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Jaguar TCS Racing case study

OpenText Vertica

Analyzing billions of data points at top speed

At a glance

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Jaguar TCS Racing

The team competes in the ABB FIA Formula E World Championship, an all-electric street racing series that showcases what sustainable mobility technology can do. ABB FIA Formula E interactively involves more than 300 million fans, and the championship contributes to pushing electric vehicles to the forefront for a better, cleaner future.

Challenge

Eliminating limitations on data uploading and analysis is critical to Jaguar TCS Racing's success in Formula E.

Products and services

OpenText™ Vertica™ Analytics Platform

Success highlights

- Sub-second analytics query response times fuel rapid insights for elevated track performance.

- 100 billion data points/season—every sensor, car, event—drives informed decisions on and off track.

- Race engineers and strategists get access to billions of event data points in minutes not hours.

- Eliminating sacrifices to speed and accuracy caused by exporting and down sampling data sets using the 650+ built-in functions.

Gaining an edge on the competition

As an official Formula E manufacturer team, Jaguar TCS Racing designs its own electric powertrain, which includes the motor, transmission, inverter, and rear suspension. Because all teams in the Championship are required to use the same car chassis and battery, the focus is on developing the most efficient powertrain—crucial to gaining an edge on fierce competition.

Successful electric powertrain development demands much more than simply specifying and manufacturing hardware. The systems and software used to control the powertrain, along with the algorithms that optimize its energy usage throughout each race weekend, are also key to beating the competition.

"

Vertica helps us to make time-critical decisions to ultimately deliver an edge that leads to more points, podiums, and wins for Jaguar TCS Racing."

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Phil Charles
Technical Manager, Jaguar TCS Racing

These powertrain solutions generate huge volumes of data, which the team must analyze effectively to understand and improve performance. However, to prevent better-funded teams from having an unfair advantage, the FIA—Formula E's governing body—applies tight controls to the number of engineers allowed to access and interrogate that data, both on the track and back at team headquarters.

Phil Charles, elaborates:

"The restrictions mean that we must make the most of limited resources in very short and high-pressure time windows. To do so, we need to use the best techniques available in terms of data processing and analytics."

However, this was where Jaguar TCS Racing had run up against a major stumbling block. The team's existing analytics platform was struggling to keep pace with ever-growing data demands. As Phil Charles explains: "The system took ages to load and query data, restricted us to a set volume of data we could handle, and forced us to work with aggregate and down-sampled data. It was holding us back from analyzing data as quickly and deeply as we wanted. Ultimately, this was holding back our performance on the track."

A winning partnership

Prior to Season 7 of Formula E, Jaguar TCS Racing set out to rebuild its data processing and analytics environment from the ground up. As part of this move, the team welcomed OpenText as its official digital transformation, business resiliency, and analytics partner. In a very short window, Jaguar TCS Racing worked with OpenText to migrate from its legacy NoSQL system to an advanced analytics and machine learning platform powered by Vertica.

With Vertica, there are no longer limits on how much data Jaguar TCS Racing can analyze. The team now has full access to all the raw data from every practice, qualifying, and race session. This adds up to a huge amount of information available for analysis.

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700+
Key parameters to optimize

—

328M
Global fans

"

Vertica's real-time analytics and machine learning capabilities are a great fit for our environment, helping us improve data-driven performance on and off the track. Vertica opens a new door for us: allowing us to collect as much data as we can in a well-defined, centralized analytical database and make it available to the relevant people incredibly quickly."
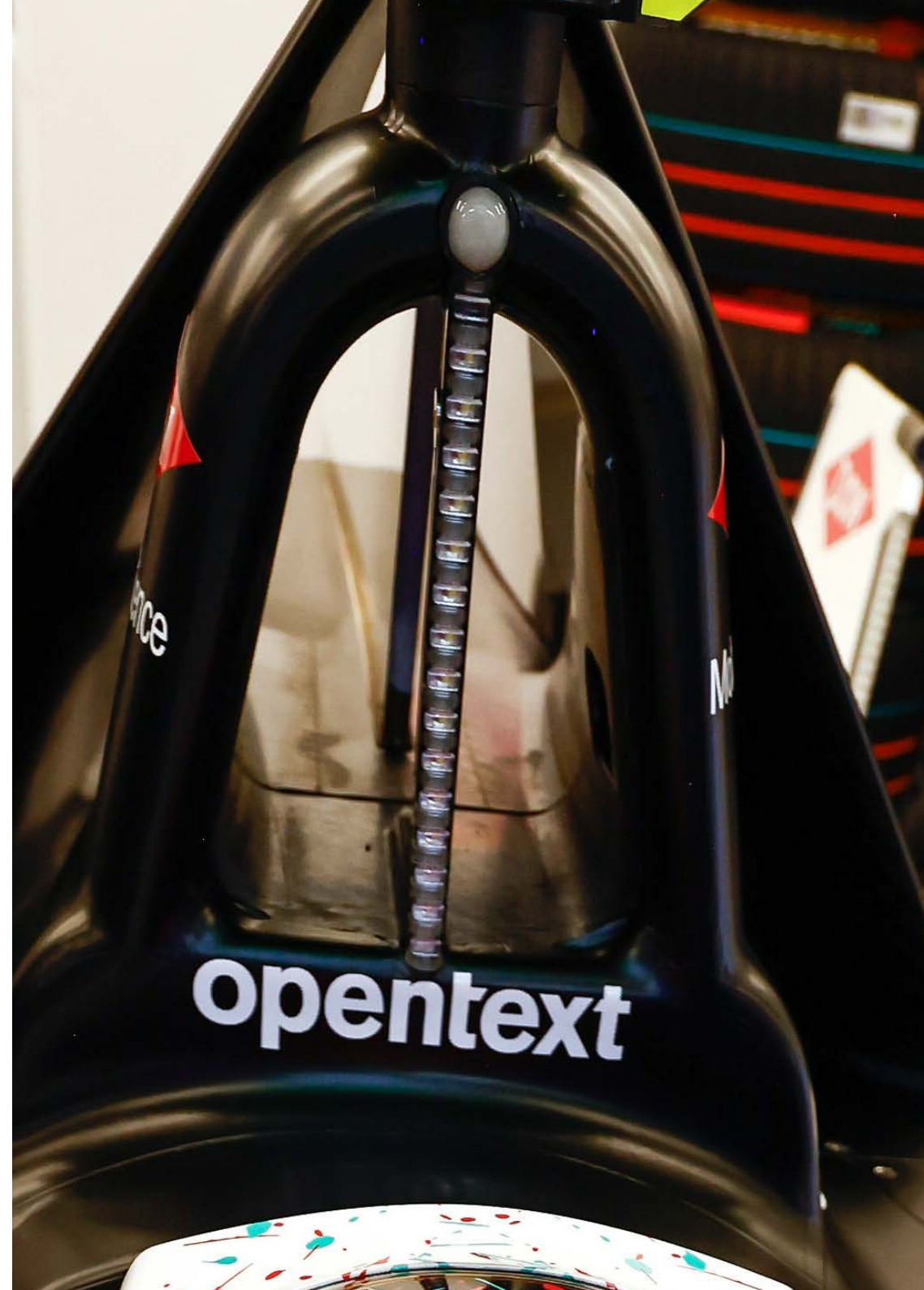
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Phil Charles
Technical Manager, Jaguar TCS Racing

