

Rational ClearCase Software on SunTM Servers

A Sizing Guide



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901 San Antonio Road, Palo Alto, California 94303 U.S.A

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Rational ClearCase Software on SunTM Servers



Executive Overview

With the increasing importance of time to market in software development, choosing a development environment that streamlines the management of software objects (e.g. code base, specifications, documentation, etc.) throughout the entire product life cycle can have a dramatic impact on the productivity of a development team. A software configuration management (SCM) solution which is reliable, scalable and available 24 hour per day will enhance developer productivity and accelerate project schedules. Carefully configuring the host hardware platform for the SCM will ensure reliable access to information, optimize developer productivity, reduce frustration, and keep projects on track.

This guide is written for software development managers who are using or plan to use the Rational ClearCase development environment from Rational Software Inc. Included is a brief overview on the ClearCase environment followed by requirements for a deployment platform and a discussion of the benefits of choosing Sun EnterpriseTM servers, Sun StorEdgeTM technology and the SolarisTM Operating Environment.

Sun provides the industry's most scalable and reliable UNIX server product line with consistently outstanding benchmark performance results. With the Solaris Operating Environment, high speed Sun StorEdge solutions and a broad range of system management tools, Sun provides a complete solution to meet all the needs of both small and large development organizations.

While each situation is a unique, it is the intent of this document to provide some guidelines for choosing an appropriately configured Sun Enterprise server to match a given ClearCase development environment. This document cannot replace the need to involve a local Sun sales representative in selecting the best Sun server and storage components for a specific situation. However, it should provide a good starting point.

Performance Test Results

Performance test results for several configurations of Sun platforms running Rational ClearCase software are reviewed here. Figure 1 lists the recommended maximum number of concurrent ClearCase users that can be actively working on various configurations of Sun equipment. Details and analysis of these test results are discussed in later sections of this document.

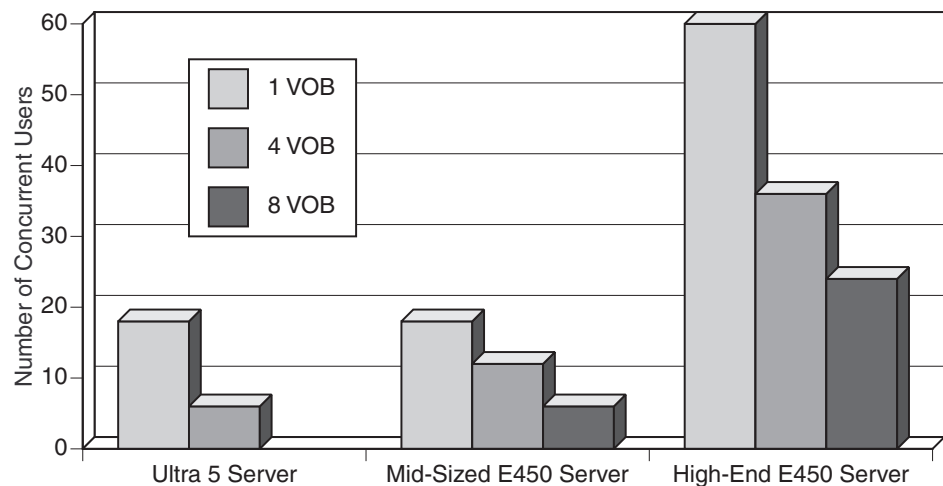


Figure 1 Maximum number of concurrent users on selected Sun servers

As the bar chart in Figure 1 indicates, the Sun Enterprise Ultra™ 5S server is a very cost effective way for small ClearCase development teams to get started. As the team begins to grow, the Sun Enterprise™ 420R and the Sun Enterprise™ 450 servers provide room for a slightly larger code base and more users. The high-end configuration of Sun Enterprise 450 server with Fibre

Channel disk arrays, extra memory and four CPUs can support a development team of up to 24 people with a large code base and up to 60 people with a small code base.

For even larger development teams, a mid-range server such as the Sun Enterprise™ 3500 server may be deployed to gain enhanced system availability and to further increase performance. Sun's mid-range server products provide the most comprehensive set of high availability features of any mid-range server in the industry.

Rational ClearCase

Rational ClearCase software provides comprehensive software configuration management (SCM) including version control, workspace management, process control and build management. ClearCase allows content contributors to develop web content in isolation and then instantly preview the results of their work against the latest changes. Its uniquely transparent, non-intrusive approach allows development teams to accelerate development cycles, ensure the accuracy of releases, reliably build and patch previously shipped products, and organize an automated development process — all without changing their environment or their tools.

The ClearCase solution makes it easy for multiple developers to work in parallel by providing controlled access to its permanent data repositories called *Versioned Object Bases (VOBs)*. Multiple VOBs can be used for any project. Independent developer work areas called *Views* control access to the VOBs.

