White Paper

SGI® and PipelineFX Qube!™ Render Management Solution

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1.0 Executive Summary

Productivity is what makes a company successful. SGI Render Management Solution is designed to enable you to better manage resources, and be more creative and productive — overall to have a positive impact on the bottom line. It enables you to decide if you have the resources available to bring a project in on time and on budget.

SGI® Altix® XE310 servers are a new family of Linux® OS-based servers and factory-integrated clusters powered by new quad-core Intel® Xeon® processors. Unlike competing systems, SGI Altix XE clusters are custom-configured to optimize leading applications, and are backed by SGI and its decades-long track record of successful customer deployments. SGI Altix XE servers and optional NAS appliances can provide exceptional high-performance rendering and file serving for a wide variety of modeling and rendering workflows.

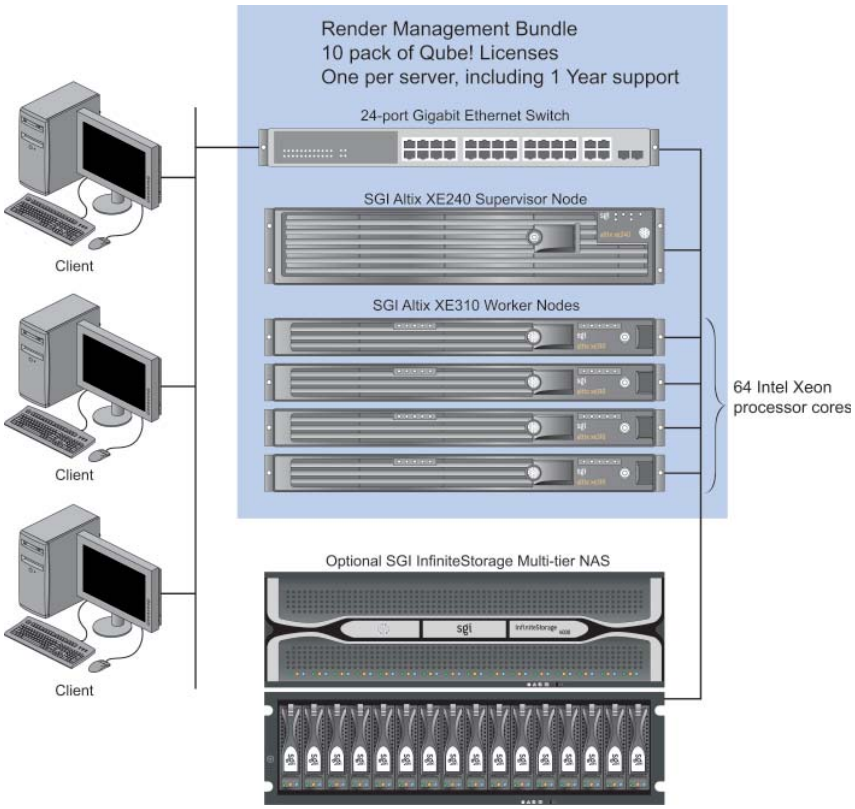
PipelineFX Qube!™ software integrates directly with key rendering and modeling applications, is MySQL® database-driven and provides open, extensible APIs — more value than mere batch queuing. SGI offers the unique capability to grow this rendering solution in server capacity, storage capacity, NAS-to-SAN conversion, and additional licenses of Qube! software as your business requires. Qube! software has proven many times over that it is the right choice for studios that depend on innovation to keep pace with the growing size and complexities of data models and demanding schedules of today's productions. And with the leasing options available, customers can start small, add and refresh equipment as required, and have better management of their costs, growth and profitability.

2.0 Business Problem

Game and animation developers and production houses are presently building millions of digital assets into a single project. Next-generation computer hardware will drive the number of digital assets even higher. The latest digital films are putting huge rendering demands on very complex server farms. Genome sequencing, simulation, forensics, animation, and fluid dynamics applications are also driving the need to produce more timely iterations and higher quality output and results. Adding more servers to solve larger and larger rendering jobs comes with the traditional headaches of adding space and cooling requirements to the computer room, administrative complexity, and interruptions for end users.