"Consider the raw data logged on each race car—from speed and lateral acceleration to steering angles and suspension geometry. Once that data is downloaded, Vertica gives us access to more than half a billion data points. We then run analytics on this directly in Vertica, which enables us to glean impactful results."

Thanks to Vertica's scalable massively parallel processing (MPP) architecture, Jaguar TCS Racing enjoys fast, efficient analysis of even the largest datasets. The team also has access to Vertica's more than 650 in-database functions for querying data. On top of this, Jaguar TCS Racing used Vertica's User-Defined Extension component to build a bespoke lowpass filter to run against its data. This ensures top analytical performance without having to move the data to other systems or tools first.

Appreciating that races can be won or lost by margins measured in fractions of a second, every millisecond that can be shaved off an analytics query means that valuable insights can be in the hands of race engineers and strategists in time to make impactful adjustments to the cars before the next race. Working closely with the Vertica team, Jaguar TCS Racing highlighted a query for performance improvement. It previously used one of Vertica's in-database functions, and took over four seconds to complete.

Within a couple of days, Vertica provided a solution that delivered an improved function call, bringing that query down to just over 500 ms, or 8X faster.

Alongside running analytical queries inside Vertica, Jaguar TCS Racing is now harnessing the platform's machine learning and optimization techniques to uncover new insights and trends. For example, it can look at how specific inputs by a driver or a particular car setup affect tire wear, then the team can fine-tune vehicle settings or driver guidance for better performance on race day.

Vertica has had a clear impact on the track—Season 9 of the ABB FIA Formula E World Championship was Jaguar TCS Racing's most successful yet. With 11 podiums, four wins, and three pole positions, Jaguar TCS Racing finished the season as runners-up in a field of 11 teams in Formula E, and just four points behind the winners. Their 292 points were the team's highest haul since joining the Championship.

Steering record results

With Vertica, Jaguar TCS Racing has transformed the way it processes and analyzes data—and the difference is clear to see from start to finish. Whereas previously, it could take hours to load data from each race car into the team's legacy system, Vertica facilitates priority access to load key data sources within seconds. And the complete dataset can now be loaded within minutes of the cars entering the garage.

Query performance has also been turbocharged. For instance, using Live Aggregate Projections in Vertica, Jaguar TCS Racing has accelerated a single query from 60 seconds to 15 milliseconds. Thanks to this performance boost, engineers and race strategists are now able to analyze a greater volume of data in much more detail. This has revealed all-new insights that the team can use to make critical performance adjustments to each car's powertrain, suspension, steering, braking, power management, and more.

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We are doing things with Vertica that were just not possible with our previous system. By getting data into the platform incredibly quickly and with sub-second query response times, our race engineers have been able to unlock new value from our data between practice, qualifying, and race sessions.

With access to all the data, 650+ in-database functions, and the blazingly fast query results, Vertica helps us to make time-critical decisions to ultimately deliver an edge that leads to more points, podiums, and wins for Jaguar TCS Racing."

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Phil Charles
Technical Manager, Jaguar TCS Racing

Ready for the road ahead

For Season 10 of the ABB FIA Formula E World Championship, Jaguar TCS Racing is pushing for even better results. The team is currently working to integrate Vertica into its existing web-based app for visualizing key analytics. With Vertica analytics embedded into their race toolset, race engineers and strategists will have near-instant access to data, which will generate even faster decisions.

As Jaguar TCS Racing gears up for Season 10, Vertica will be right alongside them, delivering the speed, scale, and reliability of analytics to help the team claim more points, podiums, and wins on the racetrack.

"We're excited for what the upcoming Formula E season holds for the team, and we look forward to working closely with OpenText to continue this success."

—

James Barclay
Managing Director, JLR Motorsport and Team Principal, Jaguar TCS Racing

Learn more about our partnership ›

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