

Automakers Turn to the Cloud to Cost-Effectively Meet High-Performance-Compute Requirements



Cloud offerings are benefiting companies

across many vertical industries, and automotive manufacturing is a prime example. Automakers increasingly find that the cloud is more flexible and less expensive than on-premises compute solutions and a particularly great fit for the digital design solutions that pervade the industry.

Automakers need to invest in designing brand-new vehicles and manufacturing processes to address new environmental constraints and leverage the opportunities of new EV markets. They use cloud solutions for a range of use cases, from computational fluid dynamics, digital twins, crash simulations, and autonomous vehicle operation to electric vehicle operations and mobility services for end consumers. But digital product design is perhaps the most demanding in terms of compute power, as simulation programs to create and refine designs continually become more sophisticated.

In terms of meeting that demand, the cloud is proving to be more flexible and less expensive than on-premises compute solutions. What's more, a move to the cloud can mean a massive reduction in carbon footprint for on-prem data centers, with CO₂ reductions reaching more than 80% for large companies.

Automakers are finding that the cloud is a good fit for their more advanced simulation tools, which require high-performance computing (HPC) and modern cloud capabilities. Oracle Cloud Infrastructure (OCI), in particular, is built to handle high-performance requirements. Oracle is the only hyperscale provider to offer bare metal services; high-performance storage; and a high-speed, flat, fast network with low-latency remote direct memory access (RDMA) over converged Ethernet (ROCE) to support traditional HPC workloads as well as large-scale graphics-processing-unit (GPU)-based artificial intelligence workloads for customers on five continents.

**ORACLE CLOUD
INFRASTRUCTURE
DELIVERS IMPROVED
PERFORMANCE AND
UP TO 50% LOWER
TCO FOR AUTO
DESIGN ENGINEERING
TEAMS.**

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OCI is highly flexible, enabling automakers to scale up or down as requirements dictate. And it delivers significant cost savings: A 50% reduction in total cost of ownership compared with on-premises infrastructure over five years is not uncommon with OCI.

Digital design drives HPC requirements

The need for powerful, flexible cloud infrastructure has never been greater among automakers. For more than 30 years, automakers have used simulation techniques to create digital models that enable them to perform aerodynamic tests, fluid simulations, and crash testing.

Today the use of digital technologies is only increasing. More than three-quarters (76%) of the respondents to a [Deloitte poll of manufacturing executives](#) said they intend to increase their investments in digital initiatives and plan to pilot and implement more Industry 4.0 technologies.

In the auto industry, digital design tools are becoming increasingly sophisticated. Digital twin technology, for example, enables automakers to create in software sophisticated models that duplicate automotive components and systems. An automaker can make a digital twin of an entire car, for example, and then test its performance under various drive train permutations.

In the same fashion, automakers can test any component, including software and electrical systems, validating their performance and uncovering issues — before ever building the actual parts.

Similarly, automakers use powerful computational fluid dynamics (CFD) programs to test vehicle aerodynamic effects, cooling and climate control systems, and combustion and exhaust system performance.

Auto manufacturers also use multiphysics analysis, which involves assessing how multiple factors affect one another in concert. It may include combinations of fluid forces, thermal effects, structural integrity, electromagnetics, acoustics, and more.



DIGITAL TWIN TECHNOLOGY ENABLES AUTOMAKERS TO CREATE IN SOFTWARE SOPHISTICATED MODELS THAT DUPLICATE AUTOMOTIVE COMPONENTS AND SYSTEMS.

All these advanced digital design programs require significant compute power, driving the need for HPC. But they are required to safely deliver the latest auto technologies, including advanced driver assistance systems (ADASs) and autonomous vehicles.

On-prem compute struggles to meet demand

The hunger for power that digital design presents is not a good match with on-premises fixed-capacity computing infrastructure.

First, many on-prem data centers have virtually no space for further expansion, which would require significant investments in real estate and construction, beyond just adding blades in the existing facility. Indeed, the demand for HPC is so high in automotive R&D centers that there is a long queue to use the existing capacity.

On-premises infrastructure also lacks the flexibility to scale to meet requirements both locally and globally. Long lead times to provision new infrastructure can mean missed market opportunities. At the other end of the spectrum, on-prem systems follow a long road map to obsolescence a time when fast innovation is required.

Private data centers also carry an environmental burden. Their heavy use of electricity adds to a company's carbon footprint, and responsibly recycling outdated equipment can get expensive.

Finally, with on-premises infrastructure, it's far more difficult to deliver on modern technologies such as worldwide massive scalability, immediate deployment of applications, blockchain, and autonomous security. But such capabilities are readily available in the cloud.

The case for HPC in the cloud

The cloud addresses each of these concerns.

It is ready-made to provide access to highly scalable HPC compute capacity. Automakers can scale up or down as requirements demand — no more stranded or underutilized capacity.

Manufacturers also have access to GPU systems if needed, along with compute and storage environments that are highly optimized for the task at hand. It's all built on the latest, most updated hardware, further improving performance. Job queues disappear as engineers can readily access whatever capacity they need, whenever they need it.

The cloud is also more cost-effective, for several reasons. First, it reduces capital spending on on-premises infrastructure and software. It also eliminates costly and time-consuming hardware refresh cycles and reduces capacity planning requirements.

