace and other high-technology markets. Its products include flight control actuation systems and components, thrust-reverser actuation systems, electrohydraulic servo valves, utility hydraulic systems and components, DC motor pumps, fuel pumps, lubrication and scavenge pumps, fuel measurement and management systems, cockpit instrumentation, flight inspection systems, pneumatic subsystems and components, fluid metering delivery and atomization devices, and wheels and brakes.

Parker standardized on Dassault Systèmes' CATIA V5 as part of its journey to becoming a model-based enterprise, replacing 2D drawings with a 3D model as the reference for product definition.

The latest generation of solid modeling systems makes it possible to insert the dimensions, geometric design and tolerancing, annotations and parts lists directly into the solid model, eliminating the need for drawings. The 3D CAD model is now the reference for product definition used by manufacturing and the supply chain, so ensuring its accuracy is more important than ever.

In the past, Parker's engineers defined proposed engineering change orders (ECOs) by redlining either a paper drawing or a CAD file. The redlined drawing or file was then sent to those responsible for reviewing the change for their approval. After the change was approved, the engineer had to start all over again by actually changing the CAD file. After the change was made, it had to be carefully checked to ensure that the changes were accurately made and that nothing else in the file had accidentally been changed. This process took a considerable amount of time.

Streamlining the Process

Bob Deragisch, Parker's engineering services manager, had the idea of improving the ECO process. He decided the capabilities of the Kubotek ECO Manager software package could make it happen.

"A key advantage of ECO Manager is that, rather than comparing random points, it compares the mathematical geometry definitions to completely catalog the differences between the source and target files," Deragisch says.

ECO Manager uses Kubotek's pattern-matching technology to compare two revisions of product data to identify all differences between the data sets. It supports most native CAD formats, and works directly with the native CAD file to eliminate data translations. It compares both the 3D geometry and the model-based design information, such as tolerances and marking, to ensure all revisions are identified—ensuring that the impact of every change is fully understood.

Once the revisions have been identified and organized, ECO Manager provides several reporting options. It stores the data model that defines the differences between the files in electronic format, and can generate customizable graphical change reports in PowerPoint or PDF format.

Now, Parker uses ECO Manager to compare the old and

new CAD files, and generate a report that identifies and organizes the differences. This report becomes a key part of the ECO approval package that is sent to reviewers. After the change is approved, nothing else needs to be done except processing the change request through the product lifecycle management (PLM) system so that the new version of the CAD file is released as the product definition master.

There is no need to make the change a second time, as was required in the past. Nor is there a need to manually check that the change has been made correctly or that nothing else in the document has been changed, because ECO Manager has identified every change in the new CAD file as part of the approval package. This new process is saving substantial amounts of time on every ECO, Deragisch says. It also avoids the possibility of costly communications mistakes by ensuring that the change that is made to the product exactly matches what the reviewers approved.

Validating the CAD Translation Process

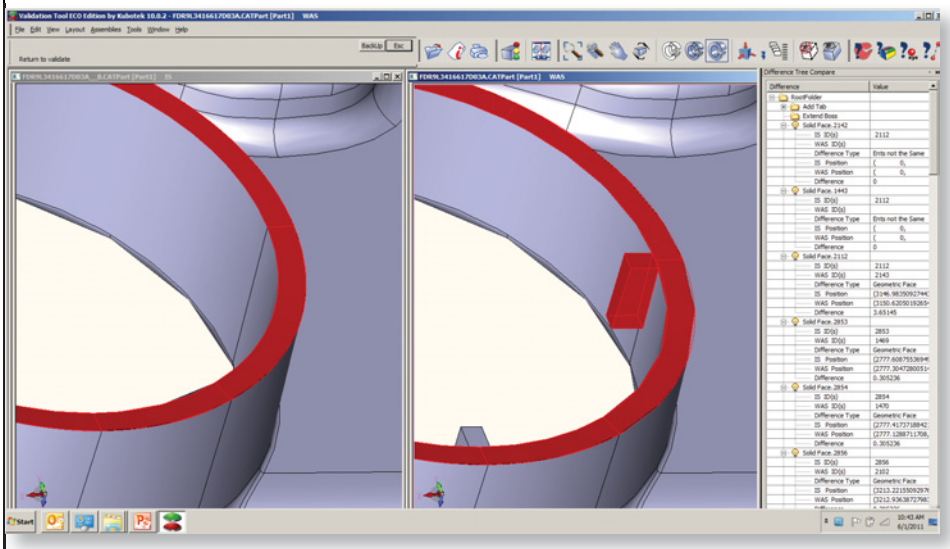
Parker provides parts for nearly every airplane in use today—and many of these airplanes have been flying for several decades. As a result, the company's move to CATIA V5 created the need to translate hundreds of thousands of older CAD files to its new CAD standard. The company found automated translation solutions for each of its CAD programs, but recognized that it would take an enormous amount of time to manually compare the CAD files.

"We knew from the beginning that differences in the geometric kernels between the previous programs and CATIA V5 would cause differences between the old and new files," Deragisch says. "In most cases, these differences

Taking a Deeper Look

This article and the following one on page 26 are part of a series that looks at one company's engineering practices. Last month, the articles in the "*DE* on the Case" series explained how Parker Aerospace created a virtual workstation cluster to speed its simulation jobs. *DE* also produced a white paper on workstation cluster computing, which was sponsored by Intel and HP. It can be downloaded for free at deskeng.com/workstationcluster.

This month, we focus on how Parker Aerospace manages engineering change orders and show you an example of how Parker Hannifin's Engineered Polymer Systems division uses non-linear FEA to improve product design. If your company would like to be the subject of a "*DE* On the Case" story, email us at de-editors@deskeng.com.



The identification of a difference, both highlighted on the model and in the difference tree.

would be very small. If the differences are smaller than our manufacturing tolerances, then it's not a problem. If they are larger, then we need to correct the translated file."

ECO Manager produces a report on each file that can be configured to segregate differences that are larger or smaller than a specified tolerance level. This feature was particularly valuable to Parker because the tolerance levels at which the files need to be compared are different for different parts.

"We considered doing a manual comparison, but when we estimated the time required to compare the files for just one of our smaller divisions, it turned out to be a 27 'person-year' effort," Deragisch says. "We looked at several tools that created a point cloud on the surface of the source file, and compared them to a similar point cloud created on the surface of the target file. The problem with these tools is that they only compared a sampling of points, so there was no way to be certain that the tool had found all of the differences between the two files."

The Parker team configured ECO Manager to automatically compare a large number of source and target CAD files. For each comparison, the team set a first tolerance level that is small enough to definitely be within manufacturing tolerances and does not require modification. A second, higher tolerance level was defined so that differences above the first level but below the second level may be checked manually to see whether changes are needed. Finally, a third, even higher tolerance level was set for differences at or above this level that definitely require modification of the target file.

After performing the comparison, ECO Manager generates a report that includes a model with all of the differences between the source and target files highlighted and color-coded. Differences that were highlighted in green did not need to be checked. Differences highlighted in yellow needed to be checked manually to determine whether changes were needed. Finally, differences highlighted in red were manually corrected in the target file to match the source file.

Looking Ahead

Parker Aerospace has identified yet another application that it plans to implement in the future. The length of time over which aerospace programs exist means that they inevitably have to be moved from release to release of the CAD package used to develop them.

"We need to be sure that when we move to a new release that the geometry of our existing programs has not changed," Deragisch says. "It would require a huge amount of time to make this determination manually, but with ECO Manager, it is a simple, automated process. We also have a number of customers, particularly in the propulsion side of the business, that do not use CATIA as their standard. For these customers, we will design parts in CATIA and then translate and deliver a 3D model in the format of the CAD package used by our customer. ECO Manager will be used to demonstrate that the models are geometrically equivalent and will save time by automating this comparison."

Deragisch estimates that ECO Manager has saved "hundreds of years of effort" through its ability to accurately and completely compare CAD files and catalog the differences.

"We have achieved substantial time savings in the ECO process by highlighting the differences between the existing product definition and the proposed changes, while ensuring that nothing else has been accidentally changed," he concludes. "In addition, this new approach provides an independent validation of the translation process, which helps to ensure the accuracy of our critical product definition files." DE

James Gordon *is vice president of Development for the ECO Manager product line at Kubotek USA. Prior to his work at Kubotek, he was vice president of Development and Chief Architect of ACIS, a product of DS Spatial Corp.*

INFO ➜ **Kubotek USA:** Kubotekusa.com

➜ **Dassault Systèmes:** 3DS.com

➜ **Parker Aerospace:** Parker.com

For more information on this topic, visit deskeng.com.

Building a Cluster with Your Workstations

Engineers can fully utilize their HP Z800 Workstation power with clustering.

BY PETER VARHOL

Screen image courtesy of ANSYS

When we think about cluster computing, we imagine a rack of blade servers in the computer room, all with multiple processors and cores. Engineers submit jobs to a queue, and it eventually executes and the results file is available for review and analysis.

That's the traditional view of the cluster, and it's a great tool for enabling engineers to more fully analyze and simulate design concepts. But here's another, emerging picture. The cluster is actually the collection of workstations used by design engineers, networked together so that their Intel® Xeon® processor cores collectively run the analysis and simulation software, while these engineers continue to do their design tasks on the same workstations. In that instance, it's just like the larger server cluster in the computer room, except that it's more suited for less complex computations.

This cluster doesn't require a large investment by the enterprise. Instead, its costs are only a little more than the price of the workstations themselves. This makes it accessible to just about any engineering group, no matter what the size.

The benefits far outweigh any additional cost. Today, most engineers have the necessary memory and processing power on their desktops. For example, workstation clustering using the HP Z800 Workstation enables engineering groups to continue doing fast designs, while analyzing those designs in real time without a dedicated server cluster.

Building a Workstation Cluster

The actual cluster is straightforward to build. Starting with the HP Z800 Workstation, use the second gigabit network adapter on the system to configure a private network between the workstations in the cluster. For the cost of the added cabling, gigabit switch and server OS, you have the backbone of the cluster.

You can employ the entire network as a cluster, but then the Z800 Workstations can't be used as individual design systems. Instead, using the Parallels Workstation Extreme virtualization solution, each workstation can be divided into two virtual machines—a software creation that has memory, processors and processor cores, disk space, graphics, and I/O—for use as independently running, separate systems. Each individual engineer sets the number of processors, cores, and memory for use in computations employing the cluster, while continuing to work on designs using the remaining system resources.

The result is actually two computers in one box—one being used by the design engineer to create and refine product designs, and one being used as a part of a cluster to run simulations on all or parts of those designs. Imagine a workflow when your engineers collaborate on a large design, then use their clustered workstations to run simulations on that design, and to use the results to incrementally improve the design.

The Software Side

Engineering analysis products such as the ANSYS Mechanical and ANSYS Fluid Dynamics and Multiphysics do their work using computations that can be highly parallelized. As a result, ANSYS and other analysis and simulation vendors have released versions of their products that will take advantage of multiple Intel Xeon processors and cores. Engineers can work with their software suppliers to take better advantage of this type of clustering. Better software, more flexible licensing options, and a good understanding of the relationship between computational analysis and the characteristics of the computing platform will help engineering groups better deploy these applications to get the most out of workstation clusters.

Clustering HP Z800 Workstations using virtualization to create dedicated computing resources results in a better overall design, achieved through earlier and more frequent engineering analysis. DE

For more information on an HP and ANSYS Solutions please go to www.hp.com/go/solver or call 800-888-0261.

'Getting' the Boot

Parker Hannifin learns firsthand how non-linear FEA ensures a fast, robust product design.

BY JASON FOULGER AND BRAD ALLEN

Non-linear finite element analysis (FEA) has proven to be an indispensible tool in the development of elastomeric molded shapes and seals. FEA models provide the ability to observe the behavior of elastomeric parts or seals when subjected to external forces. These models can then be used to investigate the validity of proposed solutions without lengthy, expensive prototyping and application testing.

Parker Hannifin's Engineered Polymer Systems (EPS) division was asked to design and manufacture a series of flexible boots from Parker Resilon polyurethane to protect the sensitive joints of down-hole drills used in the oil and gas markets. The purpose of these boots is to protect against adverse conditions that could result in seizure, breakage or decrease in torque transfer. The polyurethane material provides additional wear-and-tear resistance over traditional rubber boots.

