Infiniti Red Bull Racing steers championship success

Maximizing performance for virtual simulations and analytics with IBM Platform Computing

Overview

The need

As on-track testing restrictions grow tighter, Infiniti Red Bull Racing must maximize the efficiency and speed of virtual simulations and real-time analytics that help it optimize car performance.

The solution

Infiniti Red Bull Racing uses IBM® Platform™ Computing software to maximize the throughput and efficiency of virtual design applications and race analytics in its high-performance computing environment.

The benefit

Provides a 20 to 30 percent improvement in workflow efficiency, enabling faster, more comprehensive component tests. With these results, the team can produce winning new car designs up to twice as quickly.

Infiniti Red Bull Racing launched on the Formula One scene in 2004. Based in Milton Keynes, England, the team has rapidly established itself as a force to be reckoned with in Formula One racing. It has won three consecutive World Constructors' and Drivers' Championship titles between 2010 and 2012.

Maintaining pole position

While races may be won by drivers at the wheel, building a championship-winning Formula One car requires the ongoing efforts of designers, scientists and engineers, backed by crucial support from a vast array of partners.

Al Peasland, Head of Technical Partnership at Infiniti Red Bull Racing, elaborates, "We face the constant challenge of wanting to implement more design changes, while having less time and resources to do so. Formula One regulations are becoming more stringent every year, with governing bodies limiting the amount of wind-tunnel and on-track test time we can use. We rely heavily on virtual analysis and simulations, such as computational fluid dynamics [CFD], to form the backbone of our testing and development work."

With CFD, Infiniti Red Bull Racing can perform virtual wind-tunnel testing on new car designs as a first step to determining the impact of design changes on a vehicle's aerodynamics. Simulation is a critical factor in analyzing design improvements and requires huge amounts of processing power. As regulators clamp down on the amount of resources and computing power allocated to CFD analysis, it is all the more important for the team to get the most out of its CFD tools.

Improving system performance

To support top performance for design and analytics applications, Infiniti Red Bull Racing uses a high-performance computing (HPC) cluster, featuring IBM General Parallel File System (GPFS™), which enables high speed file access to applications running on multiple nodes of the cluster.

"IBM Platform Computing has played a huge role in speeding up design, simulation and analysis, and now forms an integral part of how Infiniti Red Bull Racing develops championship-winning Formula One cars."

—Christian Horner, Team Principal, Infiniti Red Bull Racing

As demand for the data generated by the HPC cluster took off, the time taken to complete simulations and produce reports started to increase. The team realized that the cluster was more than capable of handling the huge workload; but how could system throughput be improved to ensure that results were delivered in less time?

The Infiniti Red Bull Racing team knew that managing the workload was essential, and looked for a way to make better use of its enormous compute resources using intelligent scheduling and resource allocation. After initially examining open source alternatives, the team turned to IBM Platform Computing for a solution.

Christian Horner, Team Principal, Infiniti Red Bull Racing, explains, "We are always looking for premium partners who can deliver the cutting-edge technology we need to build better, faster cars. With IBM Platform Computing, we recognized that the quality of support and the quality of product was far beyond that of any of the competition. For us it was a very logical solution to enter into a relationship with IBM – they were clearly the market leaders and the best partner to drive us forward."

Accelerating time-to-results

Infiniti Red Bull Racing uses the IBM Platform LSF® family of products to intelligently schedule and manage application workload across its HPC environment, ensuring that the right resources are automatically allocated to the right jobs for maximum application utilization and efficiency.

Nathan Sykes, CFD and FEA Tools Group Team Leader at Infiniti Red Bull Racing, remarks: "In the past, we scheduled all of our workloads manually, and would have to sit and wait until one processor was finished so we could move on to the next one. This was not a very efficient approach, and consumed a significant amount of time and resources.

"With the IBM Platform LSF family of products, we have seen a 20 to 30 percent reduction in the time it takes to complete simulations simply by being able to design complex, interdependent workflows and schedule individual jobs automatically. This means that we can continually run more and more analyses significantly faster than before. As a result, we can redesign, model and build a new Formula One car in about half the time that it used to take in the past.

Solution components

Software
- IBM® Platform™ Analytics
- IBM Platform Application Center
- IBM Platform License Scheduler
- IBM Platform LSF®
- IBM Platform Process Manager
- IBM Platform Symphony
- IBM General Parallel File System (GPFS™)

With IBM Platform Process Manager, the team can manage and control the end-to-end process flow and submission of jobs to Platform LSF. The solution is used in conjunction with IBM Platform Application Center, which supports flexible, web-based submission of simulation workloads.

This sequence of jobs forms an overall design workflow, providing a consistent and defined path for the simulations submitted by the designers. During the process, valuable application licenses are managed with Platform LSF License Scheduler, which ensures optimum utilization of expensive software resources.

"The performance improvements that we have gained with the IBM Platform LSF family allow us to do much more in shorter timeframes," comments Nathan Sykes. "We can design and test more components, and do so very quickly, which gives us a greater chance of making the design breakthroughs we need to build the fastest and most aerodynamically efficient cars on the track."

Building on its investment in the IBM Platform Computing family of products, Infiniti Red Bull Racing is currently working to deploy IBM Platform Analytics. Once fully operational, the advanced analysis and visualization tool will help turn massive amounts of workload data into valuable insight and provide powerful reporting capabilities.

Driving faster decisions

In addition to using virtual testing to optimize car design, Infiniti Red Bull Racing takes advantage of analytical applications to power faster decisions on the racing track. For this, IBM Platform Symphony supports the processing of in-race sensor information from the car and track to return recommendations for the team on tires, designs and strategy.

"We have seen an increase in performance with the analytics work we are doing, both in terms of volume and speed," notes Christian Horner. "Instead of it taking days or hours to run a simulation, we are now completing them in minutes. This means that we are able to get results to the track side much faster, which allows the team to make intelligent adjustments and decisions during the course of a race weekend."

Powering continued success

The partnership between Infiniti Red Bull Racing and IBM Platform Computing has helped to fuel impressive results for the racing team, and will serve as a solid foundation for future success.

Christian Horner concludes, "IBM Platform Computing has played a huge role in speeding up design, simulation and analysis, and now forms an integral part of how Infiniti Red Bull Racing develops championship-winning Formula One cars.

"For an energy drink company like Red Bull to take on the might of some huge engineering companies and beat them is something that we are all fiercely proud of. We rely on partnerships such as the one with IBM Platform Computing to power engineering and design excellence, and to sustain the kind of success that we have enjoyed in recent seasons."

For more information

Contact your IBM sales representative or IBM Business Partner, or visit us at: **ibm.com**/platformcomputing

IBM