

# Sun, Voltaire, Fluent

## Setting New Standards for Performance on CAE Applications

### Features and Benefits

- Leading performance with x64 servers and blades
- Highest switching capacity: up to 11.5 Tbps
- Excellent price/performance of the complete solution
- Superior performance over Ethernet and Myrinet
- Latency as low as 1.3 microseconds
- 80+% network efficiency
- Comprehensive, easy to manage interfaces
- Seamless multi-protocol storage and network I/O integration

### Introduction

Computer Aided Engineering (CAE) is key to helping manufacturers bring products to market faster while maintaining a high-level of quality. The key to efficient CAE is finding a way to run tests and conduct analysis faster, preferably in parallel. Advances in software and server hardware have set the stage for horizontally scalable computing, but manufacturers now need to improve upon one last bottleneck: the low-latency interconnects between servers. To dramatically improve the speed of data across and within their server clusters, manufacturing firms are turning to Sun and Voltaire. The combination of the Sun Fire™ servers, Sun Blade™ server modules and Voltaire's Grid Backbone™ family of products help Fluent users maximize their productivity by allowing more jobs to be run in a shorter period of time.

### Solution Components

#### Sun



Sun's vision for High Performance Computing (HPC) is flexibility, whether in business models or computer architectures. The Sun Fire family of servers that is available with the AMD Opteron processors or the SPARC processors, is the fastest, most reliable, and energy efficient family of servers in the industry, allowing customers to solve their toughest computational challenges, from desktops to teraflops. High Performance Computing solutions from Sun allow companies to get products to market faster, simulate more processes or gain insight into complex scientific problems. When companies implement a HPC infrastructure and computing processes, they can save money in the product design process, gain higher utilization for their computing resources, and run simulations faster.

In the HPC and technical computing arena, Sun is known for its strength in partnering with the leading edge companies to deliver the products and solutions that are right for customer's computational needs regardless of the size of the problem. Sun works with you to deliver what you really need, like the Sun Grid Rack System program, that can assemble a ready-to-deploy, factory-integrated solution with Sun Fire servers, interconnect options and grid-ready software in a Sun rack.

One of the recent highlights of Sun's industry-leading capabilities and performance on numerically intensive applications, which are critical for designing better and safer products, include a selection of cost-effective high performance rack-mount and blade servers that feature AMD Opteron processors, fast internal memory and multiple internal disk drives. These servers, used as building blocks in the cluster linked with PCI-Express InfiniBand cards and interconnected via low-latency InfiniBand switch, provide the most formidable high performance and cost effective solutions for the MCAE industry.

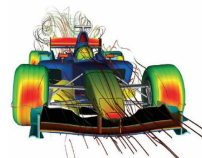
#### Voltaire



Voltaire is the worldwide leader in grid backbone solutions for networked computing in the next generation data center. Voltaire's integrated Grid Backbone Family of multiservice switching solutions and network virtualization software delivers the highest performance, intelligent backbone for grid computing architectures. Leveraging the InfiniBand standard, Voltaire solutions offer improved performance, utilization and scalability across compute clusters, storage and IP networks.

The Voltaire Grid Backbone Family of switches provides cost-effective building blocks for fully non-blocking topologies of thousands of nodes for scientific, automotive, seismic, financial, media, medical and other compute intensive applications.

#### Fluent



FLUENT CFD tools are used extensively in the Automotive, Aerospace, and Defense Industries to solve a diverse array of design challenges. Their strengths are their ease of use and versatility. With equal success they can be applied to compressible high speed flows and

low speed, natural convection flows.

Physical data models allow for the rigorous analysis of the complex phenomena that occur in environmental control systems, anti-icing systems, aerodynamics, rotor-airframe interactions, fuel sloshing, fire suppression, propulsion systems, combustion, and moving-body problems.

### Benchmarks

The FLUENT Version 6.2.16 benchmarking suite has a set of problems from nine industrial CFD applications that are selected to demonstrate the performance of FLUENT on a variety of hardware platforms. The problems are divided into three varying in size classes: Small, Medium and Large. Vendors benchmark their systems with the principal objective of providing comparative performance information for FLUENT software that, among other things, depends on compilers, optimization, interconnect, and the performance characteristics of the hardware.

The evidence presented below clearly demonstrates that the scalability, performance and reliability of the solution based on Voltaire's Grid Director 9096 InfiniBand switch and Sun's servers and blade modules, surpass those of Gigabit Ethernet and Myrinet-based solutions.

The results were obtained with Fluent version 6.2.16 running on 64-bit version of SuSE Linux ES 9 Operating System and used InfiniBand drivers v.3.5.5. All comparisons are based on the benchmark results published on the Fluent web site, as of 9/4/2006 : [http://www.fluent.com/software/fluent/fl5bench/flbench\\_6.2/fullres.htm](http://www.fluent.com/software/fluent/fl5bench/flbench_6.2/fullres.htm)

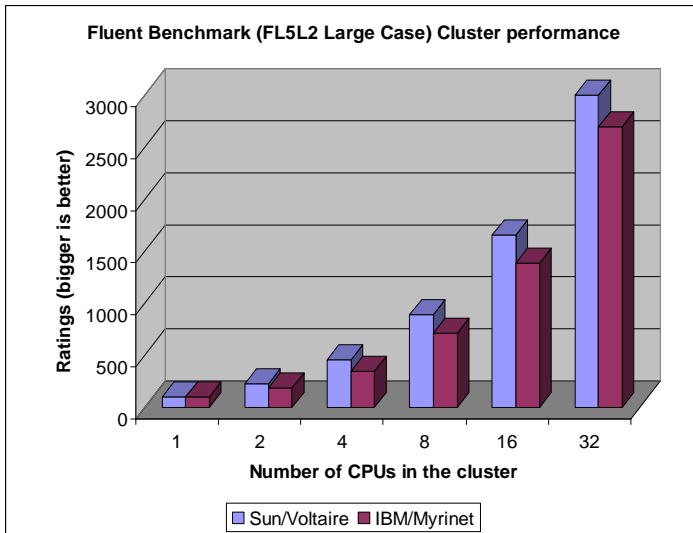
## Voltaire/Sun Scalability Advantage

The results demonstrated in **Figure 1** were obtained with a 32-core cluster based on four Sun Blade X8400 server modules, each equipped with four dual-core AMD Opteron CPUs and running 64-bit SuSE Linux (SLES9) OS.