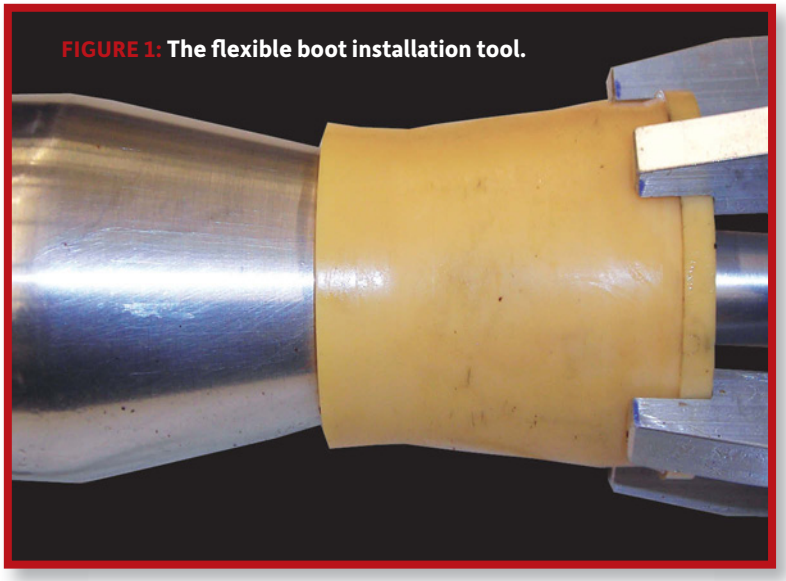


FIGURE 1: The flexible boot installation tool.

One of the challenges faced by the design engineers was how to install the tight-fitting boot onto the joint for service. To solve this problem, a custom tool was designed to stretch and install the boot onto the joint (see Figure 1). The installation tool consists of a fixture with five pivoting fingers, designed to push against the heel of the boot and drive it over a tapered, lubricated cone.

Because the fingers are allowed to pivot, contact between the fingers and the boot's heel is maintained as the boot is stretched radially over the cone. A tensioned rubber band is used to provide inward radial force on the fingers to keep them close to the cone. Once the boot reaches the end of the cone, it can be slid into position over the joint.

The installation tool proved successful with several boot designs; however, a challenge was encountered during the installation of a particularly small boot with a thin cross-section. Once it reached a certain point along the cone, the boot's heel would rotate outward—causing the fingers to slip off and preventing installation (see Figure 2). The boot's thin cross-section was not sufficiently stiff to avoid buckling under the installation force. Several immediate ideas, such as adding more rub-

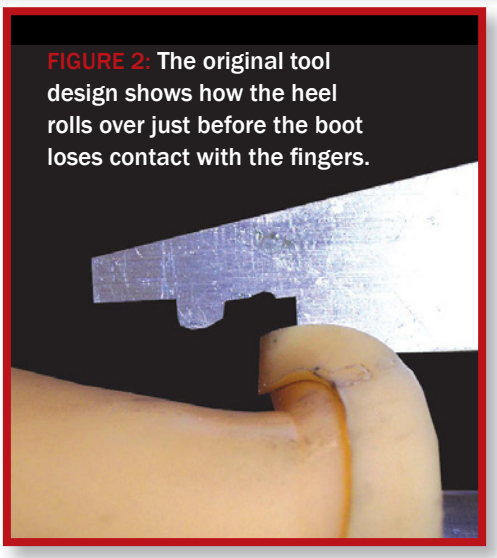


FIGURE 2: The original tool design shows how the heel rolls over just before the boot loses contact with the fingers.

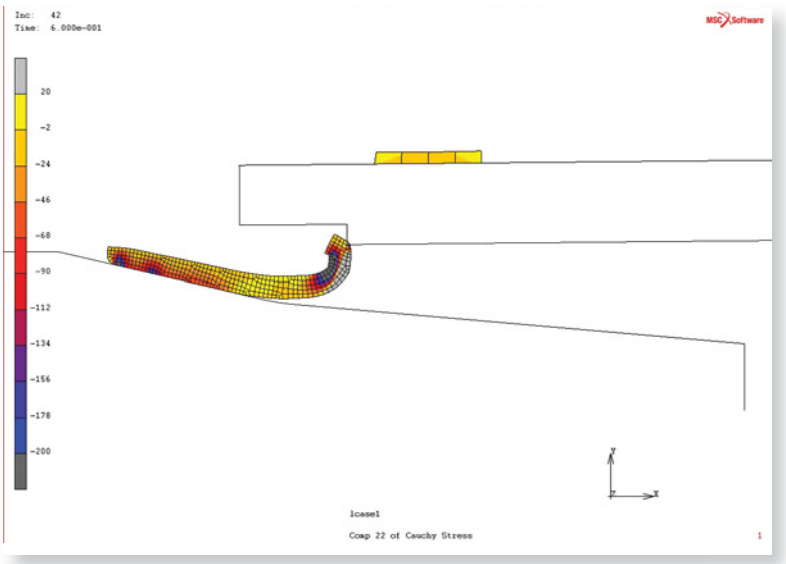


FIGURE 3: **The FEA model predicts the outward rolling of the boot's heel and the subsequent loss of contact with the installation tool.**

ber bands around the fingers and adding more lubrication to the cone, did not solve the problem.

FEA to the Rescue

An axisymmetric FEA model was created (using MSC.Software's FEA application) to simulate the conditions of the boot installation. The Resilon material was characterized for use in the FEA model via simple tension and compression testing. The resulting stress-strain curve was then fit to the non-linear, hyperelastic Ogden material model. The Ogden strain energy function is $W = \sum_{i=1}^{m} \frac{\mu_i}{\alpha_i}(\lambda_1^{\alpha_i} + \lambda_2^{\alpha_i} + \lambda_3^{\alpha_i} - 3)$, where λ1, λ2, λ3 are stretch ratios and αi and μi are specific material constants unique to the Resilon polyurethane. The above function is in its original incompressible form. The actual function implemented in the FEA program involves a bulk modulus term to account for near incompressibility.

The cone and fingers of the installation tool were assumed rigid because the deformation in these metal components is relatively small compared to that of the elastomer boot. A coefficient of friction was applied between the boot and cone that approximates lubricated contact. As illustrated in Figure 3, the FEA model accurately replicated the installation failure.

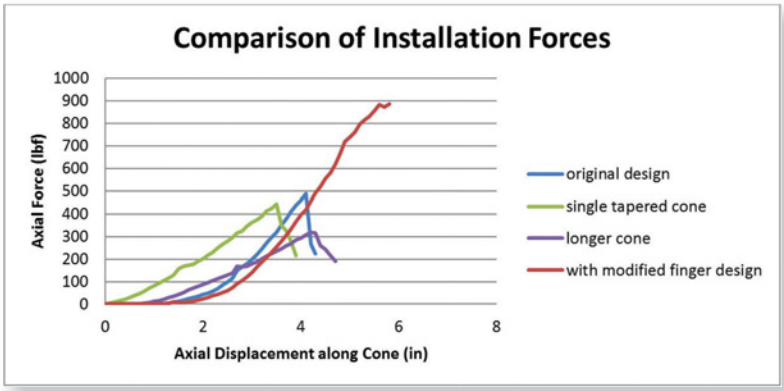


FIGURE 4: Axial force as a function of the boot's position along the cone. Only the design with the modified fingers could support the installation force without buckling.

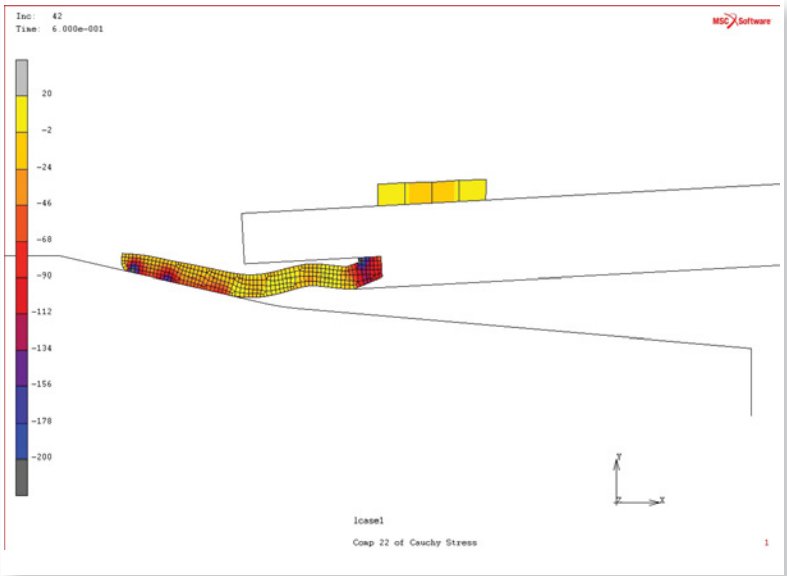


FIGURE 5: FEA suggests that adding a groove to the fingers will prevent the heel from rolling and allow for proper boot installation.

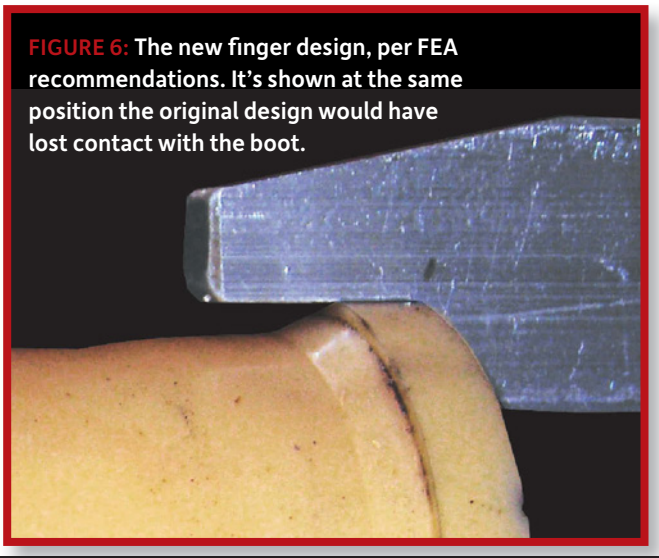


FIGURE 6: The new finger design, per FEA recommendations. It's shown at the same position the original design would have lost contact with the boot.

Design Optimization

At this point, these FEA results were used as a benchmark against which proposed solutions were evaluated. A cost-effective—and more importantly, quick—solution was needed. Two ideas for modifying the cone were examined in FEA: using a single taper instead of the dual taper, and lengthening the cone to provide a smaller taper angle.

The model predicted little or no improvement from either of these solutions. In each of the trials, once the applied axial force reached somewhere between 300 and 500 lb_F, buckling occurred. This is represented in the drop-off in force of the first three curves seen in Figure 4.

Finally, it was proposed that cutting a groove into the fingers where the boot's heel would be inserted would allow the fingers to "grip" the heel, and prevent it from rolling outward. The FEA model supported this solution (see Figure 5). The modified design allowed for the boot's heel to be supported at the high axial force required to drive it up the cone (see Figure 4). This design change also returned the lowest cost and fastest turn-around time.

The new fingers were machined per design changes recommended from the analysis. The tool was reassembled, and the boot installed without problem. The elastomer was monitored throughout the process. Figure 6 shows the elastomer securely contained in its groove. Physical testing successfully validated the FEA predictions.

In conclusion, non-linear FEA provides the ability to confirm the design problem and to perform design iterations quickly until an optimized solution is found. In this case, a simple geometry change to the fingers was all that was needed. Time and money were saved because excessive prototype machining and testing could be avoided. DE

Foulger *is a design engineer and* **Allen** *is a lab manager for Parker Hannifin's Engineered Polymer Systems division.*

INFO ➜ **Parker Hannifin:** Parker.com

➜ **MSC.Software Corp.:** MSCsoftware.com

For more information on this topic, visit deskeng.com.

Workstations and HPC Clusters

Creating the first digital model and the first simulation on your Intel® Xeon® dual processor workstation makes sense today.

BY PETER VARHOL

Many engineering groups employ HPC clusters to perform complex and demanding analyses and simulations. The combined processing power of a compute node with two or four Intel® Xeon® processors, each with up to six cores per processor, provides the means to create detailed simulations that can significantly reduce the need for physical prototypes.

Engineers have the equivalent of a supercomputer of a few years ago in their workstations, but this performance does not remove the need for HPC resources. It augments an organization's HPC investment and can help engineers explore more designs in less time. They can explore small and medium jobs locally, and employ dedicated HPC resources for large-scale simulations.

