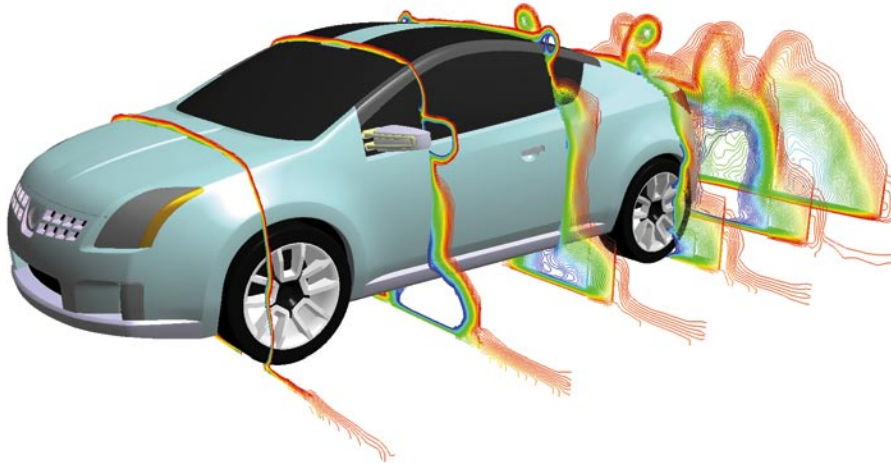


Exa PowerFLOW On Demand powered by IBM



External aerodynamic PowerFLOW simulation result for a Nissan Azeal concept car
This visualization demonstrates multiple contour plane slices colored by velocity magnitude.
Image courtesy of Stewart Reed Design and Nissan Motor Co.

Highlights

- **Obtain engineering analysis results in significantly less time to speed decision making**
- **Respond faster to market demands supported by data, not just opinions**
- **Solve larger and more complex engineering analysis problems cost-effectively by delivering ten analyses in one day or ten days—at the same cost**
- **Perform more design iterations in less time to improve quality and time-to-market**
- **Perform compute-intensive analyses that were once financially or technically prohibitive**
- **Achieve faster turnaround times at affordable cost compared to in-house fixed capacity systems**
- **Reduce long-term fixed cost commitments and IT management while satisfying peak workloads**

As a ground transportation manufacturer or supplier, you know the road from engineering design to production can be a lengthy one. And in a race where those who make it to market first, win—how you get there can determine your vehicle's long-term success in the marketplace.

Consumer demands require increasing numbers of product variants plus a shorter time to market. No longer limited to vehicle performance, the marketplace expects innovation.

So what does this mean to the automotive manufacturer? It has been proven that team collaboration, simulation and analysis early in the design process—beginning before the concept and styling stage—are key to achieving the best vehicles in the shortest timeframes. For example, vehicle manufacturers and their engineers have determined that a closed engine bay and static-tire CAD models simply are not sufficient for simulating true on-road conditions. Components such as wheel wells, sunroofs, underbody panels and rear spoilers must all be accounted for to achieve optimal accuracy of results. They are also finding that the ability to simultaneously consider—and analyze—multiple aspects at once like aeroacoustics, aerodynamics and thermal management are key for reducing overall vehicle launch time.

Rapid and non-negotiable time-to-market constraints have rendered traditional physical prototyping insufficient and costly. Missed opportunities can arise from delays in tedious prototype construction. Simply stated, without the ability to effectively support digital design optimization and accurately and quickly perform full vehicle analysis, you're left behind. But with the effective use of computational fluid dynamics (CFD) technologies—or digital design simulation—now available on demand, you can capture business opportunities that would typically be out of reach.

Exa PowerFLOW On Demand powered by IBM

Exa® PowerFLOW® On Demand powered by IBM ratchets the high performance aspect up a notch by providing automotive manufacturers with the engineering benefits of PowerFLOW—simulation software that offers a complete digital test facility for aerodynamic, thermo and acoustic testing—and on demand High Performance Computing (HPC). With the PowerFLOW On Demand integrated solution, you can solve the HPC deployment dilemma of supporting full vehicle programs without the financial, technical and management responsibilities of owning a supercomputer.

