# TRANSFORMING INDUSTRIAL AND AUTOMOTIVE MANUFACTURING

## Divergent Uses TotalCAE Managed HPC for Their Manufacturing Process

Produced by TCI Media Custom Publishing in conjunction with:

HPCwire

TotalCAE | DIVERGENT

# Executive Summary

The future of manufacturing is data driven using new digital processes and advanced technologies such as additive manufacturing solutions based on 3D printing. Divergent Technologies developed a digital production system that can revolutionize automotive and industrial scale manufacturing. Divergent CEO Kevin Zinger also founded Czinger Vehicles to change the auto manufacturing process. Divergent uses new manufacturing solutions to make vehicle manufacturing more efficient, less costly and decrease manufacturing waste by replacing existing design and production processes.

Divergent created the Divergent Adaptive Production System (DAPS™) software and hardware solution using a modular digital factory approach for complex structures. DAPS transforms auto manufacturing economics and environmental impact with a data-driven approach for designing and building vehicle structures. DAPS uses digital requirements to computationally engineer, additively manufacture (3D print), and assemble any complex structure. Divergent's manufacturing system can move seamlessly between manufacturing different vehicle models. Divergent has over 500 patents in additive manufacturing and 3D printing. The Divergent team includes more than 180 engineers and scientists across four technology divisions: structures, software (high performance computing, graphic design and AI), additive manufacturing (hardware, software and materials) and automation (software, optics and robotics).

## Introducing the Czinger Vehicles 21C Hypercar

The Czinger Vehicles 21C hypercar was designed and built using Divergent's ground-breaking technology. The Czinger 21C hypercar V8 is designed to use a range of fuels including carbon recycled methanol and other e-fuels to run as a zero-emissions vehicle. The Czinger Vehicles 21C hypercar is fast and is breaking track speed records at Circuit of the Americas (COTA) and Laguna Seca tracks.

**Czinger Vehicles 21C hypercar**

## General Atomics Aeronautical Systems, Inc. (GA-ASI) Partnering with Divergent

Divergent is working on other manufacturing solutions using DAPS. General Atomics Aeronautical Systems, Inc. (GA-ASI) is a leading manufacturer of Unmanned Aircraft Systems (UAS), radars, electro-optic and related mission

systems. GA-ASI is partnering with Divergent using the DAPS solution to support its additive manufacturing applications development efforts and implement a full digital manufacturing process for GA-ASI's Unmanned Aircraft Systems (UAS).

## Divergent High Performance Computing (HPC) Challenges

Divergent Technologies initially used on-premises workstations to run HPC simulations such as computational fluid dynamics (CFD) and finite element analysis (FEA), but workstations could not achieve fast enough turn-around time and they needed to reduce time waiting on simulations so they could run higher fidelity models faster. The Divergent IT team handled typical IT functions but wanted a domain expert to handle the HPC and computer-aided engineering (CAE) application integration challenges. HPC clusters can boost simulation performance but can be complex and difficult to manage. Divergent determined they needed help managing the HPC solution and that simulations jobs were taking too long on the PC, and a new approach was needed. Divergent contacted software vendors asking them to help manage the HPC solutions. Vendors indicated they did not provide HPC management services but recommended TotalCAE as a company that could provide a complete HPC and cloud management solution.

## Introducing TotalCAE

TotalCAE provides managed HPC clusters and cloud solutions making HPC available everywhere. TotalCAE HPC service includes HPC systems administration, CAE application management, and an easy-to-use software stack to submit jobs to HPC in just a few clicks. HPC service includes both bring your own public cloud, turn-key HPC clusters.

### How TotalCAE Meets Divergent Technologies Needs

Divergent uses TotalCAE hybrid solutions including on-premises TotalCAE Managed HPC Clusters for their day-to-day workloads, and TotalCAE on Azure for overflow work. Divergent's implementation of the TotalCAE Managed HPC Clusters solution uses the TotalCAE Platform installed on their HPC cluster appliance installed on-premises in Divergent's


TotalCAE Appliance

datacenter. TotalCAE Infinite HPC cluster and TotalCAE on Azure are tuned for Divergent's application mix, both running on the TotalCAE Platform to make a single workflow for on-prem and cloud.

TotalCAE manages the appliance and Divergent engineering applications to help the engineering team be more productive and relieves the IT team's burden of managing the HPC system and CAE application integration. The TotalCAE Platform includes solutions to track job submission, usage analytics, data management, engineering application license management and reporting, and cloud. Divergent runs simulations on the TotalCAE platform for crash safety, FEA, structure optimization, stress testing, weight and noise reduction simulations.

## TotalCAE Managed HPC Cluster on-premises Simulation as a Service Benefits

### Easy access to HPC in three steps

Divergent engineers don't want to spend time setting up, submitting and monitoring jobs on HPC—they just want to do engineering tasks. TotalCAE submits jobs in a few seconds, automatically monitors the job, and emails the user when the job is ready to post process. TotalCAE makes it simple to solve their models on HPC with just a few clicks. Users can utilize HPC as simply as they do on their workstation. The TotalCAE solution helps Divergent engineers meet deadlines and keep working on time.

## TotalCAE Support

TotalCAE clusters and cloud are proactively managed with TotalCAE tools monitoring hundreds of potential issues to automatically fix issues. TotalCAE provides one hour help desk support via web, phone, or email. TotalCAE handles all issues from the time the user submits a job until they get the results back. Divergent users can also obtain information at a time that is convenient for them using TotalCAE Knowledge Base Self-Help and TotalCAE University videos.

## TotalCAE Cloud Benefits

Divergent needed the capability to burst to the cloud when required. TotalCAE on Azure is fully managed by TotalCAE in Divergent's cloud subscription. Divergent staff don't need to worry about how to maintain, manage, and update their HPC cloud.

TotalCAE set up the cloud capability for Divergent in their account within days. The TotalCAE Public Cloud solution uses the identical workflow as the on-premises solution and the same easy three step job process. There is no usage tax for cloud use, Divergent pays the direct cloud costs to the cloud vendor. The TotalCAE solution also contains integrated billing and cost controls so Divergent can manage cloud spending and see job level spending on cloud.

## Divergent Nominated for the 2023 HPCwire Award for Best Use of HPC in Industry

Divergent was a nomination finalist using TotalCAE HPC cluster and cloud solutions to accelerate their product design.

Divergent 3D, through use of TotalCAE hybrid HPC environment results enabled Divergent DAPS to achieve 70% lighter weight vehicles than traditional automotive vehicles using industry-first 3D design, print, assemble, drive vehicles. Innovations have enabled Czinger Vehicle's new 3D-printed Czinger 21C hypercar to come in at only 2,760 pounds.

# Summary

Divergent Technologies has revolutionized automotive and industrial scale manufacturing with their data-driven approach for designing and building vehicle structures and DAPS software and hardware solutions. Divergent Technologies initially used on-premises workstations but needed faster simulation times and CAE management to allow engineering and IT to work on important project work. Divergent turned to TotalCAE to manage their HPC and CAE solutions and provide cloud burst capabilities.

***"TotalCAE makes it easy for Divergent to adopt the latest HPC solutions and CAE application versions to benefit our engineers, freeing up my team to focus on other IT missions. TotalCAE has been a great partner in keeping our CAE team happy and working productively," states John Lucas, Divergent's Director of IT.***