Here is an example: a user is investigating small and medium jobs. These simulations can now be performed locally at his dual processor Intel Xeon 5000 series-based workstation. Large, high-fidelity, multi-modal jobs can be now processed unencumbered by small and medium jobs on the remote HPC resource. The table to the right shows the impact of using workstations in this manner, and how users can potentially get three times more work done in the same time period.

Time to Complete on Remote HPC		
100mbs (fast ethernet)	Size	Time
Upload	8GB	12 minutes
Process on 12 cores	NA	4 hours
Download	400GB	12 hours
Time to Complete on Intel® Xeon® Based Workstation		
100mbs (fast ethernet)	Size	Time
Upload	8GB	0 minutes
Process on 12 cores	NA	4 hours
Download	400GB	0 hours
Number of Simulations in a 24 Hour Period		
Remote HPC	2	
Intel® Xeon® based workstations with 12 cores	6	

An organization can now optimize three key resources.

1. The engineer: By giving an engineer access to a dual-processor workstation, he or she can efficiently and effectively model small and medium jobs locally and dispense of the time tax to transmit, compute and retrieve these jobs fro HPC systems.

2. The workstation: By moving it past a CAD-only use model and using it for simulation, an organization can employ all available compute cycles around the clock for simulation. With a technology from Intel called Intel Virtualization technology for direct I/O, the CAD user will be isolated from simulation requirements and will not be slowed down in their design task.

3. The organization's HPC cluster: This resource, no longer taxed with small and medium jobs, now can process larger high-fidelity models in less time than before.

Combining Workstation and Cluster Computing

So how can the engineer leverage the power of the Intel Xeon multi-processor and multi-core workstation to make the most effective use of the resources available? Even for large and complex analyses, there are two types of computation that can readily be done on the workstation. The first is a high-level analysis or a coarse grain model evaluation, one that takes into account only a few parameters of the problem. This type of computation can be performed early in the design process, when the engineer is seeking to understand the overall behavior of a design.

The second is the sensitivity analysis, where engineers can take portions of the analysis that are most problematic, or sensitive to changes in parameters, and analyze or simulate just those components. An engineer may want to run those calculations several times, with different parameter values and different assumptions, to find the best design for those components under different operational conditions. Workstations enable users to refine aspects of the design before running a full analysis or simulation.

Because the Intel Xeon processor has up to six cores, and most engineering workstations have two processors, you'll be bringing taking advantage of the parallelism in these calculations. The large multi-level cache memory architecture ensures that all of the available cores are fully utilized.

The end result is that engineering organizations now have a great deal of flexibility in how they use their computational power in support of design, analysis, and simulation. The groups that use this flexibility to their advantage will end up with better designs that are completed more quickly, and at a lower R&D cost.

Access to the department or enterprise compute cluster may still be limited throughout the design process. But with today's workstations, engineers are in a position to leverage more computing power from more sources than ever before. DE

INFO → Intel Corp: intel.com/go/workstation

Beyond the Hype: HyperWorks 11

Altair Engineering has emerged as a major player in the enterprise CAE market, challenging the established industry forefathers with the aggressiveness of a start-up.

BY VINCE ADAMS

In June, Altair released version 11 of its flagship suite, HyperWorks—to wide acclaim. The HyperWorks suite has developed over the past three releases to be a veritable one-stop shop for engineers and analysts looking to develop products in a predictive environment requiring multiple solution domains.

HyperWorks has included HyperMesh (pre-processing), HyperView (post-processing), advanced optimization using both topology and design of experiments (DOE) algorithms (OptiStruct & HyperStudy), implicit and explicit FEA solvers (RADIOSS) and multi-body dynamics (MotionSolve). With version 11, enterprise collaboration, a conceptual geometry modeling environment (solidThinking) and computational fluid dynamics (CFD) solver (AcuSolve) have been added on top of a list of improvements too numerous to list herein—and well beyond what users of other products would expect with a yearly release.

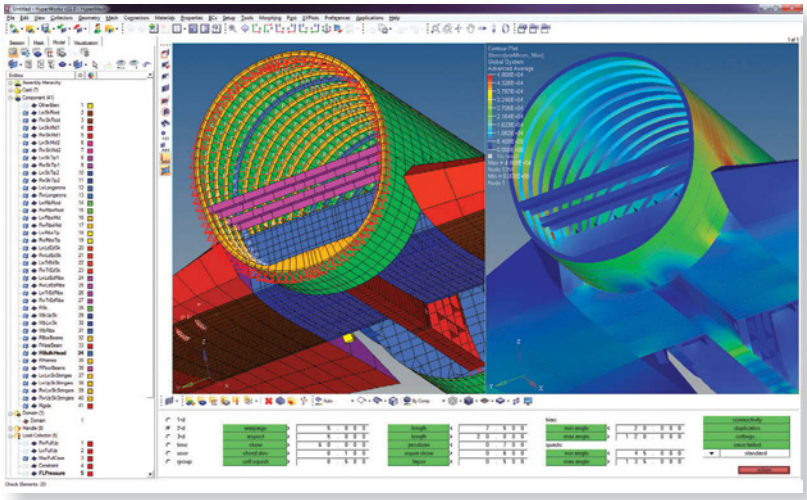


FIGURE 1: The HyperWorks 11 desktop.

"Altair is so much more than meshing and optimization these days," declares Jeff Brennan, long-time finite element analysis (FEA) industry expert and chief marketing officer of Troy, MI-based Altair Engineering Inc. Brennan credits Altair's commitment to continued growth and customer-focused innovation for his nearly 20 years with the company.

A Revolutionary Business Model

HyperWorks 11 is, first and foremost, an integrated CAE desktop environment providing access to both Altair's wide product offering and a growing list of partner applications. In the early releases of HyperWorks, the company implemented the HyperWorks Unit (HWU) token-based licensing program. This allows users of the program to purchase units instead of specific features, so that all the capabilities of HyperWorks are available to them. For example, if an engineer needs to solve a mechanism with flexible bodies, HyperWorks debits his HWU pool. When this task is complete, those units are credited back for use with any other HyperWorks feature. This flexibility removes the need for an engineer to prioritize the critical attributes of the product when planning a software purchase.

On top of this, Altair recognizes that one company cannot provide all the predictive tools an engineer needs. Consequently, it has built the HyperWorks Partner Alliance—a network of software partners that accept HWU licensing within the HyperWorks framework. These partners include, but aren't limited to, industry-leading fatigue and plastic mold filling tools.

In HyperWorks, this business model was enhanced with new solver options, AcuSolve CFD and solidThinking conceptual modeler, as well as enterprise-level collaboration tools. Additionally, the number of HWUs required for certain FE solving features were reduced, with increasing reductions as usage increases. The list of HyperWorks Alliance Partners has also been increased, and will continue to increase going forward.

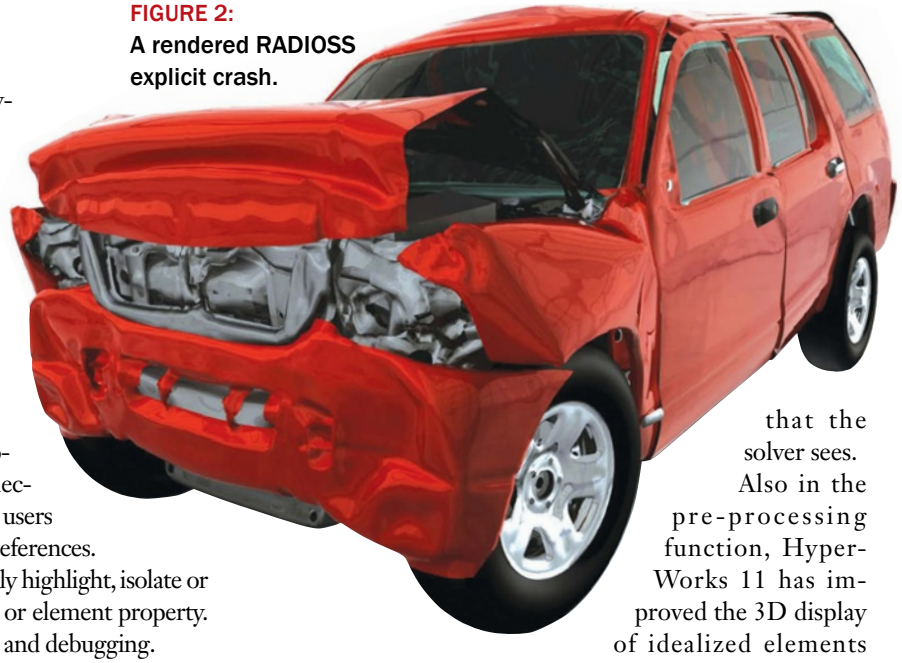


FIGURE 2:
A rendered RADIOSS explicit crash.

Improved User Experience

HyperWorks 11 combines the power of HyperMesh and HyperView, the formerly independent pre- and post-processors, into a single desktop environment. This allows HyperWorks users to switch between mesh and results views during a given project—and even view both model states simultaneously. The HyperWorks 11 Desktop expands on the previously implemented Browser window (see Figure 1). HyperWorks 11's answer to the popular "feature tree" concept now provides a diverse and robust collection of selection and display options that should allow users to work in the manner that best fits their preferences.

One improvement is the ability to quickly highlight, isolate or hide all components with a given material or element property. This is a powerful tool for model checking and debugging.

The desktop pre-processor includes an FE model building feature that lets users simultaneously construct modeling elements in a graphical, feature-oriented mode as well as the more traditional "card – field" input mode. Experienced FE users will recognize the value of direct parameter input in the "Card Image" view, because it directly reflects the true input that the solver sees.

Also in the pre-processing function, HyperWorks 11 has improved the 3D display of idealized elements such as beams, shells and composite shells. Users are provided an unambiguous display of the geometry position and orientation in 3D space of these entities. This will minimize common modeling mistakes made by newer and more experienced users alike, such as improper placement or expectations of beam neutral axes or shell mid-surfaces.

Extended Collaboration Environment

The previous file and data management capabilities were extended in HyperWorks 11 to allow better customization and collaboration at the team level within the product's user interface. Additionally, enterprise-level collaboration was added to expand the reach of predictive data, for better and more confident decisions outside the simulation group.

Personal and Team Level data management is accessed from within the HyperWorks GUI. Customization tools have been added to capture best practices and automate repetitive tasks and processes. HyperWorks 11 can now connect to product lifecycle management systems to link to CAD geometry and bills of materials.

Lastly, a brand-new set of web apps makes enterprise simulation management accessible from anywhere via web browser. This can be extremely important when reviewing projects remotely and unexpected questions about simulation results arise.

Improved Solver Capabilities

HyperWorks has relied on the comprehensive RADIOSS solver for both implicit and explicit FEA processing. Altair leverages RADIOSS for traditional FE tasks, as well as crash dynamics and stress/strain computation within a multi-body dynamics, or mechanism model (see Figure 2).

HyperWorks 11 includes some long-awaited additions to the RADIOSS solver, as well as many additional capabilities and improvements to existing features. Within the explicit solver, a mass scaling option has been added to increase the solver time-step requirement by locally adjusting mass of stiff elements without an impact on the regional or global accuracy of the model. This allows complex models with varying mesh size and quality to solve more quickly.

Another important feature allows for different geometric domains in a model to solve at different time steps simultaneously. Frequent users of explicit solvers will immediately recognize the value of this feature. The time step directly affects the total run time, so restricting higher-frequency solve tasks to only the areas requiring them opens the opportunity for larger, less idealized models.

In the implicit FE solver, HyperWorks 11 has added new dynamic solution algorithms such as Response Spectrum, Complex Eigenvalue and Pre-Stressed Modal options. The non-linear capabilities have also been beefed up with new contact and material capabilities.

One exciting solver addition in HyperWorks 11 is the implementation of the AcuSolve CFD tool. HyperWorks HWU license users get access to this full-featured CFD tool at no additional cost (see Figure 3).

Also, in the HyperWorks 11 MotionSolve module, Component Mode Synthesis has been added to the flexible body dynamics toolbox.

FIGURE 3: AcuSolve CFD results on a wind turbine.

Building on Optimization

In 1994, Altair's OptiStruct topology optimization ushered in a new way of leveraging FEA by allowing engineers to explore possibly counterintuitive geometries by specifying loads, failure conditions and the allowable design space or physical envelope a part can occupy. In HyperWorks 11, Altair expands upon this capability (see Figure 4).

