Innovating with data helps McLaren Racing create a new car prototype every 17 minutes

Celebrating 60 years of racing innovation, McLaren Racing keeps improving car and team performance using real-time edge data insights and digital twins powered by Dell Technologies solutions.

Business needs

For McLaren Racing, innovation spurs split-second advantages on Formula One circuits worldwide. Data from the edge to the data center to the cloud is critical for these races, where the smallest improvements can make big differences in outcomes. To gain better data insights, the team needed well-integrated, end-to-end technology solutions.

Business results

- Cuts the time for the design and manufacturing of new car components by over 90%.
- Accelerates time to innovation with up to 50M aerodynamic and system simulations over a race weekend.
- Enables testing of car enhancements via 3D digital twins, allowing the team to fail fast and rectify the issues before they go to the track.
- Boosts car performance and speed via real-time data analyses of 100,000+ parameters from 300+ onboard sensors.

Solutions at a glance

- Dell Precision mobile workstations
- Dell High Performance Computing solutions
- Dell PowerEdge servers
- Dell PowerScale storage
- Dell Edge solutions

Each McLaren Formula One car has more than 300 onboard sensors to monitor 100,000 data parameters.

Formula One is one of the world's most technologically advanced motorsports. The race cars have turbocharged 1.6-liter V6 engines that can generate 1,000-plus horsepower in vehicles weighing just 800 kg. (1,760 lbs.). This power-to-weight ratio produces track speeds of approximately 370 kph (230 mph) in the straights and often subjects drivers to 5G forces in the sharp turns of a typical racing circuit.

For these reasons, a car's aerodynamics and the continual optimization of its systems — from tires to brakes to wings — are all critical to gaining a competitive advantage. Tiny changes to aerodynamics can make all the difference in a race. Plus, on any given race day, teams also must consider a circuit's pavement, contours, weather and other conditions that can influence the performance of the teams' cars and drivers.

Turning data into speed and performance

According to McLaren's Business Technology Director Dan Keyworth, the best way to improve performance on the track is to analyze the data that is produced. "Data is the lifeblood of Formula One. We're using that data not only live when we are in a race, so how we gain an advantage over our competitors on the race weekend, but we're also streaming all that information back to mission control so the team can look at it in slower time, to develop the next era of car."

Dell PowerEdge servers running trackside provide immediate insights for real-time decision-making. Back at the team's U.K. headquarters, high performance computing (HPC) clusters built on PowerEdge servers with PowerScale storage support the team's engineers in using 3D digital twins, computational fluid dynamics (CFD) and computer-aided design (CAD) to make instant design changes when needed.

Instant iterations to stay competitive

Dell Precision workstations enable McLaren engineers to run high-performance apps such as 3D modeling and simulations pulling data from the trackside edge and U.K. backend HPC cluster.

Performance Engineer Amelia Lewis works at headquarters preparing the race cars for each circuit, tapping into a closed loop of car data during time trials and on race day. "Dell HPC technologies allows me as a performance engineer to have quick access to huge amounts of data, which allow me to make decisions that help the car go faster," she says. "The Dell Technologies servers allows me to have that data that might be recorded halfway around the world in Australia for me to be able to view it here in Woking, with the Precision Laptop that I use."

Always innovating, always evolving

According to Zak Brown, CEO of McLaren Racing, only 10% of parts developed from the previous season carry over to the new season. "Change is critical to the success of Formula One," he explains. "So the start of the year, the car looks radically different by the end of the year and we're constantly evolving in this race to find milliseconds every race weekend."

Now celebrating 60 years of racing innovation, McLaren Racing has seen car technology rapidly evolve. "Technology just never sits still in Formula One. Whether it's with our CFD or our wind tunnels. Of course AI is around the corner and it's something that we're embracing at McLaren Racing." Brown, himself a veteran driver with many prestigious wins to his name, recognizes that race cars today are in effect, four-wheel high-speed edge devices. "High performance technology today is vastly different from when I was racing 20, 30 years ago," Brown says. "Today in Formula One, we have over 300 sensors on the race car pulling down one and a half terabytes of data that enables us to run 50 million simulations per race weekend. Back when I was racing, I had a speedometer, a tachometer, and that was it."

Race car upgrades every 17 minutes

Keyworth concurs with Brown. "We make an engineering change every 17 minutes, and none of that's possible without having good technology that underpins all of our processes. And that's why we choose great partners like Dell Technologies that give us the compute, storage, and everything else we need to move at that pace."

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> **Zak Brown,**
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>
> **Lando Norris,**
> Formula One Driver, McLaren Racing


McLaren MCL60

Data-driven simulations are the mainstay of innovation

McLaren engineers use 3D digital twins as virtual proxies of the race cars and their components. They start out as 3D CAD designs, but the aerodynamics of their complex geometries can be tested in wind tunnels using CFD running on an HPC parallel processing infrastructure from Dell Technologies.

If a prototype part is validated in these digital twin simulations, McLaren engineers can decide to build it using 3D additive manufacturing and test it in a wind tunnel. As wind tunnel testing is regulated by Formula One's governing body, validated simulations are critical to the team's decisions about whether to continue. "We have a certain amount of fan hours each month that we have to fill, and that we need to fill, if we're not filling those fan hours we're wasting a chance to add performance," explains James Roberts, Additive Manufacturing Manager.

McLaren have seen over 90% reduction in the time taken to program parts for 3D printing with Dell Precision workstations. "It is not just a race on the track now, it's a race to get upgrades to the car. We want to have the best equipment, the best computers, the best servers, so we can get the parts made as fast as possible and get the upgrades to the car as quickly as possible."

Track-proven, driver-approved

Lando Norris is one of two McLaren Formula One drivers who count on the mechanics and engineers trackside and those back at headquarters to help him on track. "Sometimes it's the smaller things which make the bigger differences, when you add all of them up through the season," he says. "Those are the things that you may not see or notice or sometimes feel. But those are the things which end up allowing you to achieve success and go on and score podiums. So for me, mechanics are the unsung heroes of our sport."

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