Exa PowerFLOW runs on robust and scalable IBM @server® Cluster 1350 technology in a highly secure compute facility hosted and managed by IBM. The Linux®-compute cluster solution is front-ended by an IBM @server pSeries®

discretization server that divides and parcels out the simulation work. With virtual, unlimited amounts of compute capacity available when needed, you can solve larger, more complex problems and perform more analysis iterations in less time, getting you to market faster.

With PowerFLOW On Demand, automotive manufacturers can accommodate large-scale peak workloads on short notice with unprecedented access to simulation speed and capacity. Run better quality simulations 24x7 (not just when engineers are working) with the ability to collect infinite amounts of data from aerodynamic and aeroacoustic to thermal tests while accessing thousands of CPU hours.

Exa PowerFLOW as a Digital Wind Tunnel

Based on Exa DIGITAL PHYSICS® technology, PowerFLOW provides a powerful virtual wind tunnel solution, making new capabilities in design engineering a reality. A proven and reliable technology, Exa PowerFLOW Digital Wind Tunnel™ (DWT) offers aerodynamic, thermal and aeroacoustic engineering design testing and analysis capabilities previously out of reach. Engineers can realistically view design ideas earlier while simulating, analyzing and validating wind tunnel or open-road track tests as they collaborate with multi-disciplined members of the design team.

Quickly respond to market needs

With the flexibility and capability to perform only a few or hundreds of runs, it's feasible to pursue all projects without making system tradeoffs. Push new, niche concept

IBM Deep Computing Capacity on Demand

IBM Deep Computing Capacity on Demand can address the needs of users like you who require powerful solutions to scale beyond your internal HPC limits. Whether you are a scientist, engineer, knowledge worker or other professional whose core business or research relies on HPC, IBM Deep Computing Capacity on Demand can help by providing variable capacity on a variable cost basis.

Many industries today present a computing conundrum: Unpredictable and variable workloads with peaks and valleys don't necessarily map to available compute capacity. Over-provision but underutilize your IT infrastructure and suffer low return on investment. Maintain a lean infrastructure and risk business paralysis from resources that are under-capacity. These factors, combined with the simple fact that you need to focus more on core business and research and less on running your IT department, are driving the need for a new model of HPC environment—one that is on demand.

vehicles into production quickly or, for example, develop a convertible/cabriolet version for the market faster than your competition. With a PowerFLOW On Demand solution, specialty vehicle designs that previously took years to produce can now be generated in a fraction of the time, letting you capitalize on demand and beat competitive models to the marketplace.

Refining the design and analysis process

The need for predictive power upstream in the design process makes fluid-flow analysis ideal for refining vehicles while reducing the number of costly prototypes. With its upfront analysis, PowerFLOW DWT simulation and optimization technologies help automotive companies respond to the dynamics of the market, reduce timely and expensive physical testing early in the design cycle, ultimately delivering highly competitive, better vehicles to market sooner.

