



Driving the future of the automotive industry

How high-performance computing accelerated productivity and performance at Aston Martin Lagonda



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Introduction

Aston Martin Lagonda is a globally recognised leader in automotive technology and a brand synonymous with innovation and manufacturing excellence.

This whitepaper will explore why Aston Martin Lagonda wanted to harness the power of a new high-performance computing (HPC) platform working with a virtual desktop infrastructure (VDI) solution to accelerate the design process and improve the user experience for CAD and CAE users. Aston Martin Lagonda chose to work with ebb3, a specialist in accelerated computing, to deliver an environment that met its needs.

With a wealth of experience in the automotive industry, ebb3 was the ideal team to work closely with Aston Martin Lagonda to design, build and manage a solution that would drive tomorrow for one of the world's best-loved brands. As one of the world's leading accelerated computing specialists, ebb3's solutions are at the forefront of innovation, redefining the concept of the digital workspace and helping to unleash the productivity and performance of any workload.

The project enabled improvements in design to manufacture speeds, facilitated a more efficient collaborative design process, and supported the employment of the best global design talent. As a result, the platform gave Aston Martin Lagonda a competitive design advantage and unlocked the power and potential of its workforce.

HPC allows companies to analyse data and conduct complex calculations at rapid speeds by aggregating the power of individual computers into a cluster. While the average computer can execute billions of calculations per second, an HPC solution can execute quadrillions of calculations per second. Empowering users to free their imagination and unleash their productivity.

“The new HPC environment delivered by ebb3 is meeting all of our requirements and is enabling the CAE teams to lead and innovate the design of our ultra-luxury models, supporting a 30% increase in workflow efficiency.”

Lea Renaux, HPC solution lead at Aston Martin Lagonda.





Commonly used by scientists, engineers, and researchers, HPC will be required more frequently in everyday life as new technologies emerge. For example, the metaverse, Internet of Things (IoT), artificial intelligence (AI), and 3D imaging create large data sets that are too big for a traditional computer to handle. Companies need fast, highly dependable IT infrastructure to process, store, and analyse vast volumes of data to benefit. In addition, any solution must be scalable to ensure it is future-proof.

VDI creates and manages virtual desktop environments and applications from a central server. The GPU-accelerated VDI is a virtual environment whose core elements enable remote access to multiple graphic- and data-intensive workloads with physical workstation-like performance. This provides access to the HPC platform, enabling data-intensive workloads to be executed by computer-aided engineering (CAE) users.

Key elements in any solution are user mobility, ease of access, flexibility, and increased security, which is where VDI comes into its own. It enables users to remotely access data and applications from any device - anywhere and anytime. In addition, VDI deployments can run multiple applications and operating systems on a single physical server within a data centre through virtualisation.

VDI enables employees to access core computing resources remotely and with multiple user types. In addition, hardware requirements are reduced by consolidating VDI infrastructure on host servers and improving security by storing and managing data centrally in the data centre.

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Driving productivity and performance

Teamwork and innovation are at the heart of Aston Martin Lagonda, and it is these two qualities that have underpinned the successful design and roll-out of a cutting-edge integrated HPC environment and GPU-accelerated VDI service with ebb3.

Pushing the boundaries of what's possible is vital for a brand that has led innovation for over a hundred years. Its globally dispersed team of over 3,000 talented people need to work together seamlessly and securely on everything from car design to answering key engineering questions.

The organisation needed an infrastructure that was fit for purpose now and in the future. One that would enhance productivity, deliver a better user experience to a geographically remote workforce, and give the company an edge over competitors.

Seamless access is vital to the engineering teams in powertrain, aerodynamics, and body structures who use the HPC environment to perform engineering analysis and simulation of CAD models using CAE tools and applications. The role of CAE within Aston Martin Lagonda is a critical part of the iterative design process that brings design concepts to reality.