Topology optimization is now available in non-linear problems, including large displacement non-linear events, as well as in multi-body mechanisms. In the past, users would have to estimate the one or two worst-case load and/or time steps to submit to topology optimization. In HyperWorks 11, load or time steps are submitted to OptiStruct as separate load cases—and the optimization constraints are enforced across the entire event. This ensures an optimized geometry that truly maps to the problem at hand.

Historically, topology optimization results have looked rather "organic" because of the free-flowing nature of the load path within most parts. OptiStruct attempted to tame this effect with manufacturing constraints in 1998. These constraints impose requirements like tool pull direction and parting lines on the design space, so that the resulting geometry suggestion is more easily translated into a manufacturable part. In HyperWorks 11, a no-hole option was added to draw-direction

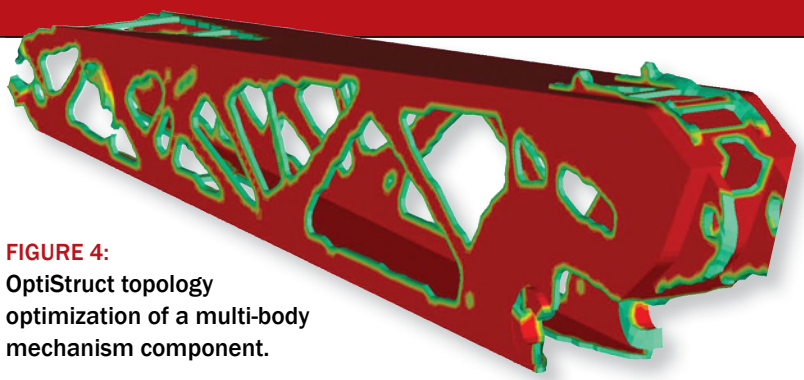


FIGURE 4:
OptiStruct topology optimization of a multi-body mechanism component.

operations, such as cast parts, when volumes can be removed but a flow path across the volume is required. A stamping constraint and minimum feature spacing requirements have also been added.

A global search option has also been added to the optimization algorithm to improve a user's chances of reaching the true optimal shape. Gradient Search optimization algorithms are often fooled into mistaking local minima for global depending on the initial conditions of the model. By processing the optimization with multiple initial conditions, or start points, this error can usually be avoided.

New algorithms for multi-objective optimization, robust design and Microsoft Excel linked studies have also been added to HyperWorks 11.

Conclusions

Surprisingly, this overview only captures a fraction of the new functionality provided in HyperWorks 11. Altiar's Brennan confirms that while this release followed the prior by 18 months instead of the usual 12, the level of growth is typical with new HyperWorks releases. There are additional capabilities in the areas of noise, vibration and harshness; durability; manufacturing; scripting and math solvers that can be reviewed on the product's website.

The addition of solidThinking conceptual geometry modeler is a feature Altair is hoping will reduce the number of round trips an engineer must make to the base CAD package. It will be interesting to see how this interacts with OptiStruct in coming releases. DE

Vince Adams, *currently an account manager for LMS, is a longtime simulation educator, consultant and speaker. He has authored three books on finite element analysis and numerous magazine articles. Contact him via de-editors@deskeng.com.*

INFO ➜ Altair: AltairHyperWorks.com

For more information on this topic, visit deskeng.com.

Quite Compatible

Graebert ARES Commander Edition for Macintosh proves to be very AutoCAD-like.

BY DAVID COHN

With its launch last year, Graebert's ARES Commander Edition for Macintosh became what the company calls the first "professional, multi-platform CAD solution for Mac, Windows and Linux," its release predating the Mac version of AutoCAD 2011 by several months.

Graebert GmbH has a long history in the CAD industry. The company has been selling CAD systems since 1983, and was the first German distributor of AutoCAD. In 1994, Graebert developed its own CAD software, which was marketed as FelixCAD (later rebranded as PowerCAD). In 2005, the company replaced its existing CAD engine with an entirely new kernel, and ARES was born.

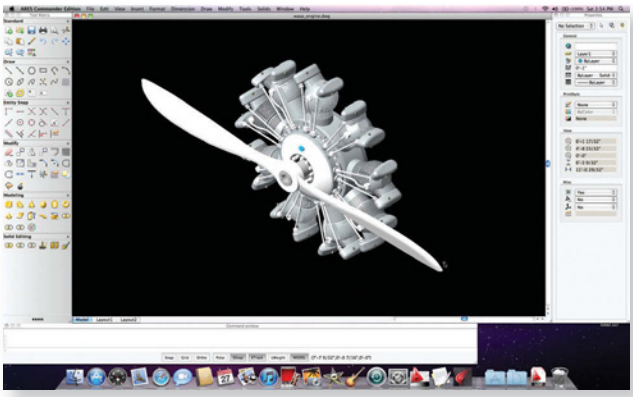
In addition to its own software, Graebert has partnered with Corel, which in April 2011 released CorelCAD for both Windows and Mac, based on Graebert's ARES technology. Graebert is also the company behind Dassault Systèmes' DraftSight.

While ARES Commander Edition has a native Mac interface, its components are quickly familiar to anyone who has ever used AutoCAD. Across the top of the screen is a menu bar with pull-downs organized very similar to those in the "classic" AutoCAD interface (the old interface before the introduction of the ribbon). When first started, a Tool Matrix palette appears on the left and a Properties palette on the right, with a new drawing open in the graphics area. ARES Commander uses AutoCAD's DWG as its native file format, and the software had no problem opening files saved in the AutoCAD 2010 or earlier file formats—all the way back to R12.

There's also a Command Window similar to AutoCAD's command line, located below the graphics area. Users can start commands by typing, with ARES recognizing most AutoCAD commands and command aliases. The Command Window also has buttons to toggle drafting aids such as Snap, Grid and Ortho modes. Each of these palettes can be floated anywhere on the screen or closed entirely. The Tool Matrix can also be minimized and individual toolbars dragged off the Matrix. The Tool Matrix initially displays four of the 25 available tool palettes.

Instantly Familiar

Like in AutoCAD itself, each drawing occupies its own window, with three tabs across the bottom to switch from model space to one of two initial paper space layouts. You can right-click on these to add rename, copy or delete layout tabs, and these tabs can be hidden and displayed just like in AutoCAD.



Graebert's ARES Commander Edition for Macintosh has a native Mac interface, but its collection of tools will be instantly familiar to anyone who has ever used AutoCAD.

In fact, ARES Commander Edition is so AutoCAD-like that it's almost frightening. A few commands have different names—such as NOTE instead of MTEXT and PATTERN instead of ARRAY—but their button icons make them easily identifiable in the ARES interface. In fact, longtime AutoCAD users can still start any ARES command by typing their AutoCAD name or command alias.

Even the command options are nearly identical to AutoCAD, and they work much the same way. For example, when drawing circles, you can right-click to display familiar command options, such as 3Point, 2Point, TTR (tangent, tangent, radius), and TTT (tangent, tangent, tangent).

Although there is no equivalent to AutoCAD's dynamic input, ARES does include most of AutoCAD's other drafting tools, including polar tracking, object snaps (which ARES calls ESnap), and object snap tracking (referred to as ETrack). ARES' object-snap glyphs are even similar in appearance to those in AutoCAD.

One difference in ARES is that commands and controls that have their own individual dialog boxes in AutoCAD—such as creating text styles and table styles, setting various drafting options such as snap and grid spacing, and establishing drawing settings such as units and coordinate systems—are all controlled from a single Options dialog.

But ARES' workflow is very much like that of AutoCAD. You can right-click to display shortcut menus, zoom using the roller-wheel on a mouse, pan by pressing the roller-wheel, and orbit in 3D by pressing the shift-key and roller-wheel simul-

taneously. Surprisingly, Graebert does not appear to have incorporated gestures. You can zoom using a two-fingered swipe, but that appeared to be the only gesture available when using the touchpad on our MacBook Pro.

Limited 3D

ARES Commander Edition for Macintosh incorporates ACIS-based solids, so you can create primitives such as boxes, wedges, cylinders and spheres. There are also tools to create some mesh objects, such as ruled, revolved and tabulated meshes, but ARES lacks AutoCAD's tools for creating mesh primitives—and the program has no surface-modeling capabilities.

Working in 3D space in ARES Commander is also not nearly as refined as in AutoCAD. While ARES has tools for performing Boolean operations such as Union, Subtract and Intersect, and for manipulating objects using tools like 3D mirror, slice and thicken, ARES lacks AutoCAD's dynamic UCS. To work in 3D space, you'll need to manually reposition the user coordinate system (called the CCS in ARES). That also means that ARES lacks AutoCAD's wonderful PressPull capability. And while ARES shows grips at various points on 3D objects, they only enable you to move the object. You can't enlarge a 3D box, for example, by grip editing—and there's no way to edit subobjects.

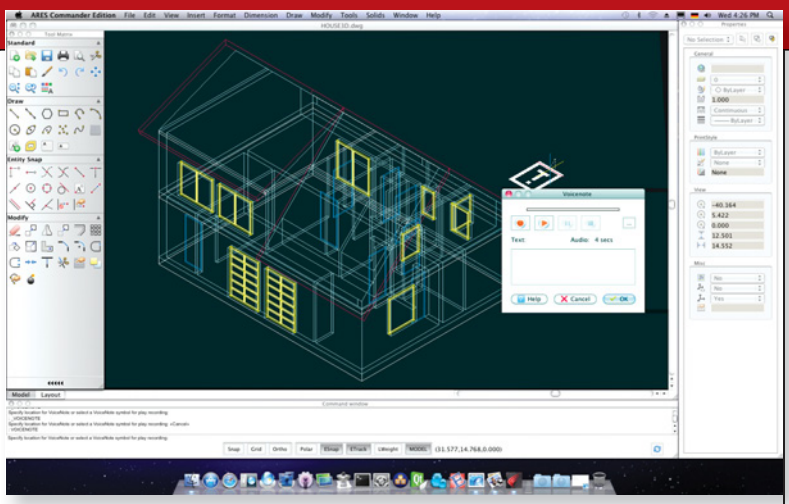
In fact, once you've created 3D objects, there appear to be very few ways to modify those objects. For example, after creating a solid box, when you select the box, only its general properties appear in the Properties palette. You cannot adjust its length, width or height, and although you can scale the entire box, you cannot stretch it in a single direction.

Mostly Compatible

ARES does provide surprisingly good support for AutoLISP, scripts and C++, and we had no problem loading and running numerous AutoLISP programs. ARES also provides interface customization similar to that of AutoCAD. It also supports user profiles. The software uses the same hatch patterns, linetypes and SHX text files as AutoCAD, so users should have no compatibility issues exchanging drawing files.

ARES also incorporates an interesting capability not found in AutoCAD: Users can insert audio recordings (called VoiceNotes) into a drawing. These recordings are embedded into the drawing and can be played back later. While AutoCAD indicates that DWG files saved using ARES were created in software not developed or licensed by Autodesk, AutoCAD had no problem opening drawings we created or edited in ARES. VoiceNotes appeared as block references with attributes, although of course AutoCAD could not play the embedded recordings. But after resaving those drawings in AutoCAD, those VoiceNotes played just fine again when we opened them in ARES.

Of course, there are a number of AutoCAD features missing from ARES Commander Edition. For example, there's no support for sheet sets, fields, dynamic blocks, data extraction, parametrics or data linking. Also missing are tools not included in the first Mac release of AutoCAD itself, such as the Action Recorder, Batch Standards Checker and eTransmit.



ARES' VoiceNotes allows users to embed audio recordings into drawings.

For the most part, ARES Commander Edition for Macintosh shows a lot of promise. It's a very serviceable CAD program with very good AutoCAD compatibility—and some interesting capabilities. With a price several hundred dollars below that of AutoCAD LT (which lacks AutoLISP), ARES could do quite well as a 2D alternative to AutoCAD. But its 3D capabilities are lacking. That, and numerous other shortcomings, currently places it well behind AutoCAD in most areas. Still, considering that ARES Commander Edition is also available for Windows and Linux, Graebert has done a very good job in this first release. It will be interesting to see what the company has in store in future versions. DE

David Cohn *is the technical publishing manager at 4D Technologies. He also does consulting and technical writing from his home in Bellingham, WA. He's a contributing editor to* Desktop Engineering *and the author of more than a dozen books. Contact him via email at david@dscohn.com or visit his website at DSCohn.com.*

INFO → Graebert GmbH: Graebert.com

Graebert ARES Commander Edition for the Mac

Price: $7,95

System Requirements:

- **Operating System:** Mac OS X v10.5.8 (Leopard) or v10.6.x (Snow Leopard)
- **CPU:** Intel processor
- **Memory:** 1GB RAM (2GB recommended)
- **Disk space:** 2GB free disk space for installation
- **Video:** 1024x768 display (1280x800 recommended)

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Get Ready for RLM: Wherever You May Roam

Mobile devices and app-driven commerce offer clues to the future of product data authoring and delivery.

