



**Objective**

To adopt a high performance computing environment to give optimum throughput within the FIA rules, constraining CFD simulation usage

**Approach**

Migrate to the latest HPE Moonshot HPC server cluster to accelerate CFD simulations, advancing performance on the track

**IT Matters**

- Halves runtime to significantly increase computations within the same regulatory limitations
- Delivers high-performance computing for more precise CFD simulations
- Enhances car set-up and race strategy decision-making capabilities

**Business Matters**

- Saves expert advice time during design and deployment
- Minimizes migration disruption during the critical F1® design period
- Increases competitiveness on the track

# Alfa Romeo Sauber F1® Team speeds up design decisions with high performance computing

## HPE HPC cluster speeds up critical computational fluid dynamics calculations



When it comes to Formula 1® aerodynamics research, FIA defines the limit of computational time available for critical CFD simulations. The Alfa Romeo Sauber F1® Team uses a supercomputing solution based on the latest HPE Moonshot HPC server cluster which significantly increases the number of CFD simulations – improving car aerodynamics and the team’s competitiveness during races.

### Challenge

**Optimizing aerodynamic performance**

In Formula 1®, a car’s aerodynamics are critical. Even the minutest alteration can affect its downforce or drag and, ultimately, how well it powers off at the start of the race, holds the road around corners or even reacts to the slipstream from a competitor just in front.

Cars continually evolve throughout the season and into the winter break between seasons. Whenever engineers modify a part such as a wing or a sidepod, they need to understand how that alteration will impact the car’s performance. To appreciate how it will impact downforce and drag, they need insights into both how forces act on the car and how the air flows around the car as it powers along.

“Our HPE Moonshot high performance computing system allows us to double the speed of our CFD computations. That helps us design the best possible solution, to give the best aerodynamic performance and, ultimately, the best competitiveness on the track.”

– Francesco Del Citto, Head of CFD Methodology, Alfa Romeo Sauber F1® Team

“Aerodynamics research is critical,” explains Francesco Del Citto, Head of CFD Methodology, Alfa Romeo Sauber F1® Team. “Computational Fluid Dynamics or CFD simulations help engineers to design the best possible solution that gives the car the best aerodynamic performance.”

CFD is a branch of fluid dynamics that uses computers to perform calculations that simulate how fluids interact with surfaces, in the case of Formula 1®, building and running a virtual car in a virtual wind tunnel. The result is an estimation of the forces on the car and a picture of the air flowing around the car. While CFD simulations reduce the number of costly and time-consuming physical wind tunnel tests needed, they are extremely complex, requiring significant computational power.

#### **Restrictions ensure fair play**

The Fédération Internationale de l'Automobile (FIA), the governing body of Formula 1® racing, restricts team's spending on aerodynamics research, primarily to ensure competition between teams remains fair. Strict regulations cap the computational time available for CFD simulations, taking into account hardware type and clock frequency, amongst other things.

“The aim of every Formula 1® team is to try and find the best hardware that gives you more throughput with your software within the rules that are constraining your usage of CFD,” comments Del Citto.

With that in mind, the Alfa Romeo Sauber F1® Team adopted a supercomputer environment, comprising workload-optimized HPE ProLiant Moonshot servers and the latest HPE ProLiant Gen9 server blades, early in 2015. HPE Pointnext operates the system, which is located in the data center at the team's headquarters in Hinwil, Switzerland. “We were really happy with our Hewlett Packard Enterprise solution,” adds Del Citto.

The FIA changed the rules around aerodynamics research at the beginning of 2018, the same time the leasing deal for the HPE solution was coming to an end. The Alfa Romeo Sauber F1® Team decided to rethink its hardware solution, taking the opportunity to evaluate new hardware for the new rules.





## Solution

### The best performance

The partnership between HPE and the Alfa Romeo Sauber F1® Team gives the Formula 1® team access to the latest HPE technologies and the best HPE expertise.