3.0 Render Management Solution Design

The SGI Render Management solution is a tightly integrated hardware and software solution stack consisting of one supervisor node (SGI Altix XE240 server) and 8 worker nodes (4 SGI Altix XE310 servers, 64 Intel Xeon processor cores), PipelineFX Qube! workload management software, cluster management software, and optional SGI ProPack™ performance optimization software.



The systems are interconnected using Gigabit Ethernet connections. An optional NAS high-performance storage system connects to the network switch to serve files used in the rendering operation. The supervisor and worker nodes can run:

- SUSE® Linux Enterprise Server 10
- Red Hat® Enterprise Server 4
- Microsoft® Windows® Server 2003
- Microsoft Windows CCS (in development)

The number of workers can be expanded in groups of 10 along with 10-packs of Qube! software licenses.

3.1. Hardware Configuration

The supervisor node is the front-end server that pushes jobs out to the worker nodes. The clients are user applications on individual workstations. The supervisor node holds a local MySQL® database.

The SGI Altix XE240 supervisor node has low computing requirements and modest memory requirements (4 GB). Because the supervisor node runs a local MySQL database and is the crucial front-end to the server farm, it contains five 250 GB internal hard drives configured as a RAID.

The PipelineFX Qube! software requires only about 50 MB of space. The Supervisor node stores great deal of log information; so, around 4 GB of disk space is allocated to hold the log information for several thousand jobs.

Each SGI Altix XE310 worker node provides two compute nodes. Each compute node supports two quad-core 2.66 GHz Intel Xeon processors for exceptional rendering performance. Applications typically require 2 GB of memory per core and have modest local disk requirements, if any. This is not a traditional compute cluster; that is, the worker nodes act only as individual servers. The supervisor manages the work that is sent to each of the worker nodes. Unlike MPI, there is no communications between the worker nodes.

3.2 SGI InfiniteStorage NAS Solutions

Optional SGI InfiniteStorage NAS solutions provide high-performance network-attached storage (NAS) services for data-intensive rich media environments. SGI NAS systems deliver universal data access for heterogeneous environments without sacrificing performance and serve UNIX®, Windows, and Mac® clients. SGI XFS® filesystem is an industry leader in performance and scalability designed for high-performance computing (HPC). It leverages award winning hardware and filesystem design and expertise to provide high availability and data protection.

The SGI Render Management Solution can be seamlessly integrated with DMF which enables access to archived digital assets or scenes. The databases always appear online to the end-user, but depending on the age, size and other administrative set attributes, may be stored on near-line disk and/or offline tape storage. If a user needs to access a previously stored database, the system seamlessly moves the data from near-line or offline storage to the on-line disk so that previous models and data are always available for re-use. End users are not constantly recreating a model because older data sets have being archived and are no longer available.

The SGI InfiniteStorage Appliance Manager (AppMan) software provides a single, unified storage management interface featuring automated storage asset discovery and configuration guidance for fast and easy initial deployment and future storage capacity expansion. The intuitive web-based GUI enables users to configure, manage and monitor the storage server, helping to lower management cost.