Additionally, the cloud offers a flexible pay-per-use cost model, so you pay only for the capacity you consume.

Finally, cloud providers shoulder much of the responsibility for securing their infrastructure. They also generally have the resources, in terms of both tools and in-house expertise, to provide more effective security than most enterprises can on their own.

Oracle Cloud Infrastructure: a cut above

With its OCI, Oracle delivers on all these cloud benefits — and more.

OCI's next-gen performance capabilities match or exceed on-premises human/computer interaction (HCI) clusters. OCI is the first cloud platform to implement off-box network virtualization, which takes network and input/output (I/O) virtualization off the server platform and puts it in the network. As a result, customers run apps on bare metal, for the fastest performance in the cloud.



ORACLE OFFERS A CLOUD-BASED DATA SCIENCE SOLUTION THAT COMES WITH PREDEFINED TEMPLATES AND MACHINE LEARNING MODELS READY FOR CUSTOMERS TO LOAD IN THEIR OWN DATA.

Oracle also delivers the best price/performance in the cloud, with virtually infinite scale-up and scale-down capabilities. It offers predictable high performance, backed by service-level agreements (SLAs) covering the performance, availability, and manageability of services.

Oracle is also the only hyperscale cloud provider to run a flat, fast network employing ROCE. ROCE enables the convergence of compute, networking, and storage into a single fabric, lowering CPU overhead and increasing data center application performance.

OCI customers can choose from an array of Oracle cloud-based enabling services, including Internet of Things; AI service — predictive failure and vision detection; blockchain; integration; and analytics. Oracle also offers a cloud-based data science solution that comes with predefined templates and machine learning models ready for customers to load in their own data.

OCI also supports a mature and diverse independent-software-vendor (ISV) application ecosystem, including access to third-party cloud-based CFD and structural simulation applications. For companies with a multicloud strategy, Oracle supports native integration with other cloud providers.

Altair Taps Oracle Cloud Infrastructure to Host High-Performance Simulation App

Altair is all about integrating high-performance computing with engineering, product development, and artificial intelligence. Its flagship Altair HyperWorks solution helps customers in the automotive, aerospace, and other industries conduct graphics-based simulations to dramatically speed product design and manufacturing.

Altair began to explore cloud-based infrastructure to give its customers access to highly scalable compute and storage capacity. It also needed a cloud partner that could support Altair applications designed for use with high-speed graphics processors.

Additionally, the COVID-19 pandemic has increased the number of software engineers working remotely, using VMware-based development and test environments. Altair's IT organization wanted to reduce its dependence on aging data centers by adopting an elastic VMware solution in the cloud.

To meet all of its cloud needs, Altair turned to **Oracle Cloud Infrastructure** for its best-in-class bare metal (not virtualized) high-performance cloud compute cycles, high-speed cloud networking, and I/O-optimized cloud storage. Altair also saw Oracle's experience with graphics processing units (GPUs) engineering and application development as a distinct advantage.

In addition, **Oracle Cloud VMware Solution** provided a native VMware environment that enabled IT staff to continue using the same tools for management tasks such as backup and recovery.

Oracle offers 20% better price/performance

"We looked for the best price/performance, security, and VMware integrations. We found that in Oracle Cloud Infrastructure," says Sam Mahalingam, chief technical officer for Enterprise Solutions at Altair.

Oracle Cloud's bare metal and low-latency RDMA networking services deliver up to 20% better price/performance for Altair's computational fluid dynamics (CFD) and structural mechanics solvers, compared to other cloud providers, Mahalingam says. Running on Oracle Cloud, HyperWorks can provide complex vehicle simulation results in less than 12 hours, for example.

Altair is also dramatically reducing its deployment times. Once a purchase decision is made, it often takes eight to 12 weeks to get a new on-premises HPC environment built, installed, and available to users. That process takes less than an hour on Oracle Cloud Infrastructure with the Altair Unlimited virtual appliance. For VMware, **Oracle's solution** enabled Altair to reduce training costs and get started in days instead of weeks.

Mahalingam was also impressed with the security features of OCI, which he calls "fantastic."

"OCI's security-first architectural approach helped Altair reduce our apprehension about security in the cloud," he says. "In the design, OCI separates the management from the end user layer, which means there is no intermixing of privileges in the same instance. We now have freed up our organization to focus on and expedite innovation."

<https://www.oracle.com/customers/altair/>

Of course, Oracle delivers fast provisioning as well as high availability, with near-zero downtime. Additionally, the Oracle Cloud Security First Approach offers protection for automakers' intellectual property and digital assets, from core to edge.

Innovate at cloud speed

It's clear that the cloud provides the kind of computing environment that automakers need. Their compute requirements are constantly increasing, and on-premises infrastructure is proving to be too expensive and inflexible in terms of meeting the demands of the latest auto design applications.

On top of that, with on-premises infrastructure, it's difficult to consistently take advantage of the latest technological innovations. And the hit to an automaker's carbon footprint is significant.

OCI offers a solution with cost-effective, flexible, secure, on-demand HPC capacity.

Although there's no question that automakers have some demanding requirements, Oracle stands ready to meet them. To learn more, visit <https://www.oracle.com/cloud/>.