Case study

Local Motors

HP Z Workstations power design of Olli — first smart, electric, self-driving shuttle vehicle

Industry
Automotive

Objective
Solve urban transportation challenge by creating world's first self-driving shuttle featuring advanced cognitive capabilities

Approach
Leverage HP Z Workstations to drive design-to-manufacturing processes including rapid prototyping

IT matters
- Compute-intensive CAD, CAE, and CAM software (Siemens SolidEdge and Siemens NX)
- 3D Printing
- Interactive design review and collaboration
- Enable small-batch micro-factory manufacturing via 3D printing

Business matters
- Bring breakthrough self-driving, smart shuttle to market in six months
- Introduce creative solution to world's urban transportation challenge
- Enable design-to-manufacturing process emphasizing rapid iteration
- Reinvent automotive industry business model to drive innovation

"We're all about iteration and continuous improvement. HP Z Workstations delivered the reliability, power, and speed to drive the design-to-manufacturing process of creating Olli, the world's smartest self-driving shuttle bus."

— Alex Fiechter, head of product development, Local Motors

Local Motors combines global co-creation with local micro-manufacturing to create innovative vehicles in less time and at lower cost than traditional automakers. Driving its computer-aided design software and 3D prototype printing, Local Motors, based in Phoenix, Ariz., relies on the power and reliability of HP Z Workstations. Its newest brainchild is Olli, the world's first self-driving public-transportation vehicle featuring advanced cognitive capabilities: Good morning, Olli. Can you take me to the aquarium? Indeed Olli can, and can even remind you to bring an umbrella if the forecast calls for rain. Olli is the world's first smart, self-driving public-transportation vehicle.

Local Motors was founded by former U.S. Marine Jay Rogers. He was attending Harvard Business School in 2006 when, analyzing the automobile industry, he saw cars being made essentially the same way Henry Ford made the Model T a century ago. Mass production necessitated huge investments in centralized factories, long design and retooling lead times, and inventory buildups that had to be sold off lots. All this was inherently inefficient and it hampered innovation, Rogers thought. He wanted to create a better way. Proposing a new business paradigm based on crowdsourced design and decentralized, small-batch manufacturing, Rogers won Harvard's annual business-plan contest.

With his MBA in hand, Rogers co-founded Local Motors. In 2009, the company introduced the world's first community-designed car, Rally Fighter, which leveraged the intelligence of car designers, engineers, fabricators, and enthusiasts worldwide. This was followed by Strati, the first 3D printed electric car, as well as initiatives to create cargo drones, military vehicles—even a better wheelchair.

Introducing first of its kind—Olli

Local Motors introduced Olli in National Harbor, Md., on the anniversary of the incorporation of the Ford Motor Co. That's both an homage to the previous century's innovations and a statement about how the announcement of Olli is a new game changer. An autonomous shuttle designed for urban areas, or places like college campuses and amusement parks, Olli drives itself using overlapping sensors to see further ahead and react faster than a human.

Powered by electricity, the vehicle is quiet and emits no gas fumes. Riders can summon Olli via a smartphone. From the outside, the shuttle looks like a curvy rectangle with wheels. Inside, it can seat approximately 12 people. When you climb in and talk to Olli, it talks back, thanks to advanced cognitive learning capabilities that draw from vehicle sensors and inputs from the Internet of Things (IoT). Feeling hungry? Olli knows the best place in town for crab cakes. Didn't like that place? Olli absorbs the feedback; the more it's used, the more data it assimilates.

Where automotive companies traditionally might take up to seven years to develop a new vehicle, Local Motors took Olli from an idea to a finished product in just months. First, the company issued an Urban Mobility Competition calling on participants worldwide

to design a vehicle for Berlin—a city with public-transportation issues similar to those of many other urban areas. Berlin, recognized for its progressive culture, has proved willing to implement creative solutions. The winner of the competition was a 20-something, newly graduated industrial designer from Colombia named Edgar Sarmiento—a prime example of how Local Motors' crowdsourcing taps creative genius all over the world.

HP Z Workstations drive CAD/CAM/CAE applications

To transform the ideas submitted through the co-creation process into real working products, however, Local Motors uses sophisticated computer-aided design (CAD), engineering (CAE), and manufacturing (CAM) software—which in turn requires high-performance workstations. That's where HP Z Workstations come into the picture. Local Motors uses Siemens SolidEdge CAD software, and Siemens NX for integrated product design, engineering and manufacturing.

3D modeling demands a higher level of compute power, says Alex Fiechter, head of product development at Local Motors. In the past, car designers could work with heavy assemblies by turning the geometries of separate parts on and off. If you were working on the engine, you could turn off the complex surfacing data relating to the door panel off and thereby reduce the workload on the software.

In the world of direct digital manufacturing, which consolidates parts, turning off sections is just not possible. Additive manufacturing, or 3D printing, uses digital 3D design data to deposit materials in layers to build up a component. Strati, for example, was essentially one big 3D part, and the CAD program had to crunch the heavy math for the geometry for the whole car. Olli was designed on the same principle. It takes the lightning-fast speed of the HP Z Workstations to handle the complex geometries of such large 3D assemblies.

"It takes a powerful workstation with processing power, cores, memory, and professional graphics chops to be able to run these applications concurrently and to swap between them," Fiechter says.

The company has relied on HP Z Workstations since it first created Rally Fighter, and today uses both desktop HP Z Workstations and ZBook Mobile Workstations. Built for reliable

Customer at a glance

Application
Design-to-manufacturing of Olli self-driving urban shuttle, using SolidEdge CAD software and Siemens NX integrated CAD/CAE/CAM software from Siemens for micro-factory rapid prototyping

Hardware
• HP Z240 Workstations
• HP Z840 Workstations
• HP ZBook 17 Mobile Workstations

high performance and easy IT manageability, HP Z Workstations feature multi-core processors, large memory capacities, and advanced graphics capabilities.

In addition, Local Motors makes HP Z Series Workstations available to its community of collaborators at its micro-factory in Chandler, Az., where Olli is built. As part of its rapid-iteration approach, Local Motors prototyped Olli parts using HP Z Workstations to drive 3D printers.

"We didn't want to invest in tooling up for injection molding, because you have to pay for the mold and then throw it away if you change the part," Fiechter says. "With direct digital manufacturing, if you want to create a square today and a triangle tomorrow, that's fine, all you need to do is change the program. You have your design file done, and then you have to pass it on as machine instructions to the 3D printers. We use HP Z Workstations to make the transition between the design file and the bank of machines associated with rapid prototyping."

Driving change in the automotive industry

Olli hit the road first in Washington, D.C., with plans to introduce it next in Miami-Dade

County and Las Vegas. Riders should recognize the vehicle as a revolutionary advance. And even more ground-breaking is the process in which the vehicle was designed and built: a crowdsourced design, rapid prototyping, 3D printed parts smart vehicle with cloud-based cognitive capabilities.

Local Motors isn't creating just vehicles, it's creating new ways of imagining and building them. The results include design adaptability, environmental sustainability, and innovative responses to the world's transportation needs. To support all this, Local Motors chose the workstation it considers best aligned with the company's emphasis on power, performance, and flexibility: the HP Z Workstation.

"We need to be able to design and react very quickly, to take advantage of lessons learned. That shifts the emphasis from repeatable manufacturing to rapid iteration," Fiechter says. "HP Z Workstations give us the power and performance to operate from our philosophy of direct digital manufacturing."

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4AA6-8500ENW, December 2016