ISILON® SYSTEMS

How breakthroughs begin.™

Solution Brief

Clustered Computing Solutions

Challenge

Enterprise data centers have evolved from the era of "big iron" proprietary mainframes to standards-based symmetrical multiprocessing (SMP) clustered servers running Linux® or Windows®. The reason? Companies of all sizes learned long ago that applying clustered computing with industry-standard hardware as opposed to large mainframes with proprietary operating systems could result in better performance at a fraction of the cost.

These powerful compute engines can be used to solve problems in various industries and verticals, from predicting the effects of global warming to completing the rendering on the latest blockbuster film. While clustering has brought about a paradigm shift in the data center from a computational perspective, a similar evolution was lacking for the storage solutions that feed the insatiable data appetite of these systems. As a result, the new challenge for clustered computing is how to get high levels of concurrent throughput—plus predictable scaling and performance—from the storage solution that feeds data to these systems.

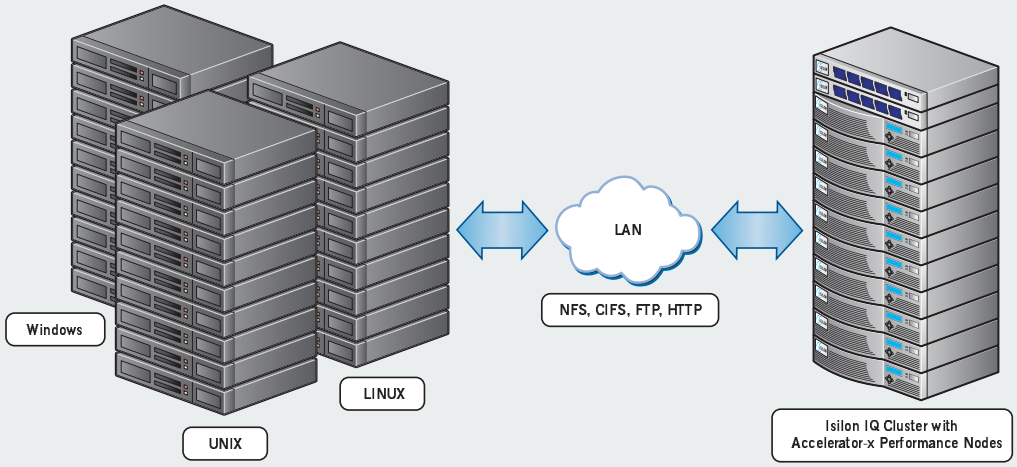
Solution

By utilizing industry-standard hardware with Isilon's award-winning OneFS® operating system, Isilon IQ® clustered storage enables customers to achieve incredibly high levels of throughput and massive scalability, all within an easy to manage, truly global namespace.

Each Isilon IQ storage node delivers more CPU, memory, bandwidth and capacity, thus enabling linear scaling of capacity and performance in the cluster. Similar to a compute cluster, the addition of more CPU power with each new storage node enables customers to find and manage their data faster than ever before.

If the compute cluster features a large number of commonly used files or datasets, Isilon's SmartCache technology can dramatically improve the performance of the cluster. Each storage node contains 4 GB of system memory that joins to the other nodes and contributes to a large global coherent cache which can keep the highly trafficked data in that cache, as opposed to having it sent to disk. The result is improved cluster performance.

Through the use of Isilon IQ Accelerator-x performance externsion nodes, Isilon's clustered architecture also enables the independent scaling of performance to maximize the total throughput out of a cluster, minimizing costs. If a company requires more compute resources and throughput, but are satisfied with storage capacity, they can add an Isilon IQ Accelerator-x to the cluster. This unique node provides CPU, memory and client connectivity without adding additional storage capacity. With Isilon, customers can more economically satisfy their storage and performance requirements on a pay-as-you-grow fashion that can be tailored to meet their specific needs.



Clustered Computing Solutions

Key Benefits

Massive Scalability—up to 2.3 PB in a Single File System

Isilon IQ supports up to 96 nodes or up to 2.3 petabytes in a single cluster, all within an easy to manage single global namespace. Customers can add new nodes to their existing cluster in as little as 60 seconds—a new installation will be up and running in minutes versus days common with traditional storage architectures. Isilon enables companies to buy what they need today, with the knowledge that they can safely add to the cluster in the future as storage and performance needs evolve.

