



The Challenge

- Facilitate a smooth, non-disruptive transition from a very stable UNIX cluster to an equally stable Linux cluster
- Improve I/O throughput performance for demanding batch processing jobs
- Simplify and reduce cost of system administration
- Ensure high scalability and availability, now and in the future
- Keep costs to a minimum

The Solution

- Five-node NAS Cluster of 3-GHz dual-processor servers running PolyServe NAS Cluster software
- Sixteen-node computational cluster for batch processing
- Job scheduling software
- SuSE Linux Enterprise Server 8
- Fibre Channel Storage Area Network (SAN)

Results

- 50% cost savings versus NAS appliance and UNIX server cluster alternatives
- On-the-fly scalability requiring no system downtimes for system upgrades
- Simplified administration by managing servers, storage and network from a central control point
- No single point of failure, system wide

PolyServe NAS Cluster Simplifies Management, Increases Performance and Lowers Cost for Westinghouse

The Westinghouse Electric Company enjoys a long-standing and impressive reputation for its commitment to excellence in commercial nuclear reactor technology. This case study focuses on its Nuclear Fuel Business. The Westinghouse Nuclear Fuel Business is, in fact, the world's leading integrated supplier of nuclear fuel products and services.

Dedicated to being the best, biggest and most responsive fuel supplier in the world, the Nuclear Fuel business unit currently provides fuel assembly fabrication, zirconium alloy products, nuclear grade tubing, core components, and other products and services for use in commercial nuclear power plants, worldwide.

With its sights set on being the world's leading global nuclear company, Westinghouse continues to focus all its efforts on helping customers produce safe, low-cost, reliable and environmentally friendly electricity by enhancing plant safety, availability and dependability, and by reducing operation and maintenance costs.

THE CHALLENGE

Within its Nuclear Fuel Business, Westinghouse's commitment to excellence includes a data center where computational and safety activities are processed for selling and manufacturing its nuclear fuel products. These processing activities are, of course, crucial to the success of Westinghouse's Nuclear Fuel Business. The data center had been successfully deployed on a cluster based on the UNIX operating system and an outdated server platform. But when Westinghouse confirmed that support from their server vendor for this line of servers was being phased out, an alternative solution was mandatory.

The data center must support the needs of approximately 100 client users across two business units — predominantly Nuclear Fuel, but also the Services division. These clients use the system to perform intensive calculations to analyze the structural, transient, safety and other characteristics of its fuel products needed to meet requirements of its customers' reactors. This large amount of computation places a heavy demand on the file-serving performance of the Westinghouse cluster.

In evaluating a new solution, Westinghouse was drawn to Linux, believing the platform was robust enough for its processing needs and very cost-effective. Additionally, Westinghouse was determined to find a solution that would be easy to administer, allow users simultaneous access to the same files, and lower its capital expenditures compared to its previous UNIX-based solution.

While a traditional NAS appliance may have seemed worth considering, Westinghouse felt performance would be a problem, given the fact that most NAS

filers can deliver at most 250 Megabytes per second (MB/s) of I/O throughput.

At the same time, the PolyServe NAS Cluster solution and another cluster file system (CFS) were evaluated. The other CFS, provided by a major Linux supplier, had a single point of failure, poor performance, and proved too limited in its capabilities. With the PolyServe NAS Cluster solution Westinghouse discovered benefits no other CFS, traditional NAS offering or UNIX-based solution could deliver:

- A global file system namespace across a cluster of servers and storage
- The ability to aggregate I/O throughput across the cluster; thus delivering more performance than traditional NAS
- The ability to allow all nodes to see and share the same data concurrently with no replication
- A single storage pool for simplified storage management and backup
- No single point of failure cluster-wide
- Easy scale out of storage capacity to accommodate projected data growth
- Easy scale out of performance by simply adding more low-cost industry-standard Linux servers
- Manage servers, storage, and network from a central control point

Westinghouse's Nuclear Fuel Business selected the PolyServe NAS Cluster solution to enable a high-performance, fault-tolerant and cost-effective Linux file-serving cluster.