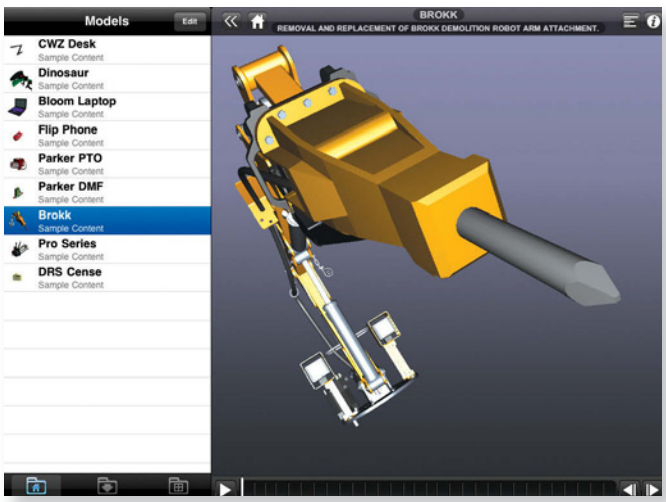
BY KENNETH WONG

The invasion began with a few inconspicuous units, dropped behind enemy lines. At the PTC World Event in Orlando (June 6-9, 2010), a journalist took notes on Apple's latest tablet while Jim Heppelmann, PTC's CEO-elect at the time, talked about Project Lightning, a codename for the company's upcoming product launch. A few weeks later, at Siemens PLM Connection in Dallas (June 27-29, 2010), an analyst sheepishly tried to hide his iPad as he shook hands with a Microsoft executive. The gentleman from Windows reciprocated the analyst's professional courtesy by pretending not to notice the Apple device.

In October, when PTC finally revealed its new product family, Creo 1.0, it became clear the company was borrowing a page from Apple's playbook. In fact, Brian Shepherd, PTC's executive vice president of product development, borrowed Apple's marketing slogan—"There's an app for that!"—to explain PTC's strategy to break up an all-inclusive CAD-PLM package into a series of app-like modules. Around the same time, PTC's rival Dassault Systèmes revealed 3DVIA Mobile for the iPad and iPhone, a mobile app for viewing 3D models.

By the time Autodesk University came around in December 2010, some keynote speakers were openly flaunting the iPad—never mind that they were speaking to an audience made up primarily of Windows-based AutoCAD users. Longtime PC devotee Autodesk eventually paid homage to Apple and mobile devices by releasing a series of apps that target the iPhone, iPad and Android devices: AutoCAD WS Mobile, Autodesk Inventor Publisher Mobile Viewer and SketchBook Mobile, to name but a few.

Last spring, as Apple prepared to launch its second-generation tablet, the iPad 2, PLM (product lifecycle management) software makers were forced to rethink their R&D strategies. It became clear to them that traditional client-server approach—a central data repository, accessible via desktop terminals—was no longer sufficient. The old computing paradigm with firewall restrictions is bound to suffocate many in the new talent pool, who have been told they're free to roam.



Autodesk Inventor Publisher Mobile Viewer lets you view interactive 3D assembly instructions on mobile devices.

Aspiring engineers and designers have become too accustomed to their Wi-Fi-enabled freedom.

Design, engineering and manufacturing have long been decentralized. Global supply chains, offshore operations and transatlantic collaboration no longer raise eyebrows. From GM and Ford to Procter & Gamble, industry titans and small businesses alike have accepted them as standard practices. Yet, many PLM technologies remain trapped inside servers and desktops. Perhaps it's time to mobilize PLM, to get ready for the inevitable arrival of RLM: roaming lifecycle management.

The Great Shakeup

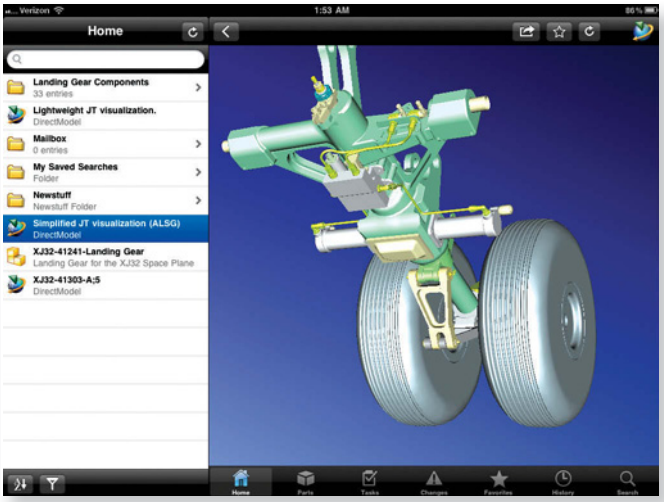
This June, at PTC's annual user conference (rebranded as PlanetPTC Live), PTC's Shepherd got one of the most enthusiastic rounds of applause when he shook an iPad—quite literally. Shepherd was demonstrating Windchill Mobility, an app that's not yet in the market. Developed to let users access product data housed in PTC's Windchill PLM system

through a mobile device, the app also lets users shake the device to explode an assembly—an example of an innovative use of the device's sensitivity to movement.

Apple iPhone and iPad offer a way to undo an action (most notably, to undo a string of text you just typed) by shaking the unit. In essence, it encourages you to do something you've been traditionally told not to do with your computing devices!

Similarly, mobile devices' touch-responsiveness encourages you to interact with digital design data—2D drawings and 3D models—differently. This distinct characteristic makes it possible to bypass the mouse altogether when launching, zooming, panning, selecting, rotating and editing CAD models in the latest crop of mobile apps developed by CAD and PLM vendors—including Autodesk Inventor Publisher Mobile Viewer, AutoCAD WS, Dassault Systèmes' 3DVIA Mobile, IMSI/Design's TurboViewer and Siemens PLM Software's Teamcenter Mobility.

"Laptops and notebooks have been able to connect wirelessly through add-on air cards for some time," observes Siemens PLM Software in a white paper, "A Mobility Strategy for PLM Users." "Recently, interest has increased in a new breed of tablets popularized by the Apple iPad and the Android platform. Seemingly overnight, product development companies are procuring tablets for their own mobile workforce, and requiring their enterprise software solutions



Siemens PLM Software's Teamcenter Mobility lets you use an iPad to search and retrieve design data and bills of materials housed in a Teamcenter repository. 3D visualization is made possible by Siemens PLM Software's lightweight JT format.

to support these mobile devices. According to Forrester Research, the enterprise mobile workforce represented 57% of employees in 2010 and is expected to grow to as much as 93% by 2015."

Downstream use of CAD data, often touted by PLM advocates as one of the benefits, was previously fueled by lightweight client apps, installed on desktops or laptops (for example, SolidWorks' eDrawings Viewer or Cimmetry AutoVue, later acquired by Oracle). But the popularity of mobile devices among road warriors and field technicians suggest the function will soon shift to smartphones and tablets.

To address this sea change, some design software makers like Autodesk and Dassault Systèmes now offer the ability to publish mobile device-displayable animations, dynamic documents and interactive manuals through products like Autodesk Inventor Publisher and 3DVIA Composer.

Naturally, discussions of mobile computing may set off some alarm bells, as the new devices are not always easy to control or track. For IP-conscious manufacturers, they could be a huge IT headache. But surprisingly, PC maker Dell comes to the defense of the new kids: "Corporate IT policies that ban the use of employee-owned devices in the name of security inadvertently create new bigger security holes as users skirt IT restrictions," Dell noted in its paper "CIO Strategies for Consumerization: The Future of Enterprise Mobile Computing" (Feb. 3, 2011).

An Unsettled Market

Chuck Cimlore, CEO of Omnify PLM Solutions, is looking at areas of his firm's software that are ripe for mobile deployment.

"The key features for general PLM users would center around viewing workflows, performing sign-offs, searching, data retrieval and document viewing," he notes. "Field and shop floor personnel would require additional functionality for scanning and tracking manufactured and test units, raising corrective actions, and recoding returned materials."

Five years ago, says Bill Barnes, general manager of Lattice Technology, "we were all about format. Our mantra was XVL, XVL, XVL—XVL everywhere, XVL on every desktop. [XVL is Lattice's lightweight geometry display format.] Now, what I've noticed is the need to support multiple consumption devices: a tablet or handheld device, a touchscreen on the shop floor, a notebook with a PDF reader. As a vendor, we need to make sure we can support all those."

Lattice's XVL Studio serves as a software suite for turning 3D design data into 3D manufacturing data and technical illustrations. Barnes acknowledges the increasing demand for mobile support, but the company's software currently doesn't include mobile publishing options.

Similarly, Omnify's Cimlore says, "The biggest challenge is supporting the wide array of operating systems. Like many, Omnify is taking the approach of developing a 'scaled-down' version of its browser-based products to provide streamlined functionality for mobile devices (through the device's browser). As demand increases for extended functionality for a specific mobile OS, we will develop apps accordingly."

Supporting mobile devices via a browser may work as a shortcut, but the method can't take full advantage of a device's inherent features, like multi-touch navigation and gesture-based 3D navigation. In fact, early prototypes and PLM apps appear to treat the device primarily as a portable input terminal. Very few, for instance, take advantage of the device's location awareness and audiovisual features.

Developing PLM apps for the iPad, iPhone and Android is the easy part (see "The Kindle Sync Model," to the left). Figuring out a way to synchronize user operations across all platforms, operating systems, and devices so everyone involved in a project can view and access the same engineer change orders, geometry edits and supply chain shuffles—that's the difficult part. And that's what it'll take to maintain a single source of the truth when PLM goes mobile.

Exceptions to the Mobile Rule

In general, PLM tasks that can be performed remotely are also those that don't need a lot of CPU power. They include data search and retrieval, design review and approval, project status query, 3D data viewing and markup, and request for quotes and proposals. But certain design- and engineering-related tasks that require dedicated workstations and servers may not be suitable for mobile treatment yet. For a start, a mobile device's computing power is no substitute for a workstation's horsepower when it comes to running professional CAD, finite element analysis (FEA) and rendering software packages.

Peter Thorne, managing director for consulting and analyst firm Cambashi, proposes a hypothetical scenario: "Think of

The Kindle Sync Model

Online book merchant Amazon's Kindle app—available for PC, Mac, iPhone, iPad, BlackBerry, Windows phones and Android phones—serves as a good model for mobile PLM app developers to follow. Suppose you have the Kindle reading app installed on your iPhone, iPad, PC and Kindle hardware. You may read a title you've purchased from the Kindle store on any of those devices. And if you highlight certain passages using your iPhone Kindle app, when you launch the same title on another device, you'll find it has wirelessly synchronized your highlights to the device you're using. Furthermore, based on the furthest location you've read to on the previous app, Kindle will ask whether you'd like to go to that page when you launch the book on another device.

PLM vendors advocate "a single source of the truth," but sometimes have a difficult time accommodating the vision in their software. It seems Kindle has figured out a way.

Dassault Systèmes' 3DVIA Mobile Viewer lets you connect to the 3DVIA community online, download models and visualize them from an iPad.

yourself as a passenger with a choice between two aircraft. You're told, 'The aircraft over there was designed by engineers working at their desks, using 31-in. screens and high-performance workstations. The one over here was designed by engineers using mobile devices.' Which one would you rather fly in?"

His point is, "There's a level at which the nature of the mobile device becomes a barrier itself," due to its willing sacrifice of computing power and display screen.

With the help of partners like mental images (a division of NVIDIA), Autodesk has been working on allowing 3ds Max users to produce ray-traced rendering remotely. The new feature will allow 3ds Max users to remotely tap into the processing powers of Tesla GPUs housed elsewhere to render their designs and animations faster. By the same token, engineering and simulation software provider Altair has begun offering users the option to remotely call up the company's computing resources to perform simulation jobs.