Industry Leading Concurrent Performance

Supporting a large and growing number of compute nodes in a predictable, linear fashion is critical to efficient data center planning and management. With Isilon's unique clustered storage architecture, each additional node provides predictable, linear read and write performance with up to 20 GB/second of sustained throughput.

Should storage capacity be sufficient, Isilon's IQ Accelerator-x provides CPU and memory without additional disks, improving throughput. Isilon IQ Accelerator-x platform extension nodes enable single stream performance of up to 400 MB/second, concurrent performance of up to 700 MB/second and delivery of over 26,000 transaction I/Ops. This unique ability to independently scale performance through Isilon IQ Accelerator-x enables a lower price point for adding throughput on demand.

Better Bandwidth Allocation

IT managers often struggle with the competing demands on their storage infrastructure. How do they ensure that high priority jobs get the resources that they need while simultaneously conducting day to day business operations? Isilon's SmartConnect™ application allows efficient management of the cluster for optimal performance. With a SmartConnect performance zone, high priority jobs can be allocated the majority of the storage cluster's compute and networking cycles, while other tasks of lower importance share the remaining cluster resources.

NFS failover ensures that in the unlikely event of a node failure, the current job is redirected to another node to complete the operation without negatively impacting the overall operation. This efficient allocation of bandwidth is even more important in a clustered environment with a large number of clients all vying for precious resources.

Seamless Integration With Linux, UNIX and Windows Clusters

Isilon storage solutions support all major standards and protocols including CIFS, NFS, HTTP and FTP, and can easily communicate with Windows, Linux and UNIX platforms without the addition of client side drivers. Isilon also adheres to industry standards throughout the solution stack, allowing companies to backup and restore their Isilon cluster using the Network Data Management Protocol (NDMP), actively monitor the cluster activity using SNMP, and authenticate file access using LDAP, ADS and NIS.

Industry Leading Manageability

In addition to SmartConnect, Isilon offers a complete set of management tools and applications that allow companies to protect, migrate and replicate data in addition to efficiently managing the cluster for optimal performance and availability. For example, Isilon's SnapshotIQ™ is the industry's most flexible snapshot solution, permitting an unlimited number of snapshots on the cluster and up to 1,024 per directory—all without pre-allocating storage space.

Isilon SyncIQ™ provides disaster recovery, disk-to-disk backup or other synchronization capabilities for Isilon clustered storage through a policy driven, easy to use GUI. SmartQuotas™ delivers quotas and thin provisioning for the clustered storage environment. These applications—combined with the ease of operation of Isilon OneFS®—makes Isilon clustered storage one of the easiest to manage storage solutions on the market.

High Availability

The uninterrupted flow of data is critical for large compute clusters. Isilon's FlexProtect-AP provides industry-leading protection to ensure reliable access to data, even in the event of up to four simultaneous failures. This level of protection coupled with SmartConnect's NFS failover capability means that if a node should fail, the operation is redirected to another node—keeping data highly available.

Isilon Clustered Storage

- Reduces storage costs
- Increases IT operating leverage
- Speeds workflows
- Unlocks new revenues
- Complementary

Related Products

Isilon IQ Platform Nodes

The Isilon IQ 1920, 3000, 6000, 9000 and 12000 platform node systems use standard Gigabit Ethernet for front-end connections and offer the option of Gigabit Ethernet or high-performance, low-latency InfiniBand® for intracluster communication at no additional charge.

Operating System—OneFS

OneFS®, now in its fifth generation, is Isilon's operating system software that provides the intelligence behind all Isilon clustered storage systems. It combines the three layers of traditional storage architectures—file system, volume manager and RAID—into one unified software layer, creating a single intelligent file system that spans all nodes within a cluster.

IQ Accelerator-x

The Isilon IQ Accelerator-x extension node was designed to enable Isilon clustered storage customers with high-performance requirements meet their specific workflow needs by modularly and cost-effectively scaling throughput. Powered by Isilon's OneFS operating system software, Accelerator-x nodes can be seamlessly added to any Isilon IQ 1920, 3000, 6000, 9000 or 12000 storage cluster using InfiniBand networking to independently scale aggregate throughput up to 20 GB/second.

SmartConnect™

SmartConnect, a licensable software module of Isilon's OneFS operating system software, greatly simplifies client management across the enterprise. Through a single host name, SmartConnect enables client connection load balancing and dynamic NFS failover and failback of client connections across storage nodes to provide optimal utilization of the cluster resources.