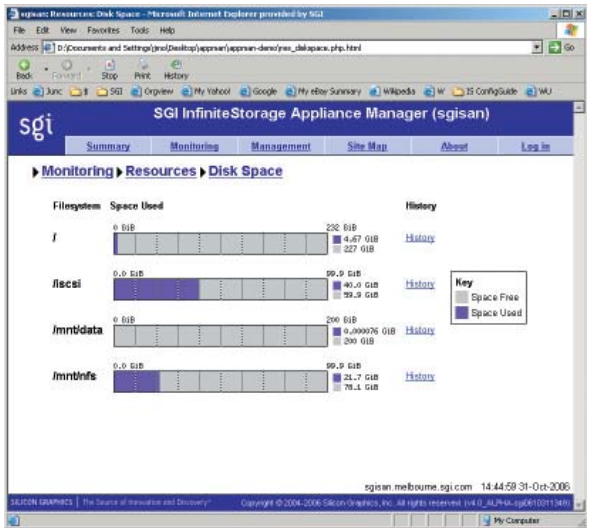


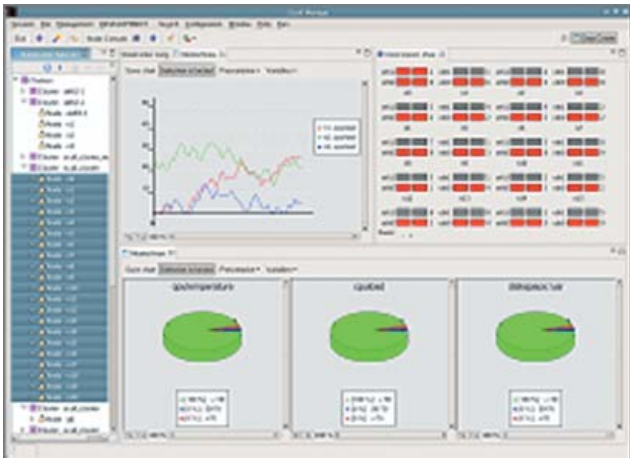
Figure 1. AppMan InfiniteStorage Appliance Manager

3.3 Cluster Management Software

SGI is using its experience in managing large high performance clusters to provide the same ease-of-use to a server farm environment. Cluster management software is a vital part of any production render farm. It simplifies node utilization, performance bottlenecks, OS upgrades, and application installs. MPI software is not required for the Render Management Solution because there is no communications between the worker nodes.

For Windows users, Windows Compute Cluster Server 2003 (CSS) brings together the power of SGI Altix XE computers, the ease-of-use and security of Active Directory directory service, and the Windows operating system to provide a security-enhanced and affordable high-performance computing solution. If you choose Windows CCS as your operating system, the cluster management software is included.

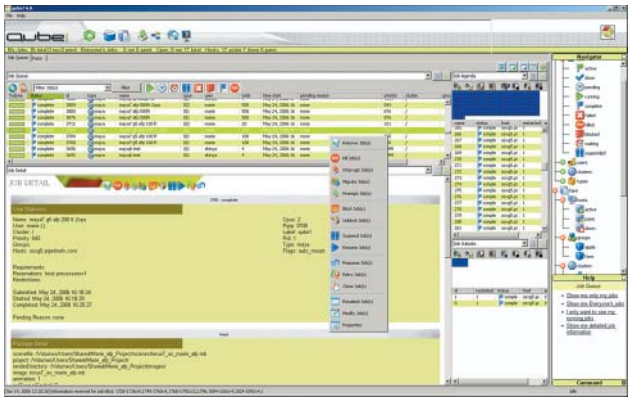
For Linux users, Scali is a leader in delivering Linux clustering software and solutions that enable you to improve the price performance ratios associated with deploying and managing enterprise and high performance computing clusters. Scali's cluster management software reduces the complexity of a Linux cluster environment and is factory-installed and configured by SGI for the Render Management Solution. It provides provisioning and monitoring capabilities that the PipelineFX Qube! software does not.



Scali Manage Cluster Management Software

3.4 PipelineFX Qube! Workload Management Software

PipelineFX Qube!™ software is an enterprise-class render farm management system. The Qube! software from PipelineFX manages the whole rendering workflow and integrates with most of the major rendering applications. Qube! has out-of-the-box pipelines for leading creative applications like Autodesk® 3ds Max®, Autodesk Maya®, NUKE™, SOFTIMAGE®|XSI®, Shake®, mental ray®, Renderman® and many more. The Qube! job template can be customized so that Qube integrates with your existing workflow, as opposed to modifying your workflow to accommodate the Qube! template. Qube! operates in Linux, Windows XP, Windows 2000 and Windows 2003, and Apple Mac OS X environments.



