Success Story

Ford Motor Company

SGI at Ford Motor Company

Raising Throughput and Efficiency with New Storage and Compute Solutions

Challenge

Bring innovations in automotive design to market more quickly; enable engineers to increase productivity and efficiency

Solution

Implement SGI InfiniteStorage Shared Filesystem CXFS to eliminate productivity bottlenecks; give scientists simultaneous access to data in a heterogeneous environment; install SGI Altix servers

Results

Faster access to data; elimination of wait time for transfers, copies, and downloads; faster delivery of results; significant improvement in overall productivity

Teams of engineers are working diligently at Ford to make your next new-car experience safer and more satisfying. They progressively smooth out the bumps in the road, hush wind noise, and make hundreds of tweaks that increase comfort, control, and safety for drivers and passengers. The primary tools for many of these professionals are the HPC resources of the Numerically Intensive Computing Center in Dearborn, Michigan, known internally as the NIC.

Across the street from the NIC is the Ford Research and Innovation Center, where Ford scientists and engineers use the HPC resources of the Research Computer Systems Department to look further down the road. Their work is not model-specific. It is advanced and basic – combustion, structure, materials – and will impact vehicle design across Ford product lines in the years ahead.

Both these facilities, and a NIC-operated HPC facility in Merkenich, Germany, have made recent investments in SGI technology to keep Ford at the leading edge of automotive design.

A More Productive HPC Infrastructure for Ford Scientists

The 1200 engineers and scientists of the Ford Research and Innovation Center -- typically people with a Master's degree or doctorate -- access the processing and storage resources of the Research Computer Systems Department to run CAE applications, including CFD and FEA. Many of their 1200 PCs and 350 UNIX workstations are tied into instruments such as spectroscopes and electron microscopes.

The Department's varied compute resources are tied together by what staff members call "the most advanced and heterogeneous SAN at Ford." The Brocade-based SAN, installed and maintained by department support staff, links SGI, Engenio, and EMC storage, and STK high-speed tape drives, with

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SGI, IBM, HP, Sun, and Windows-based servers.

The Department's primary batch machine is Mondeo, a recently-installed SGI Altix 3700 server powered by 176 64-bit Intel Itanium2 processors and running Red Hat Linux. Mach3, an SGI Origin 3200 system, is also a batch server. Focus, a 16-processor Altix 350 system, gives users an interactive environment. Administrators wanted these machines, and other servers on the SAN, to have access to the same data without the wait time and the extra administration and storage costs of having to access or copy data over the network. The solution was SGI InfiniteStorage Shared Filesystem CXFS. Two small SGI Origin 350 systems manage the shared filesystem in a highly-available configuration that gives the two Altix servers and the Origin 3200 system instant no-copy data access.

The positive results of moving to the shared filesystem have convinced the Department to bring its 160-processor IBM Opteron cluster into the CXFS environment and to consider doing the same for its Sun servers. Users will access data transparently across all platforms. For Ford, the major immediate benefit of using CXFS was greater productivity. Speed and reliability are significantly better. The Department's Failsafe servers also provide Samba/NFS network services.

SGI DMF: Transparent Migration and Data Protection

The Department is a longtime user of SGI Data Migration Facility (DMF), which it utilizes for data lifecycle management. Based on age and other factors, data is moved automatically off high-speed disk storage to an STK tape silo. When a customer references data that has been migrated to tape, DMF's will retrieve it from tape to disk.

Because the tape system was continuously operating at near-capacity, Ford needed to add more nearline storage. Instead of adding tape drives, the Department used DMF to implement a second tier of disk storage between primary disk and tape. It doubled its capacity of fibre-based tape drives and used DMF to migrate data to disk rather than tape, reducing data transfer times. The increased disk capacity becomes a nearline storage buffer, and the data is ultimately migrated to tape.

The Department used DMF to set up a disaster recovery facility in a neighboring building that is served by the SAN. Administrators will use a tape silo at this remote site to backup data and assure recovery of the Laboratory's data in the event of disaster.

SGI Helps Ease A Major Migration

The scientists that use the SGI Altix systems are delighted with the improved performance of their applications. Compute times are dramatically reduced compared with earlier systems – an important benefit for users whose runs may take up to three weeks. Some users have purchased additional dedicated processors on the Altix systems so they can establish their own queues.

Behind the scenes, and virtually transparently, Department staff and SGI Professional Services engineers carried out a three-month migration project that changed the SAN, the server platforms, and the storage facilities.

SGI service engineers were instrumental in the integration project and in the migration between storage technologies, which began in January 2005. New servers were installed and older servers were decommissioned. The SAN was upgraded and rebuilt with Brocade technology. Multipathing and failover were tested exhaustively. SGI service engineers installed 6.1 terabytes of TP9300 FibreChannel RAID. Once the infrastructure was in place, and the new SGI servers were installed on the SAN, SGI service engineers used DMF to facilitate the migration of data, which was stored on tape, to the new disk arrays. As users accessed data, it was migrated from tape to disk. The entire migration was completed with very little downtime – a very smooth transition of a very complex environment.

Ford scientists now enjoy faster access to data, much faster return of results, and a new freedom to access data transparently across multiple platforms – major contributions to the productivity and success of the Laboratory's work.

SGI at the NIC: Compute Power for New-Model Design

The NIC is the computational heartbeat of the Ford Engineering Computing Center. Design engineers run a variety of third-party CAE applications on the NIC's compute platforms to fine-tune models that will soon be translated into production-line vehicles. The NIC's resources are very much in demand; its compute workload grows by about 50% every year.

The NIC recently augmented its compute power with a 256-processor SGI Altix 3700 server with a terabyte of memory. This system is the NIC's general-purpose workhorse; it provides a large shared-memory SMP environment and also runs jobs that require distributed processing. Although the NIC operates a variety of platforms including Beowulf clusters, the Altix server can be called on to run virtually any code and any job.

The NIC also supports the Ford HPC facility in Merkenich, Germany, where SGI Professional Services has installed a 128-processor Altix 3700 server with 512GB of memory for use by Ford Germany engineers.

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