Solutions Brochure

SGI® InfiniteStorage Solutions for Government and Defense

Accelerating Time-to-Decision with a Cost-effective, Consolidated Storage Infrastructure

Satellite image by Space Imaging

As governments around the world strive to anticipate and react to potential threats—both natural and man-made—they turn to SGI. Whether studying the effects of global warming, planning for natural disasters, developing weapons systems, or deploying armed forces, SGI helps world leaders better protect their citizens.

"The biggest thing about any data lifecycle management system is reliability, reliability, reliability. You don't want to lose any data. That's really what drove us to implement DMF."

– Alan Powers, High End Computing Lead at NAS

While the process of collecting, analyzing, and interpreting data is essentially the same, the amount of resulting data is exploding in scale and threatening to swamp existing systems and processes. In order to keep up, government organizations need technologies that minimize the time required to get from data collection to decision making.

SGI InfiniteStorage solutions play a critical role in enabling government and defense customers to collect, process, analyze, archive and exploit massive amounts of complex data, so that critical decisions can be made and communicated with greater speed and confidence.

SGI storage technologies serve the needs of these customers in five critical areas:

Research and Development

Government research and development brings the brightest minds to bear on the toughest problems. From great medical discoveries and powerful defensive systems to the invention of the Internet—governments have historically provided the resources to allow scientific researchers to excel.

The Aeronautical Systems Center (ASC) Major Shared Resource Center (MSRC) at Wright-Patterson Air Force Base, Ohio is a computational science facility supporting Department of Defense (DoD) research, development, and test and evaluation communities with high-performance computing and visualization resources. Recently, the ASC moved to a 4-gigabit storage infrastructure to reduce the complexity of data access and management and to meet growing performance needs. The new storage system includes a 130TB SGI® InfiniteStorage TP9700 (SGI TP9700) storage array, which combines a high-performance 4Gb/sec Fibre Channel architecture with increased host connectivity to deliver industry-leading bandwidth. The SGI® InfiniteStorage Shared File System CXFS™ gives ASC compute servers direct, high-speed, shared access

to the new storage. The expanded storage infrastructure will help the ASC better accommodate the storage needs of its 2,048-processor SGI, Altix, Supercomputer, which has been deployed for use in advanced weapons system design and simulation.

Product Development

To turn the results of basic research into products that can improve safety, health, and security, government organizations and defense contractors employ a similar Virtual Product Development (VPD) process that is driving success in the private sector. The use of digital technology in all phases of the product lifecycle can improve product performance and quality, increase operational efficiency, reduce costs, and reduce cycle time. Reliable storage systems, high-speed data delivery, and efficient data management are now on the critical path for success. The U.S. government now mandates simulation-based acquisition (SBA), which requires pilot-in-the-loop simulation of product behavior before the first prototype is created.

When Lockheed Martin needed to control costs for its Joint Strike Fighter (JSF) development project, it turned to SGI for the tools for VPD and SBA. The company focused on eight key high-payoff initiatives, which include a combination of process change, hardware and software. In some areas, Lockheed Martin achieved reductions in cycle time and cost savings in excess of 70 percent to 80 percent. Digital simulation was a key component in achieving these aggressive targets.

Intelligence

Government and military Intelligence organizations must process massive amounts of raw data from a wide variety of sources to extract actionable intelligence. Higher resolution satellites, multi-modal sensors, unmanned aerial vehicles and other input sources are driving an explosion in data available for Defense and Intelligence decision-makers. However, the challenge of rapidly processing, visualizing and sharing these assets as they move through the decision cycle is daunting.

One of the largest archives of digital imagery in the world, managed by the National Geospatial Intelligence Agency (NGA), is powered by SGI technology. NGA's National Information Library (NIL) stores five years of digital imagery and archives 25 million images requiring approximately 6,600TB of storage. The NGA libraries are part of an extensive network of systems used by the DoD and the intelligence community to share and exploit imagery, imagery intelligence and geospatial information. The NIL can ingest 5TB of data per day and handle 80,000 queries each day—responding in 15 to 20 seconds.

Homeland Security

In the post-9/11 world, homeland security has become a top priority worldwide. Increasing security involves a wide-variety of data- and compute-intensive tasks such as intelligence gathering, rapid identification of individuals, and a variety of other surveillance and tracking activities.

SGI Altix supercomputers and SGI InfiniteStorage solutions have been installed at the Air Marine Operations Center (AMOC) in Riverside, California to help the center better utilize its state-of-the-art radar surveillance center to secure the national airspace. The AMOC is linked to civilian and military radar sites, aerostats, airborne reconnaissance aircraft and other detection assets, which provide 24-hour, radar surveil-

lance over the United States and the Caribbean to identify, track, and support the interdiction and apprehension of criminals or terrorist attempting to enter U.S. airspace. Leveraging its SGI systems, the center's staff fuse intelligence information, public information and law enforcement information with radar data, allowing them to access detailed information on the movement, registration, and criminal histories of aircraft, vessels, vehicles, and individuals.