Customer Success

UCLA Laboratory of Neurological Imaging (LONI), one of the foremost neurological research centers in the U.S., is using Isilon clustered storage to power critical research advancing the scientific understanding of the human brain. UCLA's LONI is using Isilon to store the world's largest repository of high resolution neuro imaging data.

"There was no way we could keep up with our data requirements at the rate we were growing. We evaluated several storage solutions and Isilon came out far ahead of the pack due to its inherent scalability and system redundancy. Best of all, whereas it used to take four days to add storage to our SAN, we can now add Isilon nodes in about 10 minutes, without any system downtime."

—Rico Magsipoc, Chief Technology Officer, LONI

Cedars-Sinai Medical Center's Louis Warschaw Prostate Cancer Center, at the Samuel Oschin Comprehensive Cancer Institute uses a combination of Isilon IQ, IQ Accelerators and EX expansion nodes to store and analyze its clinical research data. The Prostate Cancer Center selected Isilon clustered storage to support its critical and potentially life-saving research because it allows the Center to create a centralized, highly reliable, easily managed and highly scalable storage architecture that seamlessly supports its leading-edge cancer research initiatives.

"The advances in technology coupled with the sheer amount of data that we can effectively correlate for our studies enable us to find new ways to fight cancer. Isilon IQ clustered storage is very easy to manage and its scalability enables us to continually add new data points to our studies. The more targeted our research is, the more lives we may ultimately be able to impact in positive ways."

—Dr. David B. Agus, M.D., Research Director at the Cedars-Sinai Prostate Cancer Center including its Clinical Outcomes Project

San Diego Supercomputer Center is using Isilon IQ in a project to power new breakthroughs in scientific visualization and analytics applications, enabling University of California San Diego Cancer Center scientists to gain deeper insights into their research while accelerating the discovery process.

"Today, the line between real world applicability and scientific theory continues to fade as technological advancements and scientific knowledge unite to take scientific insight beyond the laboratory and into much broader arenas of comprehension and analysis. SDSC provides cutting-edge technology and expertise to extend the reach of science and continue to advance scientific accomplishments, and Isilon clustered storage forms part of a Web-based, Cellular Imaging Portal for cancer scientists."

—Dr. Steve Cutchin, Manager, Visualization Services, SDSC

Isilon IQ Clustered Storage

The Isilon IQ family of clustered storage systems was designed from the ground up to meet the needs of data-intensive enterprises and high-performance computing environments. By combining Isilon's OneFS® operating system software with the latest advances in industry-standard hardware, Isilon delivers modular, pay-as-you-grow, enterprise-class clustered storage systems.

- Powered by OneFS operating system software, distributed file system creates a single, shared global namespace
- First and only truly symmetrical clustered storage architecture
- System can scale from 4TB–2.3PB in a single file system
- Unmatched aggregate throughput from a single file system with up to 20 GB/second
- Single stream performance of more than 400 MB/second, concurrent performance of 700 MB/second and over 26,000 transaction I/Ops
- Industry leading, high availability for clustered storage systems
- Powerful, easy-to-use Web-based management
- 60-second scaling of both capacity and performance
- Built-in, automatic application/client connection load balancing
- Industry-standard protocol support (NFS, CIFS, HTTP, FTP, NDMP, SNMP, LDAP, ADS, NIS)

About Isilon Systems

Isilon Systems is the worldwide leader in clustered storage systems and software for file-based data, enabling enterprises to transform data into information—and information into breakthroughs. Isilon's award-winning family of IQ clustered storage systems combines Isilon's OneFS operating system software with the latest advances in industry-standard hardware to deliver modular, pay-as-you-grow, enterprise-class storage systems. Isilon's clustered storage solutions speed access to critical business information while dramatically reducing the cost and complexity of storing it.

The evolution of storage is clustered storage built on a powerful, open operating system with unique software that lets you pay-as-you-grow. Visit www.isilon.com/contact to get started—and see why clustered storage is paying off for some of the biggest and most respected names in the world.

Isilon Systems, Inc. | **www.isilon.com**
3101 Western Ave, Seattle, WA 98121

Toll-Free: 877-2-ISILON • **Phone:** +1-206-315-7602
Fax: +1-206-315-7501 • **Email:** sales@isilon.com

ISILON® SYSTEMS
How breakthroughs begin.™