The following sections describe VOBs and Views and how they can impact system performance. An overview of ClearCase Unified Change Management (UCM) is also included.

Versioned Object Base (VOB) Storage Directories

A VOB can store source files, binary object files, directories, web artifacts, documents, or any type of file that is part of an e-development project. Each VOB also stores meta-data which is specific to the content in that VOB. Together, the meta-data directory and three separate pools of files comprise the VOB Storage Directory as shown in Figure 2.

The *VOB Directory Database* contains Rational ClearCase internal meta-data which tracks the files that are stored in the pools and maintains coherency of the VOB data.

The *File Storage Pool* holds all versions of any file that has been checked in to the VOB. This includes source code files, binaries, web artifacts, etc. Over time, the File Storage Pool can become quite large as changes to the code base increase the number of versions of each file stored.

The Clear Text Pool is an internal cache of the most recently accessed versions of any text file in the VOB. ClearCase automatically updates the *Clear Text Pool* whenever a text file is accessed by a developer. The file being accessed is copied into the Clear Text Pool for faster access by other developers who might want a copy of that file in their View.

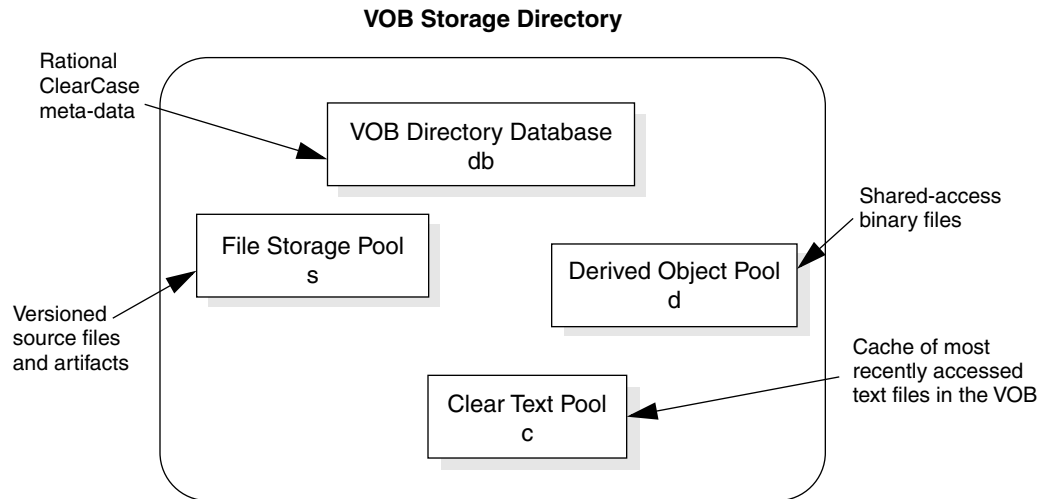


Figure 2 Contents of a VOB Storage Directory

The *Derived Object Pool* holds binary files in a cache directory that allows these files to be shared by multiple developers using a ClearCase procedure called a "wink in." These files can be *winked in* to a developer's View without copying the file into the developer's workspace, thus keeping the developer's View size to a minimum. Refer to the Rational ClearCase User's Guide for further discussion of the procedure for wink in of derived object files.

A VOB can only be accessed through a ClearCase *View* which is an independent work area for a developer or batch job.

View Storage Directories

Like VOBs, Views also have an internal data structure that is Rational ClearCase-specific. Figure 3 shows the contents of the View Storage Directory.