Command and Control

From ground stations charged with accelerating the production of visual assets, to command centers that must efficiently integrate multiple types of data, to training facilities striving to hone skills under realistic conditions, SGI provides the integrated infrastructure that accelerates decision cycles, delivering the right information to the right decision makers at the right time.

The U.S. Navy's Area Air Defense Commander (AADC) Capability program is a 21st-century battlespace management system that helps the military plan and coordinate joint theater air and missile defenses against ballistic and tactical missile attacks. The system uses SGI technology to provide an integrated picture of the battlespace so that a Joint Forces Commander can quickly gather data and develop an air defense plan that recommends tactical placement of air defense assets from land and sea.

Data Management Challenges and Requirements

Exploding Data Set Sizes

In all areas of government and defense, organizations are faced not only with huge quantities of stored data but tremendous increases in the rate of data acquisition and creation. Accommodating these trends requires scalable storage systems with the I/O capability necessary to support time-sensitive decision making processes.

Fusing Information from Multiple Sources

Many of the critical processes in government and defense rely on data from multiple sources to identify threats, uncover previously unrecognized relationships or enable better decision making in time-critical situations.

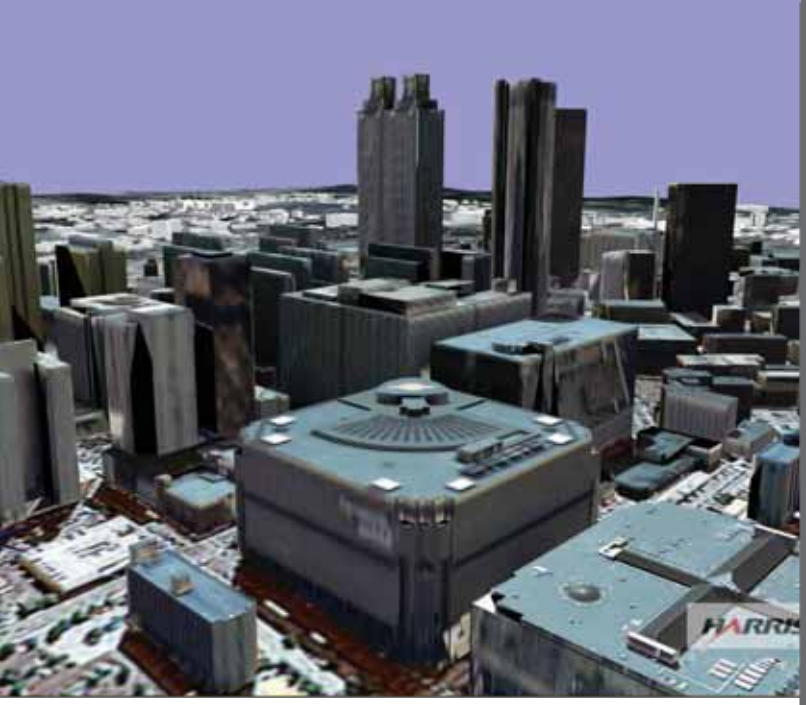
NASA Ames Research Center: Efficient, Cost-effective Storage for Massive Data

A countrywide user base of up to 800 scientists accesses the immense compute resources at the NASA Advanced Supercomputing (NAS) facility at NASA Ames Research Center. Among the many research projects that depend on this facility are critical studies of global warming and the impacts of rapid environmental change. NAS users create on average 11TB of data per day using the new 10,240 processor SGI Altix-based supercomputer developed as part of Project Columbia. As stored data has grown from 100 terabytes to over a petabyte, the NAS team has minimized cost and complexity using SGI's data lifecycle management solution: SGI® InfiniteStorage Data Migration Facility (DMF).

"In June 1999 we were writing about 80GB a day total using the previous hierarchical storage management (HSM) software running on two Convex systems," says Alan Powers, High End Computing Lead at NAS. "In January 2004 we had a single machine writing about a terabyte a day with a peak of four terabytes, and another machine writing 800GB. We keep 700-800TB of data nearline."

DMF not only delivers tremendous scalability, it has reduced management overhead. "We had the equivalent of four fulltime developers and four fulltime support people caring for the homegrown system, which was running with 100TB of storage," Powers continues. "Today, with DMF and about eight times the storage requirements, we only need the equivalent of one fulltime person, and we have faster access."

NAS selected DMF because of its flexibility, low maintenance requirements, and ease of integration. But there was one other critical factor. "The biggest thing about any data lifecycle management system is reliability, reliability, reliability," says Powers. "You don't want to lose any data. That's really what drove us to implement DMF."



