Process Automation

TotalSim simulation data management app speeds results

In the auto racing world, if you blink, you fall behind.

With decades spent in racecar engineering and design, nobody knows that better than the TotalSim US team, which relies on the high performance computing (HPC) resources at the Ohio Supercomputer Center (OSC) to produce invaluable computational fluid dynamics (CFD) data for the auto racing teams and other industrial companies they partner with.

The resulting problem has been the tidal wave of data and how to present the information, which has been becoming an unwieldy and time-consuming headache. So, TotalSim innovated.

Technical Director Naethan Eagles and President Ray Leto dreamed up TS Results—a simulation data management app that efficiently processes and collates CFD simulation data and allows TotalSim to share the results quickly in a standardized format.

"We're using about 2,000 cores a day at OSC, 300 days a year," Leto said. "That's a ton of data. You can get buried in it! While you're trying to come up with an answer, you may miss your deadline or an opportunity to do more work."

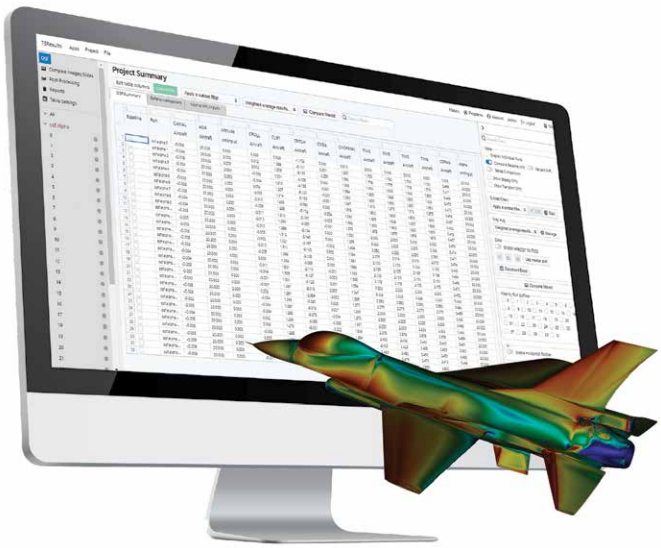
In the auto racing world, where winning and losing literally hinges on hundredths of a second, there's no room for missed deadlines or hesitation. The same mindset can be applied across various industries where rapid design cycles are becoming the norm.

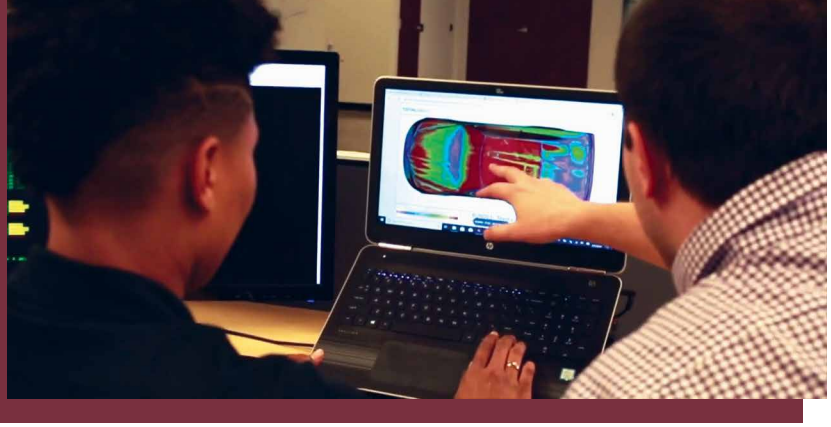
While the data TotalSim was producing was incredibly insightful, the problem came in post-processing. Although TotalSim had pioneered an automated CFD process including creation of images and movies, the team was still manually gathering results, creating charts and graphs, and writing reports and PowerPoint presentations, before sending it off to a customer.

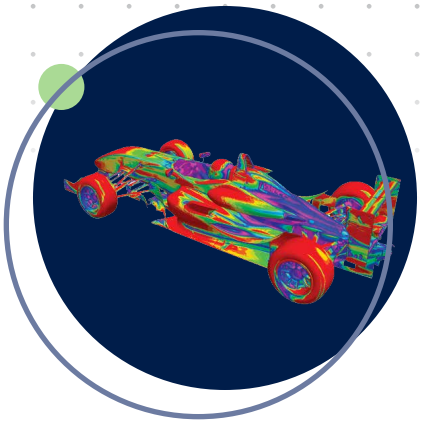
As a result, the TotalSim team began looking for a way to more fully automate the process. They found a solution in OSC's AweSim program. AweSim's app eco-structure was designed to give industrial partners an end-to-end workflow that included post processing of HPC results. TotalSim, a founding partner of AweSim, extended their contribution to the post processing and collaboration piece to create the TS Results web app.

"We just made it a standalone app," Leto said. "Out of the AweSim program, TS Results really started to take off. Now it's moved into something we use internally on a daily basis, and we keep adding outside customers."

Images, movies and data; it's all collected and published into the TS Results web app that is part of OSC's OnDemand platform—an open-source web portal that provides advanced web and graphical interfaces for HPC centers. TotalSim's clients can see results as soon as a simulation is done. It allows for more collaboration and ultimately, better decision-making.







While the bulk of TotalSim's HPC usage is in the world of auto racing and automotive design using TotalSim's automated OpenFOAM CFD process, the team also uses TS Results for clients who leverage other CFD software (like STAR CCM+ or FUN3D). It is part of TotalSim's many CFD Web Apps: TS Auto for automotive and motorsports; TS Aero, for aviation simulations; TS Truck, for semi-truck aerodynamic simulations; and other customized apps in various industry verticals.

Leto said TotalSim also has developed TS Results into a commercially viable product for engineers either doing CFD simulations on their own internal clusters or at any HPC center. TotalSim recently received a Phase I, federal Small Business Innovation Research (SBIR) program award to demonstrate how TS Results could be adapted for use by Air Force researchers to increase their productivity.

The real payoff is time. Leto said his team spends up to two-thirds less time on post-processing because of the app and that one of his main clients said it has doubled their efficiency by allowing them more time to do analysis.

The app is continuing to evolve. TotalSim added math functions and more plotting and reporting routines to the 2.0 version, and the group has its sights set on doing much more.

"Now that we've set up these platforms, the next layer on top is more analytics, maybe applying optimization and machine learning to the design processes to get better insight by using different analysis techniques while getting even more efficient," Leto said. •

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>
> — *Ray Leto, President of Totalsim*

PROJECT LEAD // Ray Leto, President, TotalSim
RESEARCH TITLE // TotalSim's TS Results delivers
FUNDING SOURCE // TotalSim, Department of Defense
WEBSITE // totalsim.us/tsresults

PHOTOS // TotalSim US produces computational fluid dynamics data for auto racing teams and other companies. Though Ray Leto's firm had automated the process, it still included some manual tasks until they leveraged OSC's AweSim app eco-structure to create the TS Results web app.