The existing HPC environment had grown organically and was comprised of three distinct clusters to support the powertrain, aerodynamics, and body structure teams. To better support innovation and collaboration, Aston Martin Lagonda wanted to update the technology used by their current environment and move away from multiple separate clusters to a common HPC environment utilising the latest computer processor, storage, and interconnect technology.

To manage the project, they approached ebb3, a trusted team that had already successfully completed an upgrade on their GPU-accelerated VDI environment and managed it with the Aston Martin Lagonda IT team.

CAE is the use of computer software to simulate performance and is used to validate and improve product designs or assist in resolving engineering problems. A typical CAE process comprises pre-processing, solving, and post-processing steps.

During the pre-processing phase, engineers model the geometry (or representation) and the physical properties of the design from CAD models, as well as the environment in the form of applied loads or constraints. Next, the model is solved using an appropriate mathematical formulation of the underlying physics. The results of the solve are then presented to the engineer for review, which may result in further design changes to the CAD models. This iterative design process is carried out multiple times before manufacturing any physical components.

At Aston Martin Lagonda, the CAE pre-processing and post-processing phases are typically carried out using dedicated workstations and network storage, with the HPC environment conducting the solve phase. With the existing HPC and dedicated network storage solution, the overall user experience was impacted for certain workloads that required a faster storage solution because of the I/O generated.

The VDI service primarily supports access to CAD tools and applications that are part of a wider PLM environment and is used by employees, external contractors, and suppliers.

Lea Renaux, HPC solution lead, Aston Martin Lagonda, said:

“Last year, we decided to invest in a new HPC and CAE storage infrastructure as it was no longer fit for purpose. We were looking for a solution that would improve the user experience drastically by providing a highly available, scalable and reliable system as well as burst capacity and proactive support.”

a 100GbE connection providing a vastly improved experience for data-intensive users and faster access to core apps, supporting a consistent user experience and allowing teams to process more jobs in less time.

ebb3 worked with Aston Martin Lagonda to build a solution that delivered a scalable, high-availability HPC platform and a fast reliable NVMe network storage solution that connected to a GPU-accelerated VDI solution, providing significant benefits.

ebb3 designed the service to support the CAD/PLM environment and other resource-intensive applications that are typically confined to physical workstation computers and often used outside of the CAD/PLM team. Built on a hyperconverged virtualised architecture using NVIDIA data centre GPU accelerators and NVIDIA vGPU software, ebb3 designed the VDI service to meet the current application requirements with the flexibility to adapt and scale to meet their future application requirements.

Typically, solve runs are managed within the HPC. Preparing, pre-processing and post-processing are conducted on a workstation connected to a network storage/drive with a standard network connection using SMB protocol of up to 1GbE. This made scale up a challenge as workstations and the datacentre are geographically in different places.

The new integrated HPC environment and VDI solution would benefit from

The ebb3 approach

Technology helps businesses unlock their potential in an ever more connected world. It's the reason that ebb3 specialises in bringing the power, performance, security, and productivity of physical workstations to virtual remote working through GPU-accelerated computing.

The opportunities are limitless when new technologies such as high-performance computing, the metaverse and AI are deployed to help people work together wherever and whenever they wish.

The Aston Martin Lagonda project began with an initial conversation to do a health check on the existing VDI infrastructure, designed and supported by ebb3. The VDI service supported access to vital CAD tools and applications that are part of the wider PLM environment. However, this remit grew when Aston Martin Lagonda identified the need to move to an integrated HPC cluster and a high-performance storage environment.

To deliver a significantly improved user experience, ebb3 delivered an updated common HPC cluster integrated with the Aston Martin Lagonda GPU accelerated VDI environment through a high-speed Ethernet network.

The updated HPC environment uses the latest server hardware technology interconnected using the latest InfiniBand HDR technology. In addition, a high-performance software-defined tiered storage environment provides a common environment for both working and archived data. Furthermore, it can scale up and scale-out by adding additional nodes. The tiered storage environment not only connects to the HPC cluster using InfiniBand HDR technology but also connects to a high-performance ethernet network shared with the Aston Martin Lagonda VDI environment.