For example, Geospatial databases combine information from a wide variety of discrete data sources such as maps, terrain data, satellite imagery, and video into unified databases. Users can access all information through a single interface to create multi-layered views that speed understanding and improve decision-making. Such systems must cost-effectively store and move huge quantities of data.

Improving Workflow

As the volumes of stored data increase, old ways of working begin to break down. Workflows that require data movement between steps are becoming impractical.

Accommodating Rapid Update Rates

Organizations involved in satellite data acquisition or other information gathering activities must collect and process an unprecedented amount of data. Moving and storing time-critical data presents a unique set of challenges. Many existing systems have reached or will soon reach their effective limits.

Securing Sensitive Information

Much of the stored government and defense information is highly sensitive. Protecting this data from unauthorized access without compromising critical decision making is an essential element of success.

Controlling Spiraling Costs

No matter how important the mission, storage cost remains a critical factor that can limit success. With data sets and data acquisition rates exploding, cost-effective storage systems that simplify data management without hampering data access are a necessity.

Harris Corporation: Improving Urban Security with Advanced Visualization

In the wake of the 9/11 terrorist attacks, security planners for high-profile events such as gatherings of world leaders and other activities are turning to advanced visualization technology to improve their preparedness. Florida-based Harris Corporation's Government Communications Systems Division (GCSD) is providing the tools to help.

According to Joe Nemethy, product manager for Harris RealSite™, "Harris has developed a technique that largely circumvents the traditional manual process of urban modeling. Using satellite imagery or aerial photography, we create geospatially accurate and highly realistic virtual cityscapes for our customers. Customers may either purchase an existing model from the growing RealSite library or contract with Harris to create a custom digital representation of the area of interest. In either case, the customer receives a finished product that they can begin using immediately."

Harris relies on SGI visualization systems and over 12TB of SGI disk storage to create and store its growing model library. Powerful SGI visualization hardware combined with Harris RealSite virtual urban cityscapes and InReality™ viewing software enable planners to view a highly accurate virtual representation of an urban environment in real time. Security planners can locate personnel and security monitoring equipment, choose routes for motorcades, and respond to myriad security-related events with greatly improved effectiveness using the latest information displayed as part of a highly accurate and realistic 3D representation of the urban environment.

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These critical challenges are driving a widespread need for storage systems with:

- Improved scalability
- Support for heterogeneous systems
- Wide area data sharing
- 24X7X365 availability
- Higher levels of data security

A Data-centric Storage Architecture with High-speed, Heterogeneous Shared Access

SGI has developed a unique data-centric storage architecture that addresses the challenges faced by government and defense organizations. SGI can help you centralize your critical data assets for improved storage utilization and security, while providing the scalability and performance to meet the needs of the most time-critical applications.

High-speed, Shared Access

A key element of the SGI solution is the SGI InfiniteStorage Shared File System CXFS. CXFS provides high speed, shared data access to eliminate the bottlenecks that hamper data-intensive operations. CXFS supports all commercial off-the-shelf (COTS) system platforms, so it works seamlessly in heterogeneous environments.

CXFS avoids the bottlenecks associated with manual copying and dramatically streamlines workflow. The ability to concurrently access data without copying delays significantly improves productivity. More work can be completed in the same amount of time—or the scale and complexity of simulations and other activities can be increased.

Unifying NAS and SAN

Traditional network-attached storage (NAS) and storage area network (SAN) storage systems do not easily interoperate. Most organizations maintain separate storage pools for each function. SGI brings NAS and SAN together with its data-centric architecture, unifying storage systems to enable efficient workflow, enhance collaboration, and improve data management. Applications can quickly migrate from NAS to SAN storage if bandwidth requirements change.

Intelligent Consolidation

SGI delivers optimal efficiency for storing, organizing, accessing and managing data. We tailor the storage architecture to reduce storage complexity, streamline management, increase performance, improve availability, and reduce TCO. By eliminating the bottlenecks that limit other storage solutions, SGI delivers unparalleled data performance that frees your organization to innovate and succeed.

Our unique data-centric approach enables data to be managed from a central, consolidated storage architecture ensuring:

- Better disk utilization
- Improved load balancing
- Zero data replication
- Reduced storage capacity requirements
- Reduced management costs

Intelligent Consolidation gives you the ability to scale independently in different dimensions over time including storage capacity, bandwidth, performance, connectivity, and supported operating systems—providing virtually unlimited growth paths to meet your storage needs now and in the future.

Wide Area Data Sharing

Until now, data sharing across significant geographical distances has been almost completely dependent on maintaining local copies of data. The result is duplication, added expense and increased complexity. Multiple copies of data results in inevitable problems with data integrity since changes in one copy of the data are not reflected in the others, and the level of security is reduced every time an additional copy is made.