Thanks to the HPE and Intel® HPC Center of Excellence, based in Grenoble, France, the local HPC technical experts handled all steps from architecture discussions to benchmarking. They ran the test cases against six of the latest HPE supercomputing architectures.

“The technical solution proposed by HPE gave a big step up in performance compared to the other solutions from other vendors,” reveals Del Citto. “It was a win-win situation for us as we had an excellent relationship with HPE and did not have to change provider. At the same time, we are switching to the best solution in terms of performance.”

The HPE and Intel HPC Center of Excellence designed the optimal solution for the Formula 1® team’s needs: an HPE Moonshot System comprising 32 HPE Moonshot chassis, each one containing 45 HPE ProLiant m710x Server Cartridges powered by Intel Xeon® E3-1585Lv5 processors with 32 gigabytes of memory each. One chassis has cartridges with 64 gigabytes for particularly demanding operations.

The system boasts 1,440 computing nodes – or 5,760 CPU cores – and 46 terabytes of memory.

### Complex simulations running daily

Around 60 people use the HPE Moonshot System primarily, but not exclusively, for CFD calculations. Running simulations away from the track to help engineers design optimal parts produces an immense four or five terabytes of data per day. After all, the simulations must show the car running in a whole host of different conditions, including in a straight line, braking, cornering and more.

The team also uses the HPE Moonshot System to run simulations at the track to define the best car set-ups or race strategy before or during a race. “On race weekends we may use the HPE cluster to predict the minimum lap time for difficult track conditions such as temperature or weather,” remarks Del Citto. “From the track, engineers decide which parameters they want to scan, then run a thousand simulations, mostly on the HPE cluster.”

No matter how the cluster is being used, speed is always of the essence: faster simulations mean faster decisions.



## Case study

Alfa Romeo  
Sauber F1® Team

## Industry

Leisure

## Customer solution at a glance

### Hardware

- HPE Moonshot System
- HPE ProLiant m710x Server Cartridge
- Intel Xeon E3-1585Lv5
- HPE ProLiant DL360 Gen10

### HPE Pointnext services

- HPE Data Center Consulting
- HPE Datacenter Care

## Benefit

### Twice the speed

The vital extra capacity offered by the HPE Moonshot System means simulations can be completed in half the time. “With the new system, the runtime is significantly shorter than before,” confirms Del Citto. “We can, for instance, now run twice the number of iterations per day compared to the previous generation.”

Aerodynamics is probably the prime area of engineering influence for car performance. The HPE supercomputing solution is a welcome addition to the team.

### Minimal disruption at a critical time

Deployment and migration to the new HPE Moonshot System began in December and continued into January 2018. Both teams, HPE Pointnext and Alfa Romeo Sauber F1® Team, worked in harmony to ensure a smooth transition from the old cluster to the new one, avoiding any interruption at such a critical time in the Formula 1® car development calendar.

Del Citto explains why this was so important: “The championship starts in March. Teams hit the track for the first time in February for pre-season testing, which means a lot of design decisions have to be made by January.”

The HPE team’s expertise and close collaboration with the Alfa Romeo Sauber F1® Team also ensured the new system was implemented on time during the January period. “The HPE Pointnext team gave us advice that saved us time,” remarks Del Citto. “When we asked if we should use configuration A or configuration B, they had the experience to tell us which option was best for us.”

### An eye on the future

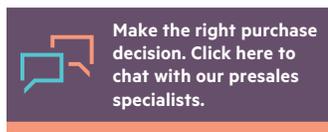
With day-to-day operations of the cluster managed by HPE Pointnext, the Alfa Romeo Sauber F1® Team does not need to use its resources to update, maintain and monitor the system. The HPE Datacenter Care team is fully responsible for both the hardware and the software to ensure it is running 24/7.

“Having an HPE solution allows us to do more throughput than before and more accurate computations within the same Formula 1® limitations. We hope this will help us outrace our competitors. And if we need to scale up our computational capacity further, we can do it quickly and easily without any disruption,” concludes Del Citto.

## Our solution partners



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