The Aston Martin VDI environment would support virtual desktops running CAE tools and applications alongside the existing CAD tools and applications. HPC jobs would now be prepared from virtual desktops with high-speed access to the HPC storage environment. The approach would significantly reduce the time taken to prepare, process and view the results of all HPC jobs and improve the overall user experience.

"Thanks to our successful work with ebb3, we are now able to provide class-leading support as well as new cutting edge technologies to the CAE Engineering teams in Powertrain, Aerodynamics and Body structures departments."

Lea Renaux, HPC solution lead at Aston Martin Lagonda.

Bringing compute acceleration to the data centre widens the reach of virtualisation to every user, from designers to engineers, and creates a great user experience that rivals physical PCs. Additionally, VDI provides a common access technology to virtual, physical and cloud workstations, enabling better access to applications.

Chris Brassington, CEO of ebb3

“We founded ebb3 to provide the world’s leading companies with accelerated computing solutions and best-in-class service, to help them realise their vision for the future. Our work with Aston Martin Lagonda is a great example of this approach and shows what is achievable when you unlock next-level performance.”

Using NVIDIA GPUs, vGPU software and AMD EPYC CPU architecture, the programme enhances the productivity and security of remote workloads from VDI and rendering to virtual reality and artificial intelligence in a single end-to-end managed service solution.

The powerful platform enables users to connect to their virtual desktop from any location or device, allowing them to access all of their files and programmes while working remotely from anywhere in the world.

A whole market and technology-agnostic view were taken when designing the platform to ensure the most appropriate solution was deployed. As a result, a high-performance solution was delivered that can adapt quickly to changing business requirements and new technologies.

It is supported twenty-four hours, seven days a week, all year round to ensure operational excellence. It also ensures the platform is constantly reviewed and can be updated with the latest applications to remain aligned to Aston Martin Lagonda’s requirements today and for the future.

Delivering Results

Integrating the updated HPC environment with the GPU-accelerated VDI environment improved speed and efficiency and enabled the powertrain, aerodynamics, and body structures teams to work remotely and collaborate within a secure environment.

The upgraded HPC environment, high-performance storage solution and GPU accelerated VDI environment share a common high-speed ethernet network within the Aston Martin Lagonda data centre.

Thanks to the NVme technology, speed interconnection between the HPC and the high-performance storage system was unleashed to an impressive 100GbE compared to a previous 10GbE when using NFS mounts. This will potentially provide a 10x speed gain within the VDI environment, depending on the workloads.

While a single storage environment removed silos to create greater flexibility and efficiency in the system. Upgrades can now be applied faster and more efficiently to minimise the impact on users and the IT team.

End-device hardware needs are significantly reduced as processing is done on the server. Users can access their virtual desktops from older devices, thin clients, and even tablets, minimising the need for IT to invest in new, costly hardware.

The VDI service is used by internal teams, external contractors, and suppliers. In the past, Aston Martin Lagonda would supply an NVIDIA RTX GPU accelerated workstation to external contractors to allow secure access to their CAD/PLM environment. However, they can now access the CAD/PLM environment through the VDI service.

Usability is essential to the success of the VDI services, and it was important to retain a flexible approach to application customisation and application deployment. Virtual Desktops are cloned on-demand from a common image. Additional levels of customisation at both a user and a system-level are then applied along with any additional applications that may be required for the Virtual Desktop. Each Virtual Desktop is customised to meet an individual's requirements whilst maintaining the ability to prevent certain actions from being performed to enhance security further. As virtual desktops are only run as needed, resources can be better utilised, and the energy requirements of the data centre are reduced.

