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—Mike Pisani, vehicle engineer, Local Motors, Wareham, Mass.

HP customer case study: HP Z600 Workstation enables single engineer to develop automotive design from start to finish

Industry: Automobile

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Objective:
Provide processing capability for end-to-end automotive design engineering
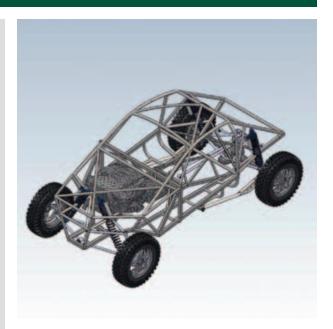
Approach:
Local Motors equipped with HP Z600 Workstation

IT improvements:
- Improved stability, with no crashes
- Expandability to accommodate more RAM, storage, peripherals

Business benefits:
- Faster throughput
- Ability to process larger, more complex models and analyses
- Elimination of delays due to hardware crashes
- Improved manufacturability

Imagine a new paradigm for automotive design. Rather than developing a car for the masses that might be sold worldwide, Local Motors' designs fit the needs of a particular, local market. The company runs design competitions and depends on an online community of designers to come up with innovative solutions to each competition's challenges.

For example, a competition to create a commuter car for the Manhattan area included such requirements as a fully electric drive train, with easy battery replacement and accommodation for front-end charging, serving up to four passengers. The online designer community submitted several possible designs and also voted on the designs to produce a winner: the Green Apple. In addition to battery power, the design also utilizes air channeled through the car's body to turn a turbine, producing wind power to create energy.

Primary applications
Automotive engineering

Primary hardware
• HP Z600 Workstation

Primary software
• SolidWorks 3D CAD software
• Genuine Windows® XP Professional x64 (available through downgrade rights from Genuine Windows Vista® Business)*,**

To translate designs into something ready for manufacture, Local Motors turns to HP Workstations. "Working with HP has been a very positive experience," says Mike Pisani, vehicle engineer with Local Motors. "The HP Workstations I've used are powerful and stable, which is critically important when you're trying to develop a vehicle cost-effectively and from scratch in 18 months."

The first vehicle being developed for production by Local Motors is its Rally Fighter, for which the company has held design competitions not just for the concept car overall, but also for individual components such as the roof light kit, the interior, and a side vent.

Focusing on unique vehicles

Local Motors is a new breed of auto developer/manufacturer that is offering customers an entirely novel approach. It's not out to develop the uber-car. Instead, it endeavors to create a distinct design appropriate to the needs and desires of local car buyers, and to produce the design in relatively small quantities (under 3,000 per production run) in small, local micro-factories.

"Our cars will never compete with the mass market models. Our cars will be more distinctive and unique," says Pisani.

Local Motors operates with a skeleton staff. So translating a design concept into a manufacturable car is Pisani's task alone. It isn't easy. The designers who submit ideas to Local Motors often submit nothing more than rough, 2D sketches. Through the design process, members of the online community are welcome to use an online sketching tool to suggest design changes.

Pisani takes the raw design and recreates it in SolidWorks 3D CAD software using an HP Z600 Workstation. His strength, as an R&D engineer, is

chassis and body design engineering. He will develop parts, run finite element analysis, thermal analysis, aerodynamic analysis, etc. Parts developed in SolidWorks can be output to a Spectrum Z510 Full Color System, a 3D printer/rapid prototyper to produce scale models. The 3D printer will output objects up to 14 x 10 x 8 inches in size. "I use that output to evaluate the part, decide if it's ready to go into production tooling, or needs changes," Pisani notes.

"Our designs are meant to be built. We're using our HP technology to keep the design intent intact, stay on schedule, stay on budget, and avoid compromises."
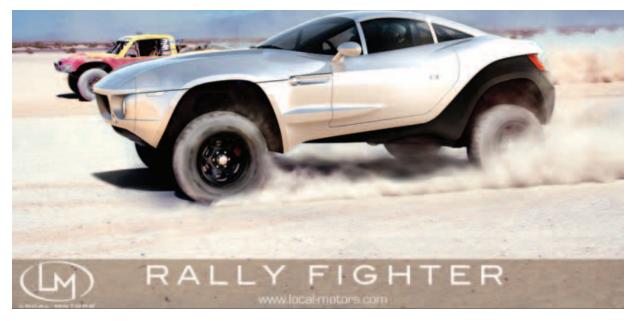Mike Pisani, vehicle engineer, Local Motors

For other components, Pisani works with suppliers to bring in schematics for standard, existing parts, which are typically developed in other CAD packages, such as Pro/ENGINEER.

For particularly complex subassemblies, an engine, for example, adding 3D design information into the CAD model is much more difficult. For this Pisani uses a 3D scanner. The scanner creates a "point cloud" —a hollow surface model—that gives him the outer geometry of the subassembly. "Imagine we're using a stock engine. Rather than approach it as reverse engineering, we scan in the design, create an STL file, and then drop that object into the chassis design."