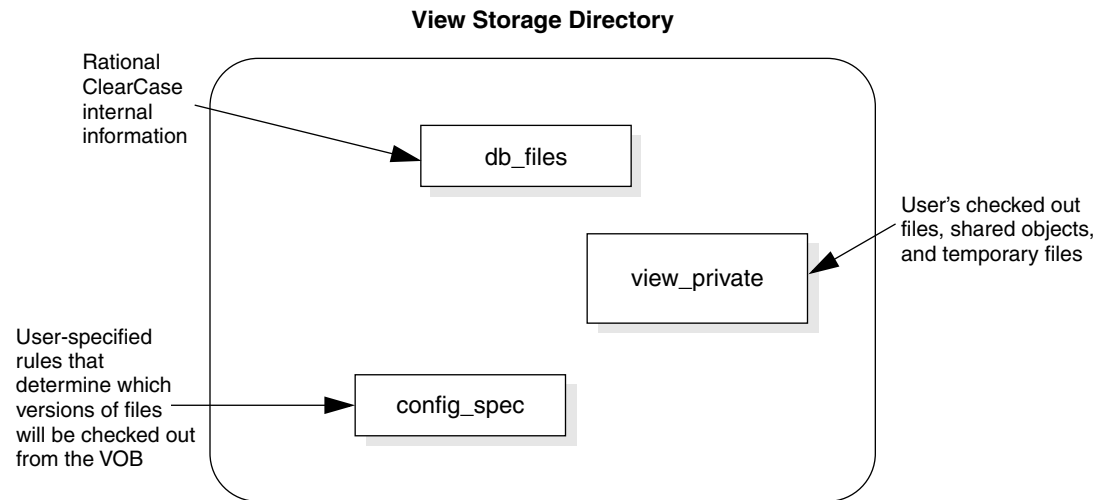


Figure 3 Contents of a View Storage Directory

The primary storage area in the View Storage Directory is the *view_private* area which contains checked out files, unshared binaries (or derived objects) and temporary files. A View's size is primarily dictated by the size of the unshared derived objects it generates. Shared objects that have been winked in (see wink in discussion in the above section) do not increase the View size.

The *config_spec* is a set of ordered rules that define which files get checked out by a developer. Even in large views, the *config_spec* generally does not grow to be very large because it is a text file which simply holds the view-specific rules.

The *db_files* contain internal Rational ClearCase meta-data about the other information in the View Storage Directory.

Effects of VOB and View Sizes

VOBs maintain all the modifications to a source code base and can therefore grow to be quite large over time. The machines which control the storage media the VOB physically resides on are referred to as *VOB servers*. VOB servers can become the focal point of much activity during the development and build process. The VOB server is where most of the data is collected to generate builds for each developer or for release engineering. Proper configuring, tuning and availability of the VOB server is fundamental to a productive Rational ClearCase environment.

Older VOBs may that are no longer in use may be archived to free up space. The question of whether to have one large VOB or several smaller ones comes down to an issue of performance versus administrative ease. Large VOBs can cause performance bottlenecks for some of the following reasons:

- Large VOBs are usually accessed by a large number of developers and will likely be a source of network contention at the VOB server.
- The large number of files kept in the VOBs can also cause contention for disk I/O resources as multiple views access the VOB for files they need in doing builds or in adding to the clear text pool.
- Rational ClearCase overhead within the VOB can consume memory and CPU resources as VOB access increases.

On the other hand, each VOB requires a certain amount of administration. Some of the per-VOB administrative tasks are:

- Backups and restores
- VOB scrubbing (can be automated)
- Moving a VOB
- Configuring VOB access and permissions

In general, large VOBs that receive significant traffic should be considered for splitting. If a VOB gets relatively few hits, then its size should not be a problem. If system administration resources are scant and the code base is not large and there are few developers, then a large VOB will be an advantage because it will require less servicing than many smaller VOBs. Projects with large code bases and many developers should maintain adequate system administration staffing and keep multiple, smaller and more manageable VOBs and VOB servers.

VOBs have a limit of 16 million records in their database. Records do not correlate to the number of elements. However, the records are of fixed size and one is approaching the limit when the database file approaches 1.2 GB. As a general rule, when the database size approaches two times the memory size of the server on which the VOB is running, VOB access performance degrades.

Unified Change Management (UCM)

An optional process called *Unified Change Management (UCM)* can be used to automate the steps required to create and maintain developer work areas, track changes to files, and manage project baselines. The easy-to-adopt UCM process helps development teams manage change across the entire e-development life cycle. UCM enables administrators to roll back to any previous version of an application, thus minimizing down time in the event of an outage. With UCM, simple check boxes are used to configure project policies for workflow and promotion models, eliminating the need for programming or scripting to manage changes to the code base.

Desired Features of a Hardware Platform for Rational ClearCase

Many factors must be considered when selecting hardware to host the Rational ClearCase solution. Considerations such as size of the development team, network topology, and the number of geographic locations served will impact the design of the overall hardware solution.

Aside from specific deployment recommendations, other factors play an important role:

- *High performance* for stable, predictable response times
- *Reliability and availability* for maximum uptime
- *Scalability* to meet future growth needs
- *A growth path* that offers *investment protection*
- *Rapid service* when a problem does occur

Selecting a hardware vendor can depend upon their ability to provide several key services:

- *Service and support* for the installation
- *Professional services* for help in getting the project up and running quickly
- *Expert installation and configuration* in preparation for a Rational ClearCase solution



Furthermore, proper sizing of the hardware should be based on available empirical testing data that demonstrates performance under simulated or actual Rational ClearCase user loads.

Benefits of Rational ClearCase on Sun

Sun Microsystems, Inc. is a leading provider of industrial-strength hardware, software and services that power the Internet and help companies worldwide to “dot-com” their businesses. Because Rational ClearCase customers need both performance and predictability to create a “dot-com” development environment that can accelerate software development, Sun platforms are a natural choice.