PipelineFX Qube! Workload Management Software

PipelineFX's Qube! combines state-of-the-art techniques for batch queuing, distributed processing and render farm management. The software maximizes job throughput by distributing the millions of computational tasks that occur during the graphics rendering and software build processes. SGI is renowned for its years of experience in content management for editing, effects, and digital intermediates. The company's open heterogeneous operating system approach to data management makes it the ideal render farm platform for PipelineFX.

Qube! can also be used as a job or queueing manager for applications that perform a large number of independent jobs in parallel. Examples of these are:

- CFD
- Engineering analysis
- Genome sequencing
- Software builds on different O/S environments

The University of Hawaii Center for Genomics, Proteomics, and Bioinformatics is using Qube! to manage high-performance computation on an SGI Altix server as they sequence the papaya genome. Qube! is also a very important component of game development and animation at the world's largest studios worldwide such as Vanguard Animation.

3.5 Linux OS and SGI Propack Performance Optimization Software

The optional SGI ProPack for Linux software includes HPC and storage libraries, products, and extensions if you use your cluster farm for both high-performance rendering and traditional HPC cluster applications. SGI ProPack for Linux is designed to complement and extend capabilities of standard Linux distribution. SGI ProPack on the SGI Altix XE product line includes specific features to drive performance and tuning in cluster configurations and provides open source kernel and base OS environment.

4.0 Recommendations

The game environment is changing. Larger teams, next generation hardware and more data are placing greater strains on development teams. The Qube! state-of-the-art techniques for batch queuing, distributed processing and render farm management and high-performance computing systems from SGI maximize job throughput and accelerate the millions of computational tasks that occur during a software build process. As such, the SGI Render Management Solution is an excellent choice for organizations that must keep up with the growing complexities and decreasing schedules of today's compute-intensive development projects.

The SGI Render Management Solution is not an individual piece of hardware or software that improves your productivity. It is an end-to-end workflow ready solution. It means being able to quickly deploy and commission large complex systems that involve hardware, software, storage, data migration and/or backup solutions.

5.0 Test Methodology and Plan

The Render Management Solution is made up of standard components. SGI professional services can implement and integrate this solution so that the whole is greater than the sum of the parts. It has been thoroughly tested to ensure compatibility with SGI Altix XE, 64-bit OS, SGI storage and cluster management software. As a result of SGI testing, PipelineFX made a number of improvements to Qube! so that it is compatible with a 64-bit OS.

6.0 Interpretation of Test Results

Qube! is an excellent tool that manages rendering jobs and aids end users and production managers to maximize throughput while integrating into existing workflows. SGI builds upon the Qube! environment by providing high-performance hardware and extensible cluster management tools that enable system administrators to manage and grow the environment effectively. Configuring a render management solution is not a trivial task. SGI Managed services enables you to deploy new clusters quickly and effectively that enable end users to be productive on day one.

7.0 Summary

Larger data sets and escalating build times are the harsh realities that face anyone trying to achieve a greater sense of realism in 3D simulations and games. Fast and easy are only part of the equation. IT managers not only need a near-term solution to heighten productivity, they need a long-term solution that does not encounter obstacles from hidden costs, administrative overhead or scalability limitations.

The Render Management Solution with Qube! enables you to focus on content creation rather than system management. Qube! Render Manager's direct interface to leading applications and management tools, streamline the rendering process for faster, higher-quality results. The SGI and PipelineFX solution drives faster ROI by offering users:

- Fast, affordable deployment. x86 64-bit systems with complete, factory-integrated solution stacks simplify deployment and reduce installation cost
- Uniquely flexible. Maximize your raw performance and I/O bandwidth by selecting SGI Altix XE servers.
- Pay as you grow – system upgrades. Buy or lease only what you need today and grow configurations as business requirements increase

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