High-Performance Infrastructure Solution for Synopsys CATS™ Speeds Up EDA Design Cycles

4X Performance Improvement With Synopsys CATS™, Voltaire Grid Director™ Switches, DataDirect Networks S2A Storage Systems, and Cluster File System's Lustre®

Massive Design Files Need High Performance Infrastructure Solutions

Ongoing advances in chip design and manufacturing technologies present a constant challenge for CATS developers and support teams.

For Synopsys, ever-expanding file sizes require an ongoing investment in greater computing horsepower, which is highly scalable and optimized for I/O intensive data processing. Initially, the company built compute clusters using NFS-based storage systems on a Gigabit Ethernet interconnect, but it found that these technologies severely limited scalability and processing performance.

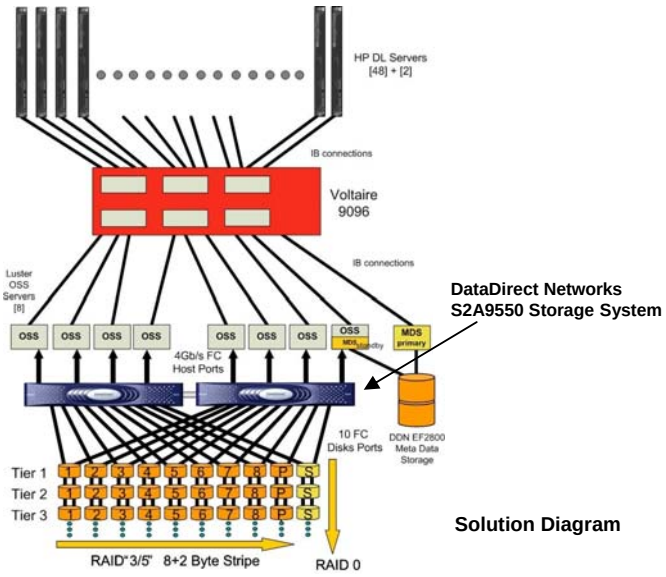
To solve this problem, Synopsys, Voltaire, Mellanox, DataDirect Networks and CFS have formed an alliance to architect and test a high performance compute (HPC) cluster running CATS aimed at providing CATS end users a baseline solution that delivers dramatic run time improvements. Based on an InfiniBand backbone, the new HPC CATS solution delivered over a 4x speedup compared to traditional Ethernet solutions. By speeding up the CATS data processing process, photomasks and semiconductor chips can be created in much less time, saving manufacturers time and money.

How the solution works

Synopsys CATS software prepares semiconductor design data for photomask manufacturing, fracturing chip designs into data that the mask write and inspection tools can understand. Chip designs are rapidly approaching Terabyte levels of data.

As these file sizes grow, a higher performance underlying infrastructure for CATS is required to complete jobs within the industry standard four to eight hour turnaround desired.

The new infrastructure solution delivers high performance file I/O using the Lustre® parallel file system from Cluster File Systems (CFS), DataDirect Networks' S2A (Silicon Storage Architecture) storage system and Voltaire Grid Director™ 10 Gigabits/second InfiniBand switches with Mellanox silicon and HCAs. Using the new solution, the CATS developers and support teams at Synopsys have realized significant run time improvements of over 4x, increased scalability, and dramatically reduced I/O latency.



Solution Diagram

This new solution for the Synopsys CATS team represents the cutting edge of high performance compute infrastructure optimized for mask data prep software processing. Jobs that had previously required 14-16 hours to process can now be completed in 5-6 hours.

Voltaire InfiniBand Scales

The solution described is tested and tuned to enable the best scalability and performance. When trying to use an NFS-based system with Gigabit Ethernet, at a certain point the file system does not scale. It works up to about thirty-two compute nodes, but then it slows down. With the Lustre® parallel file system from CFS, DataDirect Networks high performance storage and a Voltaire InfiniBand fabric, the application benefits from the aggregate performance of multiple file servers and can scale without performance degradation.

Synopsys CATS Overview

CATS™ is a highly scalable and flexible CAD software program that transcribes CAD design data into readable instructions for both e-beam and laser machines used for the pattern generation and manufacturing of semi-conductor, LCD, MEMS, Disk Drive Head and Photonics CATS has installations in virtually every photomask manu-facturing facility worldwide, and is the de facto standard for mask Manufacturing, inspection and direct-write-on-wafer data.

Voltaire Grid Director™ Solution Overview

InfiniBand is an industry standard high-performance interconnect for high performance computing (HPC) systems and enterprise applications. The combination of high bandwidth (> 10Gb/sec), low latency (<2 micro-seconds) and scalability makes InfiniBand the interconnect of choice to power many of the world's largest and fastest computing systems and enterprise data centers.

Voltaire's GridDirector switches are the industry's highest performing multi-service switches for medium-to-large and very large clusters and enterprise grids. Additionally, the Grid Director products connect seamlessly to GbE or Fibre Channel.

DataDirect Networks' S2A Overview

DataDirect Networks' high-performance S2A (Silicon Storage Architecture) storage system enables the fault-less performance of Synopsys CATS, which relies on an uninterrupted data stream of extremely large files for accurate mask-making. The S2A storage system improved Synopsys' process time performance by more than 150% and delivers hitless performance even if a drive or other failure occurs, reducing expensive chip re-spins.

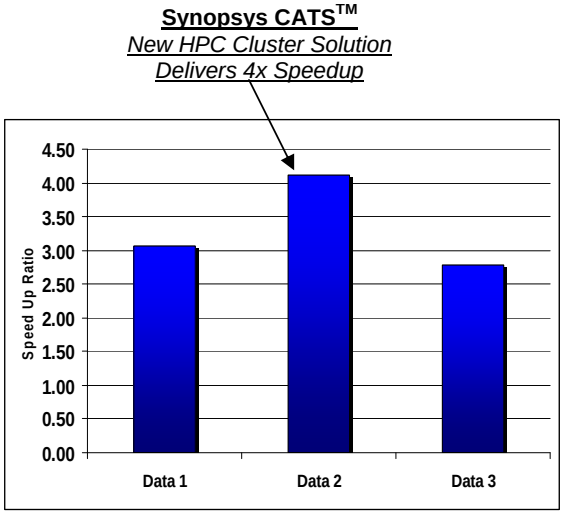
The DataDirect Networks S2A system delivers the perfor-mance, scalability, reliability, and world-class support required for CATS and related tools. In addition to tremendous performance, the S2A features superior reliability and the linear scaling required for the expected rise in CPU cycle demands as process technologies shrink and Synopsys' tools require more compute power.

Solution benefits include:

- 4x Performance Improvement of CATS over Ethernet
- Tuned, tested and proven optimal performance
- Reduce CATS jobs from 15-16hrs to 5-6 hrs
- Increased productivity
- Scalable to support future growth

Cluster File Systems Lustre® parallel file system Overview

Lustre technology redefines I/O performance and scalability standards for the world's largest and most complex computing environments. Ideally suited for data intensive applications requiring the highest possible I/O performance, Lustre is an object-based cluster file system that scales to tens of thousands of nodes and petabytes of storage with groundbreaking I/O and metadata throughput.



Graphic illustrates test run results on three data sets on two HPC clusters running CATS software, and 20 CPU parallel distributed processing. High end HPC system includes SFS+IB.

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