From small workgroups to large decentralized development organizations, Sun provides solutions for maximum uptime, unmatched scalability, terabytes of capacity, and seamless connectivity. With Sun’s investment in testing and analysis of Rational ClearCase software on Sun Enterprise servers, Rational ClearCase customers can confidently choose the Sun Server configuration which best meets their needs.

The primary benefits Sun offers to Rational ClearCase customers are:

- *Rapid performance* to increase productivity of development teams
- *High scalability* to allow for rapid growth
- *Investment protection* with a broad product line that runs the Solaris Operating Environment for *binary compatibility* across the product line.
- *Reliability, availability, and serviceability* to ensure 24 hour/day access around the globe
- *Flexible service and support options*
- *Accurate configuration and sizing of Sun Servers* for ClearCase installations through experience, testing and analysis.

Performance and Scalability

Sun offers the industry’s most scalable line of servers ranging from low cost workgroup servers such as the single-processor Sun Enterprise Ultra 5S server, to mid-range servers like the 8-processor Sun Enterprise 3500, and on to high-end servers like the 64-processor Sun Enterprise™ 10000 (Starfire™) server. Typically, Rational ClearCase sites require a workgroup or mid-range server to provide adequate performance. Even larger installations may use multiple Sun servers to distribute the load.

The Sun workgroup server product family includes four models, the Sun Enterprise 250 server, Sun Enterprise 450 server, Sun Enterprise 220R server, and Sun Enterprise 420R server. All of these workgroup servers incorporate the reliability, availability and scalability features that are hallmarks of the Sun platform. Sun Enterprise 220R and 420R servers offer a unique combination of dense processing power in an integrated, rackable form factor, ideal when space is at a premium.

The midrange server line — which includes the Sun Enterprise 3500, Sun Enterprise™ 4500, Sun Enterprise™ 5500, and Sun Enterprise™ 6500 servers — achieves best-in-class performance with blazing-fast UltraSPARC™ processors and a Gigaplane™ interconnect that speeds memory and I/O throughput. In addition, Sun's mid-range servers provide the most comprehensive high availability features of any mid-range server in the industry.

Sun StorEdge™ Storage Devices

Overall system performance and scalability requires more than the right server and operating environment. Storage technology is equally important. The Sun StorEdge™ A1000 and Sun StorEdge™ A5000 arrays use Fibre Channel technology to provide superior I/O bandwidth. And, instead of establishing islands of information which are difficult to access in a distributed network, the Sun Intelligent Storage Network™ enables engineering teams to dynamically match their storage needs to their development environments. This gives greater scalability to the overall storage environment and without the need to overbuy storage capacity.

The Sun StorEdge A5000 Fibre Channel array offers robust performance and can be configured in a variety of high availability configurations.

Investment Protection

Sun's broad product line of enterprise servers offers investment protection through scalability within the product line as well as an easy migration path to larger systems or a distributed networks of servers. All Sun Enterprise servers run the same binary compatible Solaris Operating Environment allowing applications to be easily moved from one server to another without modification.

As a development team grows, managers can simply add additional Sun Enterprise servers to the network and migrate elements of the Rational ClearCase environment to the new platforms to more evenly distribute the load.

Reliability, Availability and Serviceability

As a leader and early pioneer in network computing, Sun has nearly two decades of experience designing and building dependable and highly available network computing solutions that enable higher levels of overall availability.

Recent advances in the technology have allowed Sun to spread mainframe class reliability, availability, and serviceability (RAS) features from its high end Sun Enterprise 10000 servers down into its mid-range line of Sun Enterprise X500 servers. In addition to hot-pluggable components and automatic system recovery, Sun Enterprise X500 mid-range servers now include Dynamic Reconfiguration and Alternate Pathing (DR/ AP) for online repair and reconfiguration.

For environments that cannot risk downtime, Sun™ Cluster software delivers even higher system availability. Through automatic fault detection and recovery, other nodes in the cluster can automatically assume the workload of a failed node. Up to four servers can be connected in a single cluster configuration.

Sun StorEdge products are also architected for high availability with redundant components, multiple RAID levels and mirrored cache. Storage solutions can be configured with a Sun cluster or as part of an Intelligent Storage Network. With Fibre Channel technology, the Sun StorEdge A5000 array supports redundant data paths, hot pluggable components, multiple host connections, and dual ported drives.

Solaris Operating Environment

The Solaris Operating Environment is acknowledged by the industry to be the premier reliable UNIX environment. By minimizing planned and unplanned downtime, reducing administration errors, and simplifying troubleshooting, it keeps mission-critical applications available, and provides high-speed, reliable access to data. And because the Solaris Operating Environment is based on a smaller, more stable kernel and has better load balancing across multiple processors than other operating systems, it dramatically decreases an

enterprise's exposure to system crashes. With features like Solaris Live!™ Upgrade, Hot Diagnostics, UNIX File System Logging, and Remote Console, the new Version 8 of the Solaris operating environment is built to maximize uptime.