On demand access for time-critical design optimization

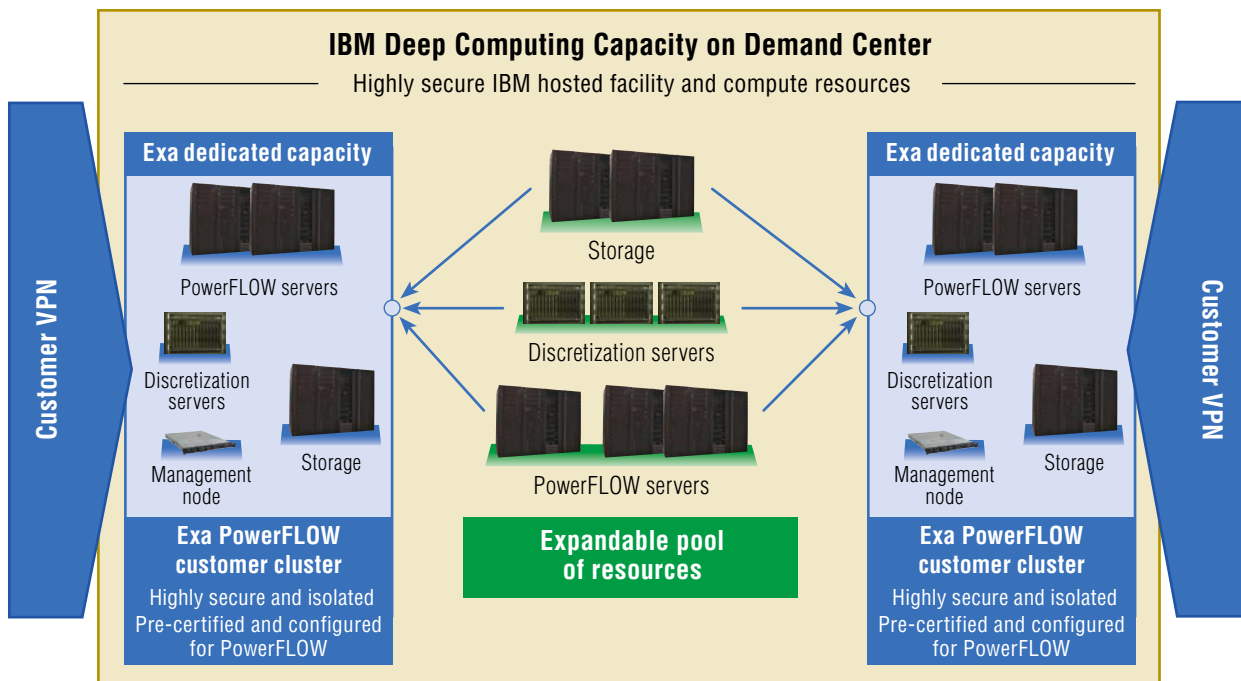
Finally, as design engineers alternate between vehicle design and engineering analysis, they use digital tools to analyze and accurately predict real-world, aerodynamic vehicle characteristics such as wind resistance and noise, comfortable

passenger temperature zones and engine cooling. Faster and less costly than physical prototypes, Digital Wind Tunnel technology has become an engineering requirement for manufacturers whose products require accurate and efficient fluid-flow modeling for time-critical design optimization.

With Exa's suite of products, users may accurately evaluate and iterate designs in ways not possible before. Exa products allow users to quickly modify CAD geometry, and mesh and queue multiple simulations in minutes, letting you generate and test additional designs quickly. With the Exa and IBM partnership, you can now overcome the deployment delays and inhibitors that might have limited the amount of simulation and iteration in the past. Clients can access thousands of CPUs at any time, returning results in a dramatically reduced timeframe.

Respond to business challenges with high performance computing

Performing concurrent levels of analysis, simulation and optimization has helped address some of automotive manufacturing's most complex and challenging business needs. But to deliver the scalable compute capacity and fast feedback required for upstream design optimization, these tools require a HPC infrastructure. If the HPC environment has not been designed to meet the needs of overlapping vehicle development programs, you're likely to find yourself in the same cycle of missed opportunities and launch dates, along with escalating costs due to last-minute changes.



Industry leaders working together

Ground transportation manufacturers can deploy Exa PowerFLOW On Demand solutions with confidence. Exa is an industry leader in digital design simulation software. IBM is the recognized leader in delivering supercomputing innovation and solutions with unmatched capability to provide a scalable, highly secure and resilient on demand operating environment.* With a history of leadership capability and experience in hosting clients' business-critical workloads, IBM also has extensive experience with PowerFLOW, participating with Exa in numerous client engagements worldwide.

Versatile solution for multiple industries

The DWT solution is just one example of how PowerFLOW On Demand powered by IBM can dramatically affect a product's design, development and lifecycle. Similar examples exist for other industries, including motorsports, heavy trucks, tier 1 suppliers, and naval, architectural and electronics cooling implementations.

For more information

Designed to offer clients a robust and variable HPC infrastructure without the cost and complexity of owning and managing it internally, the Exa PowerFLOW On Demand powered by IBM solution can help you conduct analysis, simulation and optimization using fluid flow to more efficiently and effectively compete in the marketplace. For more information about how the integrated offering can give you unprecedented access to simulation speed and capacity, please contact your IBM or Exa representative.

For more information about IBM Deep Computing Capacity on Demand, visit:

ibm.com/servers/deepcomputing/cod.html

For more information about Exa, PowerFLOW or other Exa products, visit:

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