Current barriers—primarily difficulties in moving large data to and from mobile devices—may disappear in the future as software and hardware makers invent new ways to bypass the need for local processing power. For instance, you may borrow a remote workstation or buy time on a remote server to perform your computing-intense tasks. This raises the possibility that you may, indeed, be able to use a mobile device as an intermediary to connect to a high-performance computing system hosted elsewhere, making your device's processing power (or the lack of it) irrelevant.

"If you're going to use a mobile device to do that [serious design engineering work]," cautions Thorne, "you'd better have a jolly good app to help you achieve the precision that comes more naturally on a traditional desktop workstation. It's horses for courses. Mobile is great for viewing, collaborating, and markup but not my first choice for authoring."

Roaming Product Data

In August, as if conceding to the invading mobile horde, HP announced it was considering an exit strategy from the PC business.

"The personal computing market is quickly evolving with new form factors and application ecosystems," HP observed in the announcement. Though not explicit, the reference is understood as mobile devices and tablets. At any rate, HP is considering a number of options for its Personal System Group, including "the separation of its PC business into a separate company through a spin-off or other transaction." (For more, read "HP Ponders Exit Strategy from PC Business," *DE Virtual Desktop* blog, Aug. 19, 2011.)

A week later, United Airlines announced it was giving its United and Continental Airlines pilots 11,000 iPads, preloaded with flight manuals. Alaska Airlines has also taken the same approach, paving the way for paperless cockpits. These moves are a clear sign that aerospace—the bread and butter of PLM—has embraced the idea to deliver mission-critical engineering data and technical documents on mobile devices. PLM data is now literally in the cloud. If your PLM software is still locked behind an air-conditioned server room, hidden behind a corporate firewall, you may be the one missing the flight. DE

Kenneth Wong *writes about technology, its innovative use, and its implications. One of DE's MCAD/PLM experts, he has written for numerous technology magazines and writes DE's Virtual Desktop blog at deskeng.com/virtual_desktop. You can follow him on Twitter at KennethwongSF, or email him via de-editors@deskeng.com.*

INFO

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How to Make it in Modeling

Go from 3D scan data to a parametric CAD model, step by step.

BY RACHAEL DALTON-TAGGART

In the past, it's taken a fair amount of expertise to go from a point cloud—the initial result of a 3D scan of a physical object—to an accurate 3D digital model that is completely editable in a CAD program. But steady progress over the last 10 years, aided by two recent breakthroughs, has created a data freeway originating from the point cloud.

Point cloud processing closes the loop between the physical and digital worlds, providing the physical-digital match that cannot be obtained with a nominal CAD model alone.

Until recently, the most tenuous part of the physical-digital loop was making the connection between 3D scan data and parametric 3D CAD models. Over the past two or three years, however, that connection has been simplified and streamlined by two major developments.

One is the ability to capture and reproduce design intent for a physical object. Design-intent modeling extends reverse engineering from simply producing an accurate digital copy to extracting the original design intent from a scan of a physical model. This ability to generate CAD-ready surfaces from scans of physical objects laid the groundwork for another development: a technology dubbed parametric exchange.

Parametric exchange completes the software bridge between point clouds and CAD. It provides an intelligent connection with CAD to enable automatic native reconstruction of geometry. With parametric exchange, parametric surfaces, datums and curves can be transferred from point cloud processing software to 3D CAD software without the need for intermediate neutral files such as IGES or STEP.

The parametric exchange process leverages the specific strengths of point cloud processing software and CAD software. Point cloud processing software organizes and processes point cloud data to create CAD models, and CAD software enables users to further modify and prepare models for product design and manufacturing.

How it Works

We can see how the process works with this step-by-step illustration. The parametric exchange functionality within Geomagic Studio reverse engineering software works directly within many 3D MCAD systems, including CATIA, Autodesk Inventor, SolidWorks and Creo Elements/Pro (formerly Pro/ENGINEER), to recreate what was 3D scan data and turn it into CAD data. It also uses a range of tools to identify standard elements (cylinders, cones, planes, etc.) based on the point cloud data.

In this example, we will illustrate the process of transferring a 3D model from Geomagic Studio into Creo Elements/Pro:

Figure 1: Inside Geomagic Studio, there is a Parametric Surfacing module in the top toolbar. This recognizes discrete features in the model that will be recognized in the MCAD software. The software allows the user to combine and split regions in the model to match the engineer's needs for the CAD model.

Figure 2: Geomagic Studio then automatically classifies the 3D shapes into distinct features. The user can also manually classify elements by hand (cylinders and extrusions, for example).

Figure 3: The software then automatically recognizes the edges and creates distinct parametric surfaces for each element.

Figure 4: Using the tools within Geomagic Studio, the engineer can then align and constrain elements in the 3D model in preparation for transfer to the MCAD system. The profiles of each extrusion can be individually edited if needed, to build even more accuracy into the data.

Figure 5: The Fit Connector tools automatically trim the surfaces to ensure the model is completely watertight. The software then stitches the surfaces together. At this point, the engineer is ready to use Geomagic's parametric exchange tool.

Figures 6 and 7: The engineer selects the base extrusion and sends it automatically to the MCAD system.

Figure 8: The engineer can switch back to Geomagic Studio and select the cutting pane for the extrusion, and send this to the MCAD system.

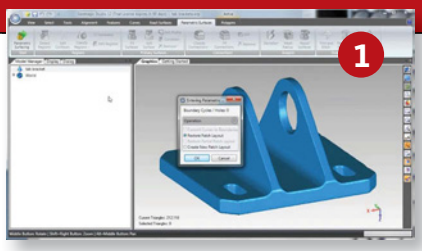
Figures 9, 10 and 11: These steps can be carried out step by step or simultaneously in Geomagic Studio's parametric exchange.

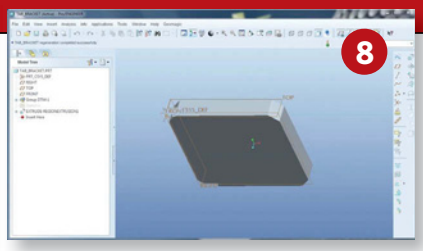
Figures 12 and 13: Slots in the 3D data are selected and automatically transferred to the MCAD system to complete the model.

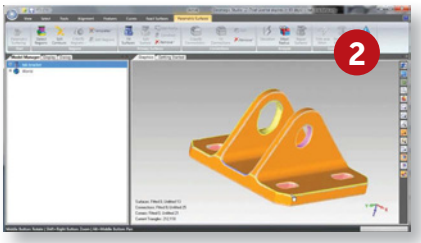
Figure 14: It is now ready as a parametric model for design edits, additions and updates.

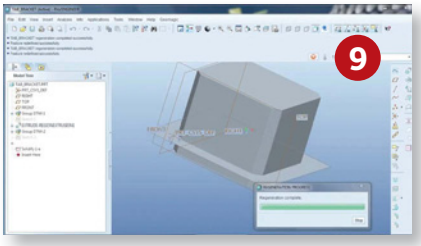
Explore, Customize, Analyze

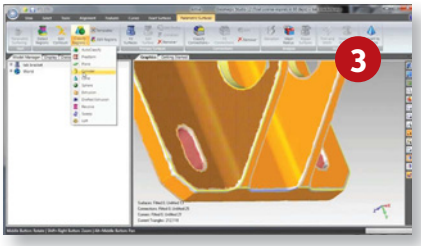
The closed loop between scan data and CAD that parametric exchange provides gives product designers and engineers the freedom to explore new and endless variations of products. Think of thousands of permutations of classic Nike shoes, individualized Mattel toys or personalized fuel tanks for Harley-Davidson motorcycles—even custom-designed prosthetics.

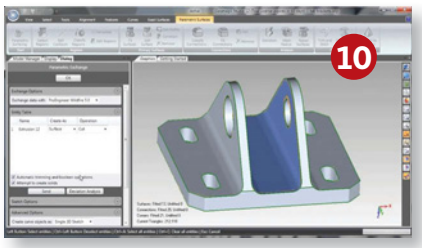


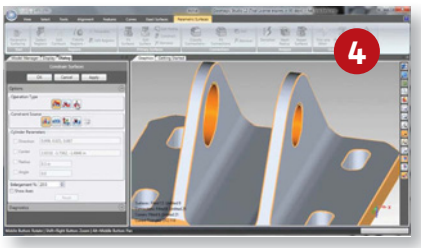


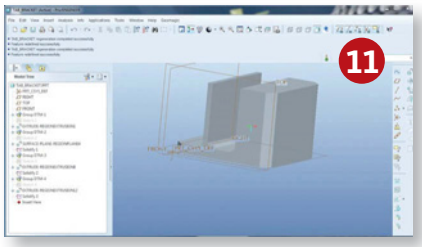


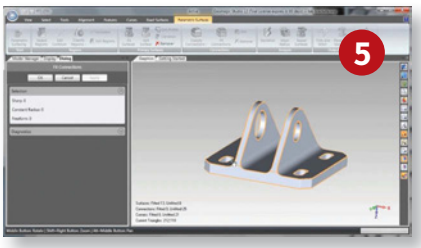


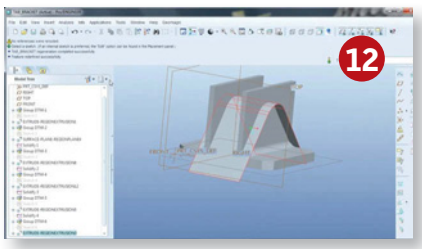


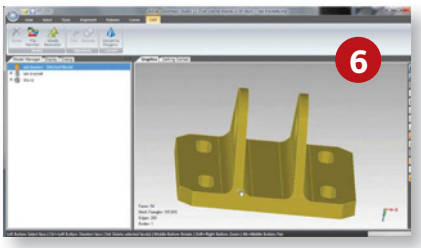


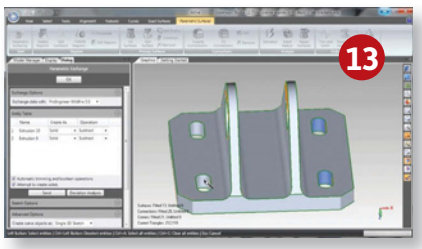


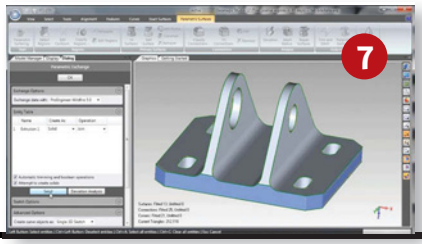


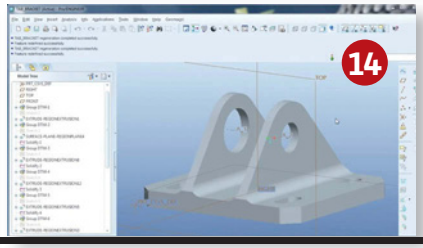












It also has the potential to save manufacturers on tooling costs. Instead of recreating an expensive mold from scratch, for example, companies can scan an existing one, analyze the wear and tear, design an improved model, and manufacture new molds in days instead of weeks or months.

The ability to capture an existing design and adapt it to new styles and purposes is critical to the evolution from mass manufacturing to mass customization.

Streamlined processing of point clouds into accurate digital models is also opening up new applications in 3D inspection, computer-aided analysis and quality control. Manufacturers now have the ability to scan a product coming off an assembly line and compare it to the nominal CAD model to determine deviations and changes caused by the manufacturing process.

Companies can also conduct finite-element analysis and computational fluid dynamics simulations based on the actual digital model of an as-built part or assembly. Maintenance, repair and overhaul organizations can quickly assess damage to parts, and fulfill the dual goals of better and faster repairs. And in the medical world, the ability to scan a body part or a dental mold enables doctors and dentists to tailor treatments to the exact physiological needs of their patients. The results include better fit and functionality of prosthetic, dental and hearing devices; less invasive and more personalized treatment; greater ability to analyze treatment success and make adjustments; and better communication with patients through 3D imaging.

All of this starts with the point cloud—and the ability to turn it into a usable, parametric 3D CAD model. DE

Rachael Dalton-Taggart *is director of marketing communications for Geomagic.*

INFO ➜ Geomagic: Geomagic.com

For more information on this topic, visit deskeng.com.

A Focus on Energy

BY JIM ROMEO

Finite element analysis (FEA) products are not always developed and built to suit a particular industry. However, Bentley Systems recently expanded its portfolio of products and companies by acquiring SACS' suite of applications that had been developed specifically for the offshore energy and engineering industry.