Simple Yet Powerful Management Capabilities

System management for Sun Enterprise servers is enhanced with Sun™ Management Center software, the most advanced systems management solution from Sun to date. Sun Management Center 2.1 software offers a single point of management for all Sun servers, desktops, storage systems, the Solaris Operating Environment, applications, and data center services.

D.H. Brown Associates rates Sun as the overall leader in system management products, citing their dynamic reconfiguration, superior embedded performance management, and application monitoring capabilities.

Service and Support

The Sun Enterprise server product line is backed by comprehensive service and support, including enhanced 7 x 24 system support services, education and training programs, and professional service offerings to assist with developing, deploying, and managing complete solutions.

Find out more about the flexible service offerings from Sun Enterprise Services at <http://www.sun.com/service/> or by contacting a local Sun sales representative.

Sun Enterprise Server Sizing Guidelines

There are many factors that should be considered when configuring Sun hardware for a Rational ClearCase software installation. The test results described in this section are based on testing specific environments and provide guidelines for configuring Sun hardware for those environments. Slight changes to the environment will change the performance results. Thus, it is important to use these test results only as a guideline and to consider other factors in selecting the appropriate hardware configuration. The local Sun sales team is a good source for additional information.

General Sizing Guidelines

Although each customer situation is unique and involves many factors, there are a few general guidelines that apply to most installations:

- The amount of *memory in the server* has proved to be the single *most dominant* system configuration variable impacting system performance. It is recommended that the server be configured with enough RAM to *equal 50 percent of the total of all VOB database sizes* for VOBs running on that server.
- For the largest projects, *it is more efficient to distribute the processing across multiple Sun servers* than to have a single monolithic server with a single copy of the Solaris Operating Environment and a single copy of Rational ClearCase software.
- Rational ClearCase software is more *I/O intensive* than CPU intensive, but tests show that the *Sun servers scale well up to four CPUs* running ClearCase when using appropriate storage systems.
- Separating the VOB database onto a separate server from the VOB storage pools can provide additional efficiencies in performance by distributing the I/O load across multiple hardware servers.
- According to anecdotal evidence from Rational ClearCase users, a system performance bottleneck occurs when there are more than 50 active VOBs and more than 200 concurrent users. The performance bottleneck is based on the product of the concurrent users times the number of VOBs. Thus an extremely high number of users with fewer VOBs could also cause the bottleneck to be seen. To avoid this potential performance issue for large installations, Sun recommends multiple servers be used to distribute the load.

Performance Test Results on Sun Enterprise Servers

The results described in this section are based on tests performed by Sun engineers running Rational ClearCase software on various configurations of Sun Enterprise servers. Three different ClearCase data sets were used on each of the systems tested. The tests measured response times for a programmed sequence of ClearCase operations by a simulated user. In the test, more users were added to each server, increasing competition for I/O, CPU and network resources, until a saturation point was reached. A server was deemed fully loaded with users when the duration of time to complete the test sequence was double the time it took for a single user.

Version 4.0 of Rational ClearCase software was used in all tests. Since Version 4.0 requires a UCM process for each VOB, the tests included one UCM process for each VOB in the data sets tested.

Sun Server Configurations

Performance tests were done on three different configurations of Sun Enterprise servers, the Sun Enterprise Ultra 5S server, and two different configurations of the Sun Enterprise 450 server. Table 1 shows the configurations for each of the three platforms tested.

Sun Server Configuration	Details of Sun Server Configuration
Sun Enterprise Ultra 5S	128 MB RAM, single 333 MHz CPU, single 7200 RPM IDE disk, Solaris 7
Sun Enterprise 450 (Mid-size)	500 MB RAM, 2 X 400 MHz CPUs, 3 X 7200 RPM FW-SCSI disks, Solaris 7
Sun Enterprise 450 (High-end)	1 GB RAM, 4 X 400 MHz CPUs, Sun StorEdge A1000 using RAID 0 with Fibre channel, Solaris 7

Table 1 Sun server configurations

Rational ClearCase Data Sets

There were three Rational ClearCase data sets used in the testing described in Table 2. The Sun servers were tested against each of these data sets to see how data set size impacted performance.

Rational ClearCase Data Set	Description of data set
Single VOB data set	1 VOB with 500 elements
4 VOB data set	4 VOBs with 3000 total elements (2 VOBs with 500 elements, and 2 with 1000 elements)
8 VOB data set	8 VOBs with 8500 total elements (2 VOBs with 500 elements, 3 with 1000 elements, and 3 with 1500 elements)

Table 2 Rational ClearCase data sets used in performance tests

Performance Test Results

Based on the criteria described earlier, Figure 4 shows the maximum number of concurrent Rational ClearCase users that can be actively working on various configurations of Sun equipment. Performance results can vary significantly if the environment is different from that which is described in the preceding sections.