The VDI service can be accessed from an Aston Martin Lagonda site or when working remotely. While employees continue to use workstation computers for workflows, using the CAD/PLM environment from a standard corporate laptop provides added flexibility when an employee is working from a different site, from meeting rooms, or at home.

The greater flexibility of the platform will allow Aston Martin Lagonda to explore the benefits of cloud computing. Hyperconnectivity will enable devices, data and systems to talk constantly, enabling the use of digital twins, which allow the digital simulation of production facilities.

“ebb3 has been instrumental in our digital transformation journey to renew and better our HPC and CAE storage services.”

Lea Renaux, HPC solution lead at Aston Martin Lagonda

Ready for tomorrow

The robust nature of the platform means new users can be added to the VDI with relative ease, which means a wider pool of staff can feel the benefits.

“We are looking forward to continuing our work with ebb3 to shape innovation and pursue excellence in our engineering challenges.”

Lea Renaux, HPC solution lead at Aston Martin Lagonda.

With the growth in hybrid, electric, autonomous, and fully connected vehicles, the role of HPC within an automotive manufacturer is changing. The development of Advanced Driver-Assistance Systems (ADAS) relies heavily on simulation to test rare situations that are unlikely to happen predictably in the real world. As vehicles become more connected, real-world data can then be fed into these simulations, effectively creating a digital twin to further improve fidelity, making ADAS technologies safer and more reliable.



Aston Martin Lagonda - a century of innovation

The Aston Martin Lagonda brand combines luxurious craftsmanship and sophisticated design with high-octane emotion and intense driving pleasure. It has hand-built some of the world's most iconic and desirable cars for more than a century.

Today it employs over 3,000 people who use the latest technology to design the next generation of vehicles, from the world's most powerful luxury SUV to hypercars. Aston Martin Lagonda's cars are sold in 55 countries around the world.

Gaydon is home to the company's purpose-built headquarters and a state-of-the-art sports car production facility, with its SUV products hand built in St Athan, Wales.

The company is developing alternatives to the internal combustion engine. Its first plug-in hybrid, the mid-engine supercar Valhalla, will commence deliveries in early 2024. By 2026, all-new Aston Martin Lagonda product lines will have an electrified powertrain option, with a target for its core portfolio to be fully electrified by 2030.

Aston Martin Lagonda is making a continued investment in the future of British advanced engineering and developing the high-performance cars of the future. It continues to recruit engineers, including specialists in electrified powertrain and other areas such as vehicle calibration, software, and electrical systems.

More growth is planned as part of a new drive to attract the best talent to develop Aston Martin's next generation of sports cars and future electric vehicles.



Tomorrow's technology specialist

ebb3 was founded on the belief that the right technology, supported by the best people, can empower companies to go faster and further than ever before.


We are one of the world's leading accelerated computing specialists. We design, build and manage accelerated computing platforms for businesses with complex data-heavy workloads. The technologies we deploy are not only for today but technologies that future-proof IT infrastructure for the technology of tomorrow that is untapped in the mass market. Together we help customers realise the potential of artificial intelligence and the metaverse.

The workforce of tomorrow is global in location and outlook. Our aim is to give people the tools they need to create and work effectively wherever they are and whenever they want. And accelerated computing is proven to unlock the potential of any team.

A passion for what's next drives our team to seek the best of what the industry offers today and tomorrow. Our experts are specialists in designing, building and managing accelerated virtual platforms.

It's an approach that has built a strong relationships with car manufacturers, universities, construction companies, architects and Formula One teams.

Our team has a wealth of experience that spans automotive and motorsport, government and education, retail and logistics, construction and manufacturing, media, research and healthcare, architecture and engineering. Indeed, whatever your industry, we are here to help you embrace digital transformation.

A long-exposure photograph of a road at night, showing light trails from cars. The trails are primarily red and orange, with some white and blue trails. The road curves to the right, and the light trails follow the curve. The background is dark, and the overall scene is dynamic and energetic.

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