When compared to other clusters listed on the Fluent web site that have the same number of cores, Sun's solution, interconnected using the Voltaire Grid Director ISR 9096 director-class InfiniBand switch, performs better than similarly configured solutions based on AMD Opteron processors and low latency interconnect. Specifically, the Sun Blade X8400-based cluster beats the IBM X336 Intel Xeon-based server cluster interconnected with Myrinet technology.

**Figure 1**

*Sun Blade X8400 32-core Cluster Performance*



The scalability efficiency of Sun/Voltaire offering that stayed around 90%, as demonstrated in **Table 1**, while the cluster grew in size up to the maximum of 32 cores.

**Table 1 - Sun Blade X8400 Server Module**

*4xAMD Opteron Model 885 CPU, 32 GB RAM, 64-bit SLES9 OS*

# of CPU	Large Class FL5L1	Large Class FL5L2	Large Class FL5L3	Scalability Efficiency
1	141.4	98.6	19.1	-
2	271.2	225.0	40.5	106.02%
4	520.2	453.5	74.0	96.86%
8	964.8	892.1	140.7	92.08%
16	1747.2	1658.3	303.4	99.28%
32	2805.2	3105.7	544.5	89.09%

## Voltaire InfiniBand Trumps Ethernet

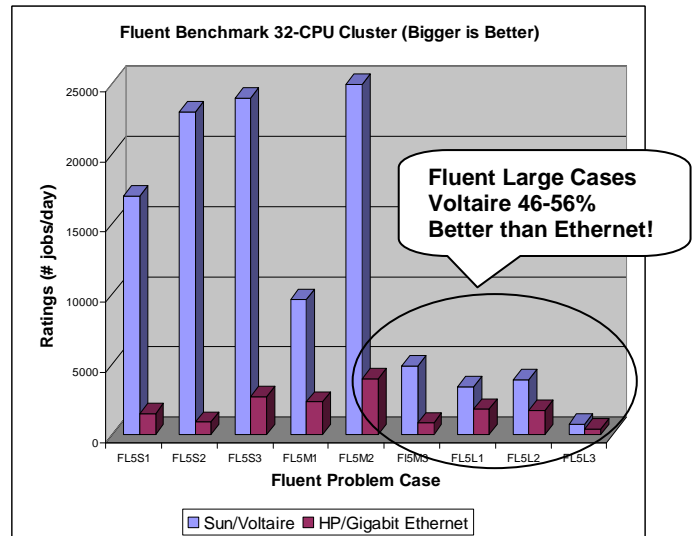
**Figure 2** illustrates the performance of two 32-CPU systems. One system is based on HP servers and an Ethernet switch, and the second system is based on Sun Fire X2100 servers with the Voltaire Grid Director 9096 InfiniBand switch. The Voltaire and Sun solution allows the user to run significantly more jobs in a given time than does

the HP's Gigabit Ethernet solution, thus benefiting the user by being able to run more jobs in less time.

Please note that the entries in **Figure 2** are benchmark ratings, a metric representing absolute performance. A higher rating means faster performance.

**Figure 2**

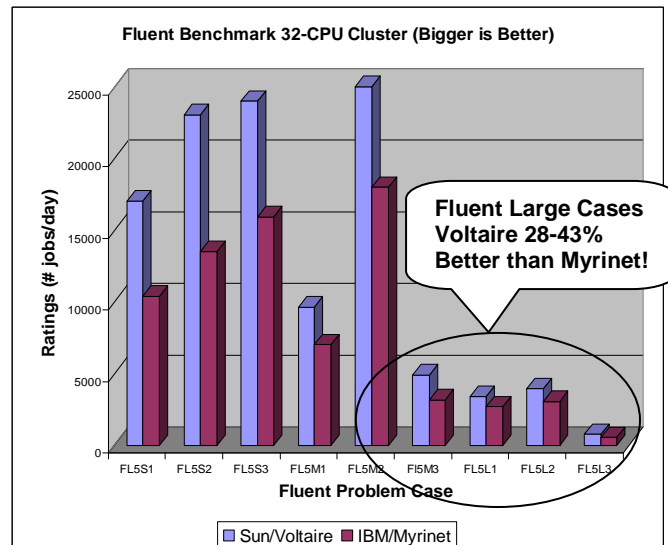
*SunFire X2100 32-CPU Cluster; 3.0 GHz Opteron 156 processor under SuSE SLES 9 SP 3*



## Voltaire InfiniBand Beats Myrinet

**Figure 3**

*SunFire X2100 32-CPU Cluster; 3.0 GHz Opteron 156 processor under SuSE SLES 9 SP 3*



**Figure 3** illustrates the performance of two 32-CPU systems. One system is based on IBM servers and a Myrinet switch, and the second system is based on Sun Fire X2100 servers with the Voltaire Grid Director 9096 InfiniBand switch. The Voltaire and Sun solution allows the user to run significantly more jobs in a given time than does the Myrinet and IBM solution, thus benefiting the user by being able to run more jobs in less time.