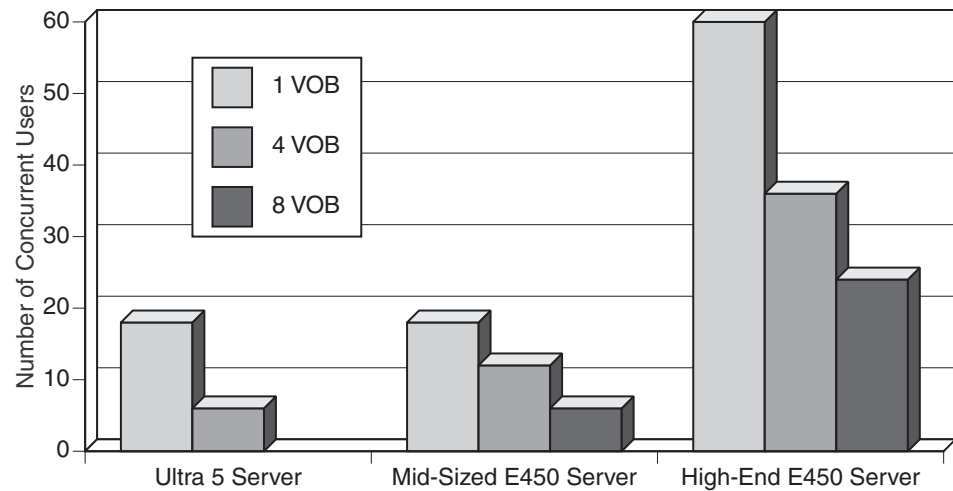


Figure 4 Maximum number of concurrent users on selected Sun servers

As the bar chart in Figure 4 indicates, the Sun Enterprise Ultra 5S server is a very cost effective system for small development teams of 10 to 15 people as long as the code base is small. This server performs well in the single VOB test which has only 500 elements in its database. However, on the four VOB test with 1500 elements the Sun Enterprise Ultra 5S server can support only six users simultaneously. For the large data set in the eight VOB test, the Sun Enterprise Ultra 5S server was not able to complete the test in a reasonable amount of time and should not be considered for a project with a large code base.

The mid-size configuration of the Sun Enterprise 450 server can handle the larger data sets much better than the Sun Enterprise Ultra 5S server. This server is well suited for small development teams of 10-15 people and a code base of

a few thousand elements or files. The eight VOB test with 8500 elements seems to be near the saturation point for this server as it can handle only 6 users for this large data set.

The high-end configuration of Sun Enterprise 450 server with Fibre Channel disk arrays, extra memory and 4 CPUs can support a development team of up to 60 people for a small code base and up to 24 people on the larger code base in the eight VOB test.

For even larger development teams, a mid-range server such as the Sun Enterprise 3500 server may be deployed to gain enhanced system availability and to further increase performance. As with all of Sun's mid-range server products, the Sun Enterprise 3500 offers Dynamic Reconfiguration (DR) and Alternate Pathing (AP). These features allow system boards to be dynamically attached or detached during continuous operation and allow I/O operation in a live system to be redirected to a predetermined alternate path.

Configuring Storage

With an I/O intensive application such as Rational ClearCase, the storage configuration on the ClearCase VOB server can have a big impact on overall system performance. The amount of storage needed is dependent on the size of the code base for the project and many other factors. It is important to keep in mind however, that storage needs will grow as the code base is modified and new versions of files are added while historical versions are also maintained.

The test results clearly show that using a Fibre Channel attached storage array such as the Sun StorEdge A1000 storage device will provide the best performance for medium and large development projects. However, small projects can utilize the lower bandwidth SCSI disks or IDE disks.

For the larger projects, these configuration guidelines should be considered:

- A Fibre Channel attached storage solution such as the Sun StorEdge A1000 storage device or the Sun StorEdge A5000 Fibre Channel array will provide the best performance.
- For fault tolerance, RAID 5 offers equal or better performance than RAID 0 and provides a more cost effective solution.
- A stripe size of 16 Kilobytes is optimal for VOB database storage and a 32 Kilobyte stripe size is preferred for the storage pools.



As a general note, VOB database accesses are heavily write-biased (95 percent). VOB storage pools are also write-biased because many of the reads are satisfied from the user's file system buffer cache.

Sun offers a wide variety of storage options to meet the needs of nearly any development project. A local Sun sales team can assist in determining the best storage configuration to meet project requirements.

Summary and Recommendations

In general, the Sun Enterprise Ultra 5S server is a very cost effective server for very small Rational ClearCase projects. For slightly larger projects, the Sun Enterprise 420R and the Sun Enterprise 450 servers provide room for a slightly larger code base and more users. The high-end configuration of Sun Enterprise 450 server with Fibre Channel disk arrays, extra memory and four CPUs can support a development team of up to 24 people with a large code base and up to 60 people with a small code base.