A special version of CXFS for wide area networks (WANs) is available through SGI Professional Services. Wide Area CXFS utilizes networking technologies from either LightSand or YottaYotta to create a shared storage infrastructure that can span the globe to meet the needs of worldwide operations. SGI and YottaYotta have demonstrated a CXFS cluster reading and writing to a shared file across thousands of miles at hundreds of megabytes per second.

Data Lifecycle Management

Expanding mission requirements are inundating government and defense organizations with data. This data has to be retained on appropriate media to provide continuing access and to comply with regulations. Cost-effective management is a critical element for success. Institutions must control and manage their data throughout its entire usable lifetime—from creation, storage and protection to eventual archiving or deletion.

SGI data lifecycle management (DLM) solutions integrate seamlessly with the SGI data-centric storage architecture to take the guesswork out of data management by automatically and transparently moving data from primary disk to secondary disk, tape or other storage devices according to your criteria, ensuring that data is always stored on the most appropriate and cost-effective media. Data is recalled to primary storage immediately on first access without intervention.

DLM solutions from SGI virtualize your data assets, creating a scalable storage pool that is transparent to users and applications. This fully-automated, tiered approach to data storage adapts automatically to changing usage patterns to ensure data is always accessible and users are always productive.

Only SGI DLM offers the scalability to tackle the challenges of today's most data-intensive government and defense environments. SGI customers use DLM to manage hundreds of terabytes and even petabytes of storage at a fraction of the cost of disk-only solutions. Busy sites move more than 3TB of data per day between primary and secondary storage with no loss of user or administrator productivity.

Data Protection and Security

Critical information assets and applications must be secure, protected from equipment failures or user error, and available around the clock to meet the needs of critical security and intelligence operations. SGI offers a flexible array of options from simple offline tape solutions to 100 percent redundant environments.

SGI's modular Backup and Restore solutions combine record performance with a choice of best-of-breed products from leading vendors. In 2003, SGI passed the world record for backup and restore performance by 3X. Disaster recovery strategies ensure that a site-wide disaster won't disrupt ongoing operations or result in permanent loss of critical data. System uptime can be further maximized by protecting application availability against hardware or software failures.

SGI has the technology and expertise to help architect complete backup and disaster recovery solutions. You can select components according to your specific needs:

- Synchronous mirroring for real-time data replication to a secure remote location.
- Fail-over technology to enable applications and services to achieve a projected 100 percent system uptime at a fraction of the cost of specialized fault-tolerant systems.
- A range of disaster recovery solutions to reduce the impact of outages that impact an entire site.

Intel® Itanium® 2 Processors for Data-Intensive Applications

Data-intensive applications such as SGI InfiniteStorage Shared File System CXFS and SGI InfiniteStorage Data Migration Facility (DMF) benefit tremendously from the massive on-die resources and proven performance offered by the Intel® Itanium® 2 processor. Based on Explicitly Parallel Instruction Computing (EPIC), Intel Itanium architecture supports highly parallel processing, large memory addressability (up to 1,024TB), and innovative, compiler-based optimization that greatly improve performance for data-intensive operations. With up to 9MB of L3 cache, and 10.6GB/sec I/O bandwidth, the Intel Itanium 2 processor can readily cache the large volumes of metadata required to accelerate data management applications and move data on and off chip without bottlenecks. Because SGI technologies are frequently deployed in the most data-intensive environments in the world, SGI selected the Intel Itanium 2 processor to power all SGI InfiniteStorage SAN and NAS Solution Platforms.

SGI Helps You Succeed

Rapidly Deployed Solutions. SGI offers complete, integrated solutions that make it easy for you to realize the benefits of our data-centric storage architecture. Architecting a complete storage solution can be difficult and time-consuming. Mistakes can be painful and have lasting impacts throughout your organization. SGI InfiniteStorage solutions eliminate these difficulties with pre-configured, turnkey solutions for NAS, SAN and DLM deployment.

SGI Professional Services. For more complicated installations, SGI Professional Services provides a complete suite of services to cover every aspect of storage infrastructure deployment from initial design and planning to ongoing optimization and support. Experienced SGI consultants work on-site to implement intelligent consolidation, wide area data sharing, DLM and data protection strategies specifically tailored for your environment. SGI Professional Services is prepared to meet your unique challenges with:

- Over 10 years of direct government and defense experience
- Professionals on staff with US security clearance
- SGI secure facilities

Will your organization benefit from SGI's data-centric storage solutions? Ask yourself the following questions:

- Is data access becoming a bottleneck?
- Is your current storage infrastructure able to accommodate the volumes of data created?
- Would a partial or complete loss of data impact your operations?
- Would you like to ensure that data is automatically migrated to the most cost-effective storage?
- Are your storage costs out of control?

If you've answered "yes" to any of these questions, SGI InfiniteStorage solutions can help.

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