Complexity demands processing power, stability

Despite such shortcuts, the files Pisani works with become huge—many gigabytes of data. Modeling their interaction for analysis and to produce animations is highly challenging. That's where the processing power and stability of the HP Z600 Workstation become critical.

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RALLY FIGHTER
www.local-motors.com

"There was a time when I was running on a consumer-grade computer that you might find at your local retailer, and when it came time to compile the designs and do motion studies, things would crash," Pisani notes. Early in his career at Local Motors, he was mandated to work on a Macintosh and experienced many of the same problems.

So he turned to the HP Workstation team to ask for a recommendation. Soon he had a one-to-one relationship with a product engineer who put together exactly the workstation Pisani needed. "Since I started working with HP Workstations, previous problems have essentially gone away," he says. "They're incredibly stable."

Crashes are a thing of the past—which is important, since Pisani wears many hats at Local Motors and is solely responsible for the engineering of a new vehicle. The timeline is incredibly demanding: developing a new vehicle from scratch, starting from a 2D design drawing, in 18 months.

HP Z600 Workstation: performance, expandability
The HP Z600 Workstation is designed to deliver ultimate performance with extreme expandability. It comes with up to eight processing cores, six DIMM slots for up to 24 GB of RAM, and built-in RAID up to 4.5 terabytes. The system can be expanded using any of six PCI slots. Local Motors has a single Quad-Core Intel® Xeon® Processor X5570.

"Memory is critical because of the file sizes I work with," Pisani notes. "The ability to store the part and assemble files right on the computer, and to run detailed analysis in SolidWorks, really keeps the work flowing. I can get a lot more done with my HP Workstation." Though he hasn't done studies to determine exactly how much more he can do, Pisani

estimates his Z600 is two to three times faster than the quad-core machine he worked with previously.

Pisani's HP Z600 Workstation came with Genuine Windows XP Professional 64 available through downgrade rights from Windows Vista Business 64. The 64-bit operating system enables him to make use of all of the RAM and multi-threading capabilities in his software.

Designers provide him with JPEGs, Adobe Illustrator files, or even raw scans of hand sketches. Parts suppliers might work in Pro/ENGINEER or CATIA. Regardless of the native format, Pisani must find a way to open and interpret the files, to capture them effectively in SolidWorks, and ensure the interaction among parts is portrayed accurately in his computer models.

Seeing is everything
Seeing the models is critical to his ability to envision a design. He's currently using a single 30-inch diagonal widescreen LCD monitor supported by an NVIDIA Quadro FX 1800 graphics card. The HP Z600 Workstation can be configured to support up to eight displays if he so chooses.

"With my HP Workstation, our work is enhanced rather than compromised by the technology. I know the tools are good. The rest is up to us."
Mike Pisani, vehicle engineer, Local Motors

Pisani contrasts his current capabilities—to handle a vehicle's design engineering from start to finish in CAD—with the partly manual system he worked with right out of school. "The methodology then was to design something by hand, then go to the computer

and enter it in. By keeping a project on my workstation from start to finish, I can be both more efficient and more accurate. I'm not fixing problems down the line that creep in because something was drawn without specifications."

Having total control over a project gives Pisani a distinct advantage over vehicle engineers elsewhere. The typical vehicle engineering paradigm is to divide the engineering work into many distinct, smaller tasks delegated to a far-flung engineering team. But that can lead to miscommunication and ultimately to compromise.

"It's very common in the auto industry to have a design that's supposed to weigh a certain amount, and perform a certain way. But because of communication breakdowns between design and engineering, the vehicle comes up short. What comes out in the end may not be what anyone working on the project originally conceived." Worse still, he notes, is when prototypes are developed that aren't production-worthy. That wastes time and money, both of which are in precious short supply.

On schedule, on budget, no compromises
"We're reducing that effect at Local Motors," Pisani says. "Our designs are meant to be built. We're using our HP technology to keep the design intent intact, stay on schedule, stay on budget, and avoid compromises."

Working faster means he can develop parts in-house that he previously had to send out. He also has time to run more detailed analysis throughout the development process. A computer model that takes him a day to produce early in the process can sniff out a problem that might otherwise not be caught until production, which will delay progress for weeks.

Looking back, Pisani says his experience with HP engineering products and support has been excellent. "Everyone that I've worked with at the company is top-notch. They have a good understanding of what I need as a user. The people are great; the technology is easy to use and cutting edge."

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With the challenges involved in automotive engineering, he notes, finding the right computer and support is a prerequisite to success. "With my HP Workstation, our work is enhanced rather than compromised by the technology. I know the tools are good. The rest is up to us."

Contact the
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