For even larger development teams, a mid-range server such as the Sun Enterprise 3500 server may be deployed to gain enhanced system availability and to further increase performance. The Sun Enterprise 3500 server is a good choice when, in addition to performance, system uptime and continuous operation is important to the project.

A Fibre Channel attached storage environment such as the Sun StorEdge A1000 storage device or the Sun StorEdge A5000 Fibre Channel array provides the best I/O throughput for Rational ClearCase software installations. However, lower bandwidth SCSI or IDE disks can provide adequate performance at lower cost for small projects.

Typical Scenarios

This section discusses three typical scenarios with varying size development teams using Rational ClearCase software on Sun Enterprise servers. For each development team described, a specific Sun server configuration is recommended.

Scenario 1 — Small Local Development Staff with Limited Growth

A team of six developers is building a web-based benefits application to be deployed on Company XYZ's intranet. The project is expected to be completed in three months. After deployment, one of the six developers will be responsible for on-going maintenance and support of the project.

The developers plan to use a single Rational ClearCase VOB and expect the VOB database to be less than 500 elements and remain under 50 kilobytes in size. The initial code base will be less than two gigabytes in size.

Recommended Sun Server Configuration for Scenario 1

This small project can utilize the *Sun Enterprise Ultra 5S server* since it requires a single VOB, will have limited competition for resources in the project, and requires very little storage. Performance will not be an issue using the 7200 RPM IDE disks that come standard with the Sun Enterprise Ultra 5S.

The recommended configuration is:

- Sun Enterprise Ultra 5S server
- 128 MB RAM
- Single 333 MHz CPU
- Two 9 GB 7200 RPM IDE disk drives
- Solaris 8 Operating Environment

The recommended memory of 128 Megabytes is more than double the expected 50 Kilobytes maximum size of the VOB database so it is well beyond the rule of thumb suggesting that system memory be half the VOB size. Two disk drives are recommended so that the VOB database and storage pools can be on a separate disk from the system disk, thus enhancing performance. There are no high availability options in this configuration and disk striping is not possible with only two disks.

Scenario 2 — Medium Size Development Staff with Limited Growth

A team of 20 developers has been maintaining the entire web site of Company ABC for over five years. The base of software and web artifacts has grown to approximately 7,500 items. The project manager recently brought in Rational ClearCase software to gain control over changes to the site. The site is not expected to grow much bigger, but is under continuous change.

The developers plan to use eight separate ClearCase VOBs and expect the total of all the VOB databases to be approximately one megabyte. The code base itself requires 10 gigabytes of storage. High availability is important to the project because the team cannot afford to lose development time when creating and testing time-critical web pages.

Recommended Sun Server Configuration for Scenario 2

With 20 developers, there will be significant competition for disk I/O and CPU resources. The processing can be handled by a single Sun Enterprise 450 server. However, *two Sun Enterprise 450 servers* are recommended to meet the high availability requirements.

The recommended configuration is:

- Two Sun Enterprise 450 servers
 - Four 400 MHz CPUs
 - One GB RAM
 - Monitor
 - Solaris 8 Operating Environment

- Two Sun StorEdge A5000 disk arrays

The disk arrays will be dual-attached and will use RAID 5 for high availability. The recommended memory of one gigabyte on each server provides sufficient RAM in each server to run all the VOBs in the event of a loss to one of the servers.

For increased high availability, the project team might choose to implement Sun Cluster software to allow failover from one system to the other. Setting up the Sun Cluster software should include enlisting the help of Sun Professional Services as this is not a standard configuration with Rational ClearCase software.

Scenario 3 — Medium Size Development Staff with High Expected Growth

A development team of 30 engineers is creating a web-based front-end to the order entry system at ZZZ Company. If this first phase of the project is successful, it will expand to include a web-based front-end to purchasing and other enterprise business applications as well. The team of 30 people is likely to grow to a worldwide team of over 150 people.

The initial project phase will have a code base of 20 Gigabytes and will use eight VOBs. The expected combined sizes of all the VOB databases is two gigabytes. While reliability is important to this project, redundant hardware servers are not considered necessary.

Recommended Sun Server Configuration for Scenario 3

The high level of expected growth in this project warrants starting with a larger server that can easily be expanded. Because of the mission-critical nature of this project, a server with high availability features is recommended. The *Sun Enterprise 3500 server* is best suited for this project as it has a large capacity for I/O operations and offers many high availability features.

When the project reaches 150 developers, more than one server will be required. Although performance test results are not yet available on the Sun Enterprise 3500 server, it is expected to support significantly more than the 24 concurrent user limit on high-end Sun Enterprise 450 server with a large Rational ClearCase data set.