To find out more about these products, *DE* spoke with Parvinder Jhita, Bentley Systems product manager, SACS product line, based in Kenner, LA:

DE: How does the SACS suite work?
PJ: *SACS is an integrated finite element structural analysis suite of applications that uniquely provides for the design, fabrication, installation, operations and maintenance of offshore structures. SACS provides comprehensive lifecycle applications for the analysis and design of new and existing fixed offshore structures for the oil, gas and wind energy markets. The comprehensive lifecycle applications include nonlinear analysis for blast, ship impact and pushover loads; fatigue life evaluation; and installation loads.*

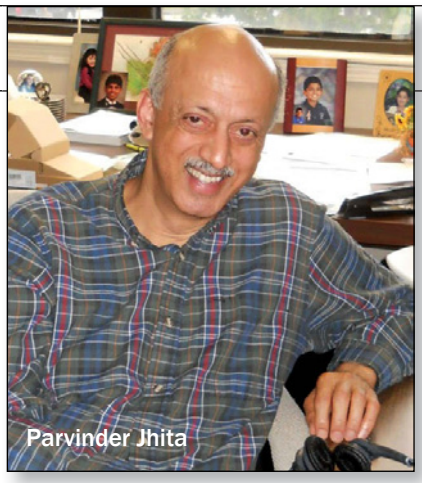
DE: How does SACS proactively address safety issues?
PJ: *SACS offers an efficient and easy way of performing different types of analysis over the lifecycle of an offshore structure. For example, our Collapse and Dynamic Response modules, which are closely coupled together, allow the user to quickly analyze and visually simulate the damage to a jacket structure from accidental events in real-time, leading to a safer design.*

Another good example is our Wave Response module, which allows the determination of dynamic effects on a structure due to cyclic loading from waves, wind and turbine mechanical time/history forces. It is fully coupled with the Fatigue module, enabling the user to effortlessly conduct a fatigue design of offshore platforms for the oil, gas and wind industry. Our Interactive Fatigue module allows the user to redesign any joint on the fly, by interactively changing the structural data and fatigue parameters—saving many hours of analysis and design time to reach a solution.

DE: What features about your product would you say are most appealing to end-users?
PJ: *Three key features include built-in standard platform templates that enable fast, detailed creation of jacket and topside structures; front-end dashboard to simplify and effortlessly design for the many complex loading scenarios; and the ability to seamlessly integrate joint finite element meshes into the overall structural analytical model for detailed collapse design.*

DE: Do you plan to add to your application and publishing program in the near future?
PJ: *Features of upcoming releases will be focused on improving productivity and providing safer platform designs. These include enhanced visualization of analysis results, additional European standards, and a new, non-linear collapse module with enhanced large deflection capability and optimization of fatigue calculations to dramatically reduce analysis times. Our major focus, however, is to integrate SACS with other Bentley structural and modeling products using Bentley's integrated structural methodology (ISM).*

DE: How would you characterize the return on investment for SACS?
PJ: *SACS is available in packages that have different low- to high-end capabilities, depending on the requirements and scale of the project. Users who acquire SACS stay highly competitive, because SACS is the most widely used software for the design of offshore platforms.*


Parvinder Jhita

There is significant economic benefit to using this software: SACS is geared toward the analysis and design of offshore platforms. It has specific tools for this purpose and, as a result, there is substantial return on investment in terms of time-savings and reduced cost.

DE: In your view, what are the greatest challenges facing design engineers of all disciplines today, and how do you integrate such concern into your product lines?
PJ: *Design engineers in the infrastructure community have a shared responsibility to improve the lives of people around the globe by sustaining the world's infrastructure. Quickly developing economies, such as those of Brazil, Russia, India and China, are creating unprecedented demands for energy—as well as for food, developed land, water, materials and infrastructure. SACS enables the safe design of offshore platforms to meet the rapidly growing demand for oil and gas energy, and will continue to play an increasing role in the growing generation of energy from wind farms.* DE

Jim Romeo *is based in Chesapeake, VA. Contact him via de-editors@deskeng.com.*

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Tools of the Month

New Products for Engineers

1 Lightmap Releases Plug-in for KeyShot
Lightmap Ltd. (lightmapstore.co.uk) has announced the launch of the HDR Light Studio Live plug-in for Luxion (luxion.com) KeyShot. HDR Light Studio brings a high dynamic range imaging (HDRI) lighting toolkit directly to KeyShot users, allowing them to create custom lighting designs for each shot.

NI Upgrades Measurement Studio
National Instruments (ni.com) has announced the NI Measurement Studio 2010 Service Pack software upgrade. The release, which, according to the company, addresses 15 improvements to Measurement Studio 2010, is an exclusive update for members of the NI Standard Service and Volume License programs.

MathWorks Announces Release 2011b of MATLAB and Simulink
MathWorks' (mathworks.com) new release introduces Simulink Code Inspector, which assists with the review of source code generated from Simulink models. R2011b also updates 82 other products, including Polyspace embedded software verification products. Features of MATLAB, R2011b include a Parallel Computing Toolbox, an Image Processing Toolbox, a Global Optimization Toolbox, and a Statistics Toolbox.

2 Hexagon Metrology Offers Agilent Laser Calibration
Hexagon Metrology Inc. (hexagonmetrology.us) has announced the availability of the entire line of Agilent (agilent.com) laser calibration parts and accessories in its online store. The Agilent Dynamic Calibrator laser calibration system is used to verify machine tool and CMM accuracy. The online store exclusively serves and ships only within the US.

SofTech Releases ProductCenter PLM 9.2.0
Softech's (softech.com) ProductCenter 9.2.0 includes platform support for: Adobe FrameMaker 10, AutoCAD Electrical 2012, AutoCAD Mechanical 2012, Autodesk Inventor 2012, Oracle AutoVue 20.1, SofTech CADRA 19, CATIA V5 R20, NX 7.5, and SolidWorks 2011. The ProductCenter Inventor Integrator is an Autodesk Inventor Certified Application and the ProductCenter SolidWorks Integrator is a SolidWorks Gold Partner Product.

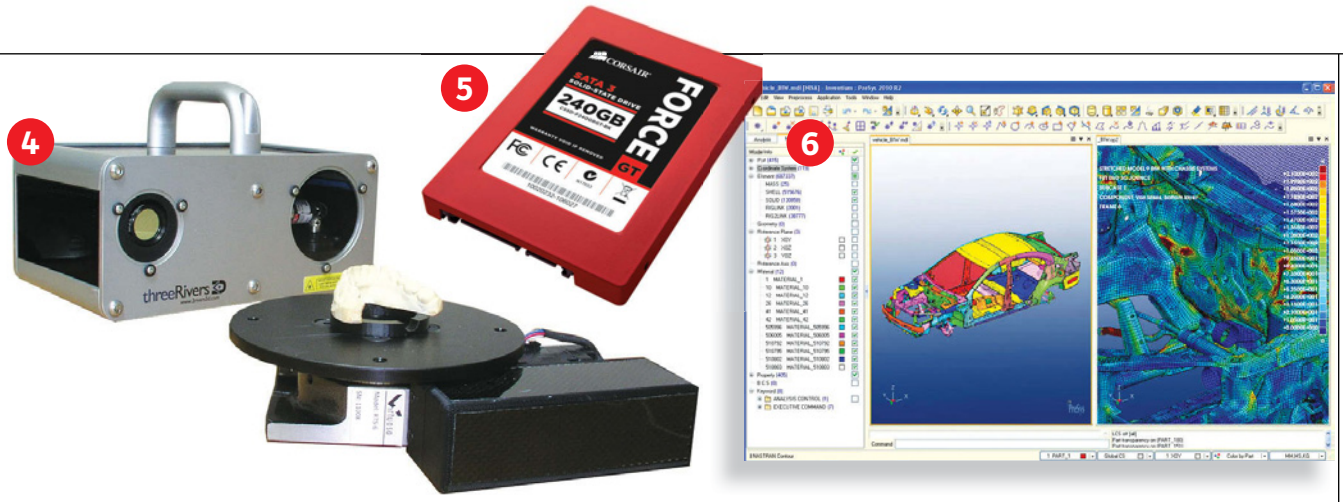
Omega Introduces Digital Temperature Transmitters
Omega's (omega.com) PRTXB and PRTXAL series are two-wire transmitters that provide a 4 to 20 mA signal representing temperature linearized. It features a 316 Stainless Steel RTD Probe that captures minimum and maximum readings. Selectable units and an auto shutoff time feature are available for battery-powered models (PRTXB and PRTXBL).

3 Siemens PLM Software Releases New Version of Teamcenter Mobility
Siemens PLM Software's (siemens.com/plm) latest release of its Teamcenter Mobility mobile app is intended to enhance the end user's ability to participate in the product lifecycle management (PLM) process using an Apple iPad. In addition to access to the existing product knowledge managed using Teamcenter software from any Wi-Fi or mobile broadband-available location, Teamcenter Mobility 2.0 provides individuals with the ability to capture and contribute additional knowledge, browse product structures and initiate workflow processes.

Bunkspeed PRO 2012 has Integrated NVIDIA iray
Bunkspeed (bunkspeed.com) has introduced the Bunkspeed PRO Suite 2012. The software features image processing and camera manipulation tools, single click "render pass" output for post production, new configuration and model set capability for creation of variants, and photometric lights including spot, point and directional.

Gstarsoft Launches Portable CAD Software for Apple iPad
GstarCAD (en.gstarcad.com) has launched GstarCAD MC for iPad, which includes functions for viewing, creating, annotating, and editing drawings. The new software works with OCF files, which can be converted from DWG and DXF files using GstarCAD for Windows.

4 threeRivers 3D Introduces 3D Laser Scanner
threeRivers 3D Inc.



(3rivers3d.com) has launched the LC-2-MACRO. The LC-2-MACRO is designed for 3D scanning of small parts such as dental molds, hearing aid impressions, jewelry and other highly detailed parts. The LC-2-MACRO has a working volume of 4x3x3-in. and a point spacing of 80um.

NVIDIA Releases Tesla GPU Starter Kit from HP

NVIDIA (nvidia.com) has announced a limited-edition GPU Starter Kit from HP (hp.com), a pre-configured system that provides engineers with a ready-to-use GPU computing cluster, straight out of the box. It consists of eight HP ProLiant SL390 G7 servers, containing 24 NVIDIA Tesla M2070 GPUs and 16 CPUs. It is preconfigured with NVIDIA CUDA 4.0 parallel computing software.

5 Corsair Releases New SSDs

Corsair (corsair.com) has announced retail availability of 180GB and 240GB Force Series GT SSDs. The new 180GB and 240GB models join the 60GB and 120GB Force Series GT models already on the market. The Force Series GT uses the SandForce SF-2280 SSD Processor, with native support for SATA 6Gb/s (SATA 3), combined with ONFI synchronous flash memory.

ZWSOFT Updates ZW3D 2011 with Service Pack 1

ZWSOFT (zwsoft.com/en) has announced the release of Service Pack 1 for ZW3D 2011. This service pack is intended to improve ZW3D in the areas of editing, sheet metal work, CAD/CAM operations, and file import-export. It is available in eight languages. Service Pack 1 can now import more than two 3D solids from DWG files, and assign colors when exporting in DWG or DWX formats.

6 PreSys FE Modeling Now Available for NISA

ETA Inc. (eta.com) has announced the availability of its PreSys finite element modeling environment to NISA (nisasoftware.com) users. A solution for finite element analysis engineers, PreSys is a precise modeling tool that interfaces with CAD software products such as CATIA, Unigraphics, Pro/Engineer, Solidworks and AutoCAD; while also offering CAD-based finite element meshing capabilities. DE

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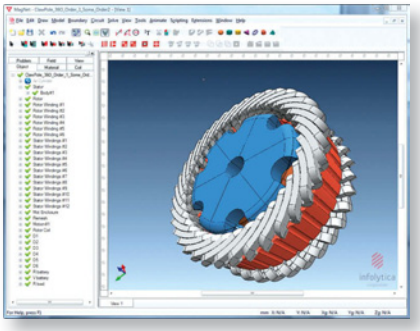
Editor's Picks

by Anthony J. Lockwood

Each week, Tony Lockwood combs through dozens of new products to bring you the ones he thinks will help you do your job better, smarter and faster. Here are Lockwood's most recent musings about the products that have really grabbed his attention.