“Due to the heavy I/O demands of our applications, traditional NAS appliances were not a viable option. The PolyServe NAS Cluster software not only enables us to deploy these low-cost Linux servers as a single system, but also ensures our cluster is always available, provides high-performance I/O throughput, and simplifies administration.”

Hans Bostrom
Manager of Software Development
Västerås Fuel Engineering
Westinghouse Electric Sweden AB

THE SOLUTION

Westinghouse needed a highly scalable, highly available storage platform to support the demands of the 16 node computational cluster. Westinghouse’s 100 users schedule and execute computational jobs and batch processing on the 16-node cluster. These computational processes require access to a shared repository of data and the ability to support significant I/O throughput. The 16-node computational cluster uses Network File System (NFS) protocol to connect to the PolyServe NAS cluster, which is the storage platform and repository for Westinghouse’s business critical data.

With the PolyServe NAS Cluster solution, Westinghouse was able to deploy a cluster of affordable Linux-based, industry-standard servers in an environment where each server in the cluster can simultaneously read and write to volumes of shared data on its SAN. Because its Linux cluster could be treated as a single NFS server, Westinghouse has no need to divide or replicate data among separate servers and no need to assign clients manually to individual servers.

The PolyServe NAS Cluster solution integrates NFS protocol functionality with a true symmetric cluster file system, high-availability services and cluster and storage management capabilities. The product aggregates up to 16 low-cost Linux- and Intel Architecture-based servers for high-performance, fault-tolerant file serving across a storage area network (SAN). Shared data and management capabilities ease IT administration by enabling servers and storage to be managed as one.

“With the PolyServe NAS Cluster solution, we are able to easily add or swap out hardware and software without taking down the cluster. That’s a critical requirement for our business. The cluster needs to be available at all times.”

Hans Bostrom
Manager of Software Development
Västerås Fuel Engineering
Westinghouse Electric Sweden AB

From an administrative standpoint, the PolyServe NAS Cluster solution enables data to be shared among all servers and storage to be administered as a central pool. Storage provisioning and back-up procedures were greatly simplified. As a result, Westinghouse has guaranteed high availability with full protection against server, network and storage failures. With the PolyServe NAS Cluster solution, the cluster detects and takes prescriptive action to failures at the network, storage, server and software layers within the cluster. The PolyServe NAS Cluster solution also provides transparent fail-over of NFS sessions and improves system uptime and service quality for the entire cluster.

Because the PolyServe NAS Cluster solution features a symmetrical cluster file system, Westinghouse can enjoy seamless, simple, on-the-fly scalability to meet

growing workloads, or to conduct system upgrades with no disruption to the users.

“Of course I was nervous about transitioning from a very stable UNIX cluster. But, in the end, the PolyServe NAS solution enabled a very smooth transition to an equally stable Linux cluster. It all went very well.”

Hans Bostrom
Manager of Software Development
Västerås Fuel Engineering
Westinghouse Electric Sweden AB

RESULTS

In production since December 2003, Westinghouse's PolyServe-enabled NAS cluster has met its throughput and reliability requirements, while achieving major cost savings versus NAS appliance and UNIX server cluster alternatives. Westinghouse saved 50% on the cost compared to competing NAS and UNIX file serving alternatives.

Moving to the PolyServe NAS Cluster solution also meant changes in how Westinghouse administers its system. With the old UNIX system, Westinghouse outsourced much of its administration of the cluster. Because the PolyServe NAS Cluster solution greatly simplifies the demands and complexity of system

administration, Westinghouse has brought its administration in-house, representing even more cost savings stemming from the PolyServe-enabled platform.

“The batch performance over the PolyServe NAS Cluster has been very impressive. Compared to our UNIX platform—what was high performance just a few years ago—we have definitely increased system wide performance”

Hans Bostrom
Manager of Software Development
Västerås Fuel Engineering
Westinghouse Electric Sweden AB

CONFIGURATION

Westinghouse has deployed a NAS cluster of five 3 GHz dual-processor servers with 4 GB of memory each, running PolyServe NAS Cluster software for Linux. The cluster exports file systems via NFS to 16 computational servers supporting more than 100 users' requests for a variety of I/O- and memory-intensive calculations. Users schedule their computational jobs using a third-party job scheduling software package.

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