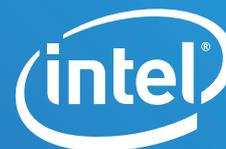


SOLUTION BRIEF

Manufacturing
High Performance Computing (HPC)



Simple, Powerful HPC Clusters Drive High-Speed Design Innovation

Overnight completion of complex engineering simulations can help design teams get better products to market on faster time lines.

“Dual-socket servers based on the Intel® Xeon® processor E5-2600 v4 product family offer amazing compute power for Altair HyperWorks® solvers, especially RADIOSS®. They are ideal for architecting efficient, scalable HPC clusters.”

— Eric Lequinou, HPC Director, Altair



Scientists and engineers across a wide range of disciplines are facing a common challenge. To be effective, they need to study more complex systems with more variables and greater resolution. Yet they also need timely results to keep their research and design efforts on track.

A key criterion for most of these groups is the ability to complete their simulations overnight, so they can be fully productive during the day. Altair and Intel help customers meet this requirement using Altair HyperWorks® running on high-performance computing (HPC) appliances based on the Intel® Xeon® processor E5-2600 v4 product family.

Up to 17x Faster Simulations¹ through Optimized Cluster Computing

An HPC cluster based on the latest Intel® Xeon® processors can make fast work of even the most complex simulations. For example, automotive design teams are exploring lighter-weight materials for next-generation designs, which raises a host of new manufacturing and safety challenges. To reduce risk, many companies are moving from models with 5 to 6 million elements to higher resolution models that have up to 10 million elements.² Since the finer meshes require smaller time steps to ensure simulation accuracy, these models can increase compute requirements by up to four times.

Taurus: full frontal impact at 50 kph

10M elements (2.5 mm mesh size)



Speeding Time-to-Results through Cluster Computing¹

Taurus Crash Simulation (10 ms, 10 million elements)

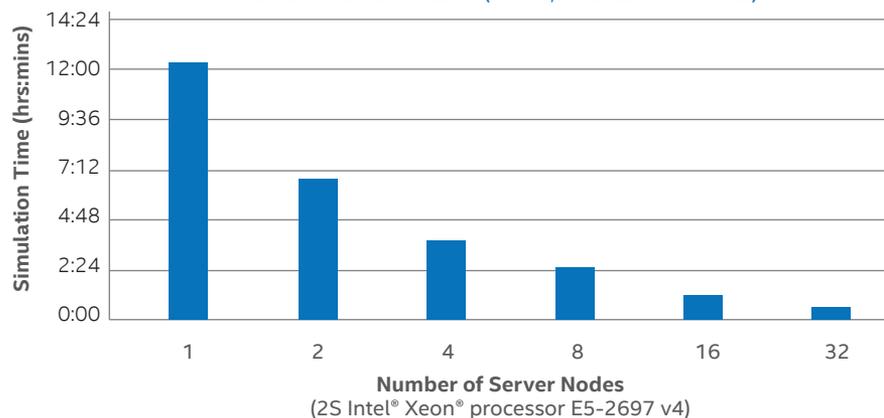


Figure 1. A 32-node server cluster based on the Intel® Xeon® processor E5-2697 v4 can improve simulation throughput by up to 17x versus a single server based on the same processor family.

Altair and Intel conducted a series of performance tests to verify overnight performance for a 10-million element crash simulation using the Altair RADIOSS* solver. Results showed that a 32-node cluster based on the Intel® Xeon® processor E5-2697 v4 was able to complete a 10 millisecond (ms) crash simulation in just 42 minutes, versus more than 12 hours on a single server.¹ Results also showed that a 120 ms crash could be simulated in as little as 10 hours and 44 minutes. With this simulation speed, a design team could potentially start a full 120 ms crash simulation running in the evening and have the results when they returned to work in the morning. No time would be lost.

Optimized Code for Speed and Efficiency

Altair and Intel work closely together to deliver optimized, high-performance cluster solutions. All Altair solvers—AcuSolve*, FEKO*, OptiStruct*, and RADIOSS—are optimized for high performance on Intel® architecture in both single-server and clustered environments. Altair developers consult with Intel engineers and use the Intel® Parallel Studio XE suite of tools extensively to help deliver the best possible performance to customers with every new Intel® processor generation.

A Complete, Production-Ready Design Environment

Altair offers simplified cluster solutions through its HyperWorks Unlimited Appliances. These production-ready systems provide a complete design and HPC environment that can be accessed through the cloud in minutes or deployed onsite in days. They are powered by Intel Xeon processors and can be configured with up to 32 server nodes, and potentially more,³ to deliver optimized performance for a wide range of workloads. Each appliance comes with full access to all Altair applications under a single license, so design teams have both the tools and the high performance they need to drive faster innovation, while delivering high-quality products on tight timelines.

Taurus Crash Simulation ¹ (10 million elements) (Intel® Xeon® processor E5-2697 v4)			
Server Nodes	NP	Run Time (hrs:min)	Performance Scaling
10 Millisecond Crash Simulation			
1	4	12:17	1.00
2	8	6:44	1.83
4	16	3:49	3.22
8	32	2:35	4.75
16	64	1:14	9.95
32	128	0:42	17.17
120 Millisecond Crash Simulation			
32	128	10:44	N/A

Learn More

- **Altair HyperWorks:**
www.altairhyperworks.com
- **Intel in HPC:**
<http://www.intel.com/content/www/us/en/high-performance-computing/server-reliability.html>



¹ Tests were performed by Intel on systems ranging in size from a single server to a 32-node cluster. Server configurations: Intel® Xeon® processor E5-2697 v4 @ 2.30 GHz / 9.6 GT/S, 145W, dual socket 18 cores, 36 threads, 9.6 GT/s dual Intel® QuickPath Interconnect links, Intel® Smart Cache 45 MB (cache: L1-1152KB, L2-4608KB, L3-46080KB), 128 GB total/node, 8x 16GB 2400 DDR4 DIMMs, Intel® SSD Data Center S3500 Series 800 GB, Intel® Omni-Path Architecture interconnect fabric.

² Source: Altair customer engagements with major automobile manufacturers.

³ Altair has validated configurations of up to 64 nodes for the HyperWorks* Unlimited Appliance with the Intel® Xeon® processor E5 v4 family. Tests of larger configurations are currently underway. Software and workloads used in performance tests may have been optimized for performance only on Intel® microprocessors. Performance tests, such as SYSmark* and MobileMark*, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products.

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