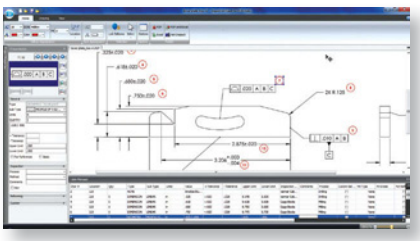
Infolytica Releases Latest ElecNet and ThermNet

New functionality enables simulation of lightning strikes and sudden thermal effects.

Infolytica has announced the latest releases of its ElecNet and ThermNet CAE software; v7.2 for both. ThermNet, as it name implies, is for thermal simulations. What struck me as interesting about this announcement are two things: coupling of analyses and a new feature for modeling adiabatic events.

Coupling. Yeah, I know that I've beaten the multiphysics analysis drum for years now, but I can't help myself. What Infolytica's announcement means is that these two tools link seamlessly. This lets you determine the non-linear steady state temperature distribution due to electric heat sources for both static and time-varying thermal simulations.

MORE ➜ deskeng.com/articles/aabber.htm



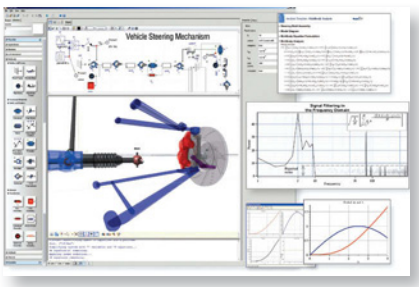
On-Demand Automated Inspection Tool

Web-based application for creating ballooned inspection drawings.

I came across this interesting new product the other day. It's for two sets of readers. The first is all of you who have to balloon inspection drawings and build inspection sheets for first article, in-process, and final inspections manually. The second is all of you championing SaaS (software as a service).

Extensible CAD Technologies has released InspectionXpert OnDemand. It's a web-based, updated version of its InspectionXpert software suite for automating your inspection documentation process. InspectionXpert OnDemand helps you create ballooned inspection drawings from PDF and TIFF files created by CAD systems.

MORE ➜ deskeng.com/articles/aabbga.htm



Maplesoft Releases MapleSim 5

Newest version of MapleSim said to simulate more systems more efficiently.

MapleSim, in its briefest description, is physical modeling and simulation software. It lets you leverage a symbolic modeling engine to handle the complex mathematics used to develop models in such areas as multi-domain systems, plant modeling, and control design. Capabilities include automatically generated model equations in full parametric form, equation-based custom components, optimized code generation for real-time systems, multibody technology, and an interactive analysis environment.

MapleSim 5 has what Maplesoft calls a "broader application scope" and, cheek to jowl with that, greater simulation efficiency.

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STL Repair, Editing Tool for Simulation/Manufacturing

Product fixes dirty STL geometries, comes with prototype intelligent wrapping algorithm.

Here's an interesting new product that showed up at *DE* HQ the other day. A company down in Cajun Country called Discretize just released Xtl, a new application for repairing and editing dirty STL geometries you encounter during simulation as well as manufacturing jobs like 3D printing.

The first thing that makes Xtl interesting is that it approaches STL models as a CAD-like topology—bodies, surfaces, curves, and vertices overlaying the faceted model—not just as a bunch of triangular facets and nodes. This means that you approach repairs and editing from this kind of design angle, which should give you good control over what you're doing.

MORE ➜ deskeng.com/articles/aabbkp.htm

What Will **Your** Design Cost to Produce?

As a design engineer, you are under tremendous pressure to create quality products that differentiate your company. You have requirements for form, fit and function—and you have a schedule to keep. Of course, in this economic environment, profit margins are tight, and budgets are even tighter.

In the never-ending battle for market leadership, design engineers play a larger role than they may realize in determining a company's success. But it's not just about which company has the best products; it's also about which company does a better job of controlling its product costs.

For manufacturing and product companies, the biggest expense on the quarterly income statement is the cost of goods sold (COGS)—the amount of money required for producing the goods your company sells. Typically, it's between 70% and 90% of the gross revenue your company earns. A manufacturing company that could reduce its product costs by just 1% would see its profit rise substantially.

Every change you make to a design has an impact ...

Remember the old mantra that 80% of the cost of a product is created in the first 20% of development? It's true. That means that design engineering is responsible for the largest portion of your company's product costs. You and your colleagues are in the best position for increasing corporate profitability if you can reduce the cost of the products your company sells.

Defining the Challenge

Typically, the stumbling block is knowing how much your designs will cost to produce. When you are working in your CAD program, every change you make to a design has an impact—positive or negative—on how much the finished product will cost. You may have a general idea how a particular change, such as material, might affect cost, yet the only way to know with certainty is to have someone generate an estimate or a quote. That requires either calling in a cost expert or having the purchasing department contact your suppliers. This can mean a frustrating back-and-forth process that might take days or weeks. But with deadlines looming, who has time for that?

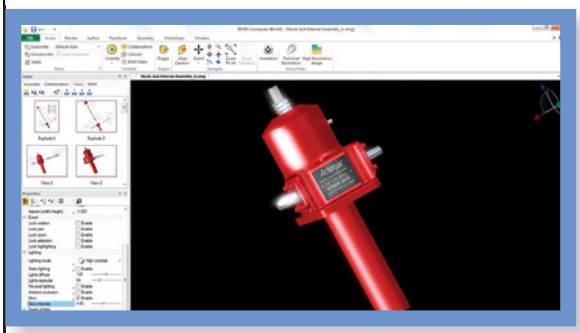
The entire process—from considering a design change to understanding its cost impact—is incredibly inefficient. And it's likely preventing you (and your team) from considering many design changes that could result in a lower product cost without sacrificing functionality, performance or quality.

The solution, of course, is to understand the impact of your design and the trade-off decisions involved every time you made a change. Your CAD system may not support that today, but there are project cost management tools that work with your CAD system to give you real-time cost information without slowing you down. With them, you can better understand the price tag for changes as they are being considered so you can find the optimal balance among functionality, performance, quality and cost that delivers the maximum value to your customers. You can explore more early design alternatives and eliminate cost earlier in the product lifecycle, resulting in fewer changes later in development when they get incrementally more expensive. Most importantly, these tools can help you avoid a number of profit-killing pitfalls, including missed cost targets, delayed product launches, late-stage product redesign and post-launch cost-reduction efforts.

With these product cost management tools, your CAD system acts as the primary data source for geometric information. The tools should integrate tightly with your CAD, and evaluate geometric cost drivers directly from solid models. As a result, you don't have to wait for cost estimates. You always know how much your design is going to cost. You always get an instant update when you make a change to a design. You can make more trade-off decisions earlier in the design process—and drive a significant amount of the cost out of a product before you start producing it.

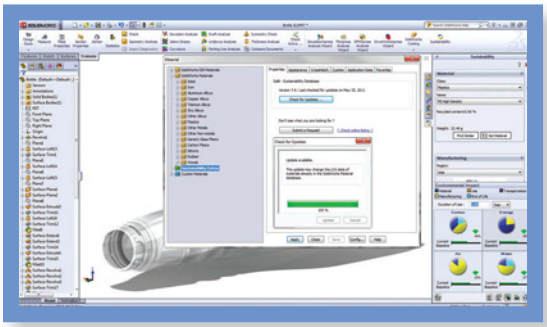
While the ultimate result of having real-time access to product costs will help your company boost its profit, that same knowledge also helps your teams meet their product cost-reduction goals. Equally important, making changes early on reduces the amount of re-work needed after a product launches. Routing more cost out up front means there won't be much cost left to root out on future generations. That allows your team to focus on new designs and innovation, rather than fixing old ones. DE

John Busa *is vice president of professional services at aPriori (aPriori.com), a provider of product cost management software solutions for discrete manufacturers.*



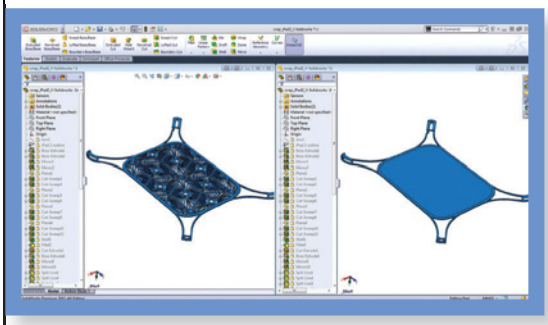
Renderings with 3DVIA Composer

SolidWorks 2012, the 20th release of Dassault Systèmes SolidWorks' CAD software, features enhancements to 3DVIA Composer, including the addition of part-to-part shadows, ambient occlusion and shadows to 2D panels with precise control. A glow effect (pictured) can also be added to highlight specific areas of interest.



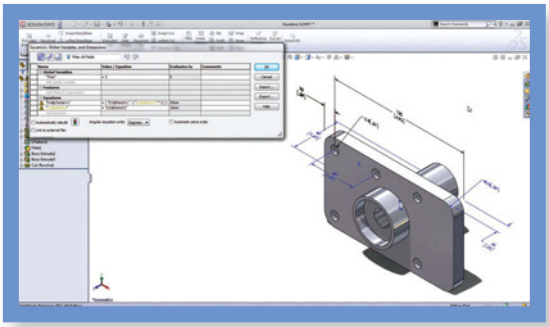
Automated Design Functions

SolidWorks Sustainability's new user interface means users can more accurately model products with "what if" scenarios and better support custom materials. Users can also closely model processes with parameters such as recycled content and duration of use.



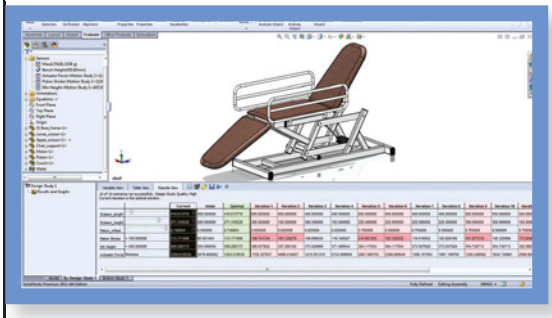
Workflow Enhancements

SolidWorks 2012 is intended to make the design experience flow more naturally, and without disruptions. One such enhancement, Feature Freeze, helps eliminate unwanted feature rebuilds by locking all features above the "freeze" bar, speeding up the design of complex models where rebuilding of specific features isn't needed. Features can also be unfrozen at any point.



Working with Equations

New equation capabilities allow users to create equations faster and understand order more easily. Equations can have multiple syntax highlighting and messages.



Simulate Motion in SolidWorks

SolidWorks Simulation includes enhanced motion optimization that automatically uses motion study results to create sensors and refine complex and time-intensive machine aspects such as motor size, bearing loads and range of travel. Users can optimize designs in less time as they refine inputs and immediately see changes to restraints or goals.

MORE INFO

Dassault Systèmes SolidWorks 2012 is a 3D design solution that the company says will enable users to work more efficiently and have the data they need to make better design decisions throughout the product development process. Improvements have been made in areas such as assembly and drawing capabilities, built-in simulation, design costing, routing, image and animation creation, and product data management. According to the company, there are more than 200 enhancements in SolidWorks 2012.

For more information, visit solidworks.com/launch

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SC11, the premier international conference on high performance computing, networking, storage and analysis, will convene **November 12-18, 2011 in Seattle, Washington.** This year's conference will bring together communities to facilitate information exchange, discussions and new collaborations for research and education related to innovating high performance computing applications and advanced scientific discovery and scholarship.

The program will highlight the latest technological advances in the field, with examples of their applications, many of which will be showcased on the exhibit floor by industry and research organizations.

Conference Thrust:

- **Data Intensive Science** — which focuses on the challenges and opportunities for addressing the exponential growth and demands in the generation and analysis of data.

Technical Program Focus:

- **Sustained Performance** will place a spotlight on how to achieve real, measurable productivity using leading-edge computing, networking storage and analysis across a diverse range of science and engineering disciplines.

New This Year

- **State of the Practice**, a new element in this year's technical program, will provide a venue for discussing best practices involving provisioning, using, and improving the critical systems and services in high performance computing, networking and storage.
- **Scientific Visualization Showcase**, also new to this year's technical program, will be presented in a museum/art exhibit-style environment so attendees can experience and enjoy the latest in science and engineering HPC results expressed through state-of-the-art visualization technologies.

Don't miss the full day of technical sessions on Friday, November 18, the last day.

Join the SC11 conversation on Facebook, Twitter and LinkedIn and look for podcasts, videos and blogs.

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