The recommended configuration is:

- Sun Enterprise 3500 server
 - Four 400 MHz CPUs
 - Two GB RAM
 - Monitor
 - Solaris 8 Operating Environment

- Two Sun StorEdge A5000 disk arrays

The disk arrays can be mirrored to offer additional reliability in the storage, but there will still be a single point of failure at the server. The recommended memory of two gigabytes on the server provides sufficient RAM for growth in the VOB database to double its expected size. The rule of thumb is that the server memory should be at least half the total of all VOB database sizes which is two gigabytes in this case.

Scenario 4— Large Geographically-Diverse Development Staff

In a joint project funded by several large multi-national utility companies, a global development team of over 200 people is developing a business to business exchange for energy market providers. The exchange consists of many components that will be deployed in phases. The development tasks have been



divided up across four global teams with an average of 50 developers per team. A sixth team of 10 engineers will perform testing of the integrated application suite on a continuous basis throughout development.

The project will use a more than 50 Rational ClearCase VOBs and the expected total of VOB database sizes will be greater than 25 gigabytes.

Recommended Sun Server Configuration for Scenario 4

Performance of Rational ClearCase on a single Sun server scales well up to four CPUs and beyond this point a distributed solution with multiple servers is recommended. The needs of this project can best be met by several mid-range servers.

Each of the four development teams has 50 users so they are beyond the capacity of the Sun Enterprise 450 server. The *Sun Enterprise 3500 server* is recommended for performance and increased system availability. The servers are configured with four gigabytes of memory so that each server can manage access for up to eight gigabytes of VOB database, or roughly one third of the 50 VOBs in the whole project.

The testing team will require an additional server of equal capacity to perform the integrated testing. Two Sun StorEdge A5000 disk arrays for each server will provide adequate storage capacity and allow for a level of fault tolerance by using dual-pathing to attach the storage arrays to the servers.

The recommended configuration is:

- Five Sun Enterprise 3500 servers
 - Four 400 MHz CPUs each
 - Four GB RAM each
 - Monitor
 - Solaris 8 Operating Environment
- Ten Sun StorEdge A5000 disk arrays

For Further Information

Your local Sun sales representative is the best source for additional help in properly configuring a Sun Enterprise server for a Rational ClearCase software installation.

The following web site links also provide further information about the Sun offerings discussed in this document:

Web Site Link	Topic
http://www.sun.com/servers/	Sun Enterprise servers
http://www.sun.com/solaris/	Solaris Operating Environment
http://www.sun.com/solstice	Sun network management and security software
http://www.sun.com/service/	Sun service and support
http://www.sun.com/software/white-papers/wp-s8security/index.html	Secure Enterprise Computing with the Solaris 8 Operating Environment white paper
http://www.sun.com/software/white-papers/backup-n-storage/	Solstice™ Backup and Storage Management white paper
http://www.sun.com/clusters/	Sun Cluster 2.2



Sun Microsystems Computer Company
A Sun Microsystems, Inc. Business
901 San Antonio Road
Palo Alto, CA 94303 USA
650 960-1300
FAX 650 969-9131
<http://www.sun.com>

Sales Offices

Argentina: +54-1-317-5600
Australia: +61-2-9844-5000
Austria: +43-1-60563-0
Belgium: +32-2-716-7911
Brazil: +55-11-5181-8988
Canada: +905-477-6745
Chile: +56-2-638-6364
Colombia: +571-622-1717
Commonwealth of Independent States:
+7-502-935-8411
Czech/Slovak Republics:
+42-2-205-102-33
Denmark: +45-44-89-49-89
Estonia: +372-6-308-900
Finland: +358-9-525-561
France: +33-01-30-67-50-00
Germany: +49-89-46008-0
Greece: +30-1-680-6676
Hong Kong: +852-2802-4188
Hungary: +36-1-202-4415
Iceland: +354-563-3010
India: +91-80-559-9595
Ireland: +353-1-8055-666
Israel: +972-9-956-9250
Italy: +39-39-60551
Japan: +81-3-5717-5000
Korea: +822-3469-0114
Latin America/Caribbean:
+1-650-688-9464
Latvia: +371-755-11-33
Lithuania: +370-729-8468
Luxembourg: +352-491-1331
Malaysia: +603-264-9988
Mexico: +52-5-258-6100
Netherlands: +31-33-450-1234
New Zealand: +64-4-499-2344
Norway: +47-2218-5800
People's Republic of China:
Beijing: +86-10-6849-2828
Chengdu: +86-28-678-0121
Guangzhou: +86-20-8777-9913
Shanghai: +86-21-6247-4068
Poland: +48-22-658-4535
Portugal: +351-1-412-7710
Russia: +7-502-935-8411
Singapore: +65-438-1888
South Africa: +2711-805-4305
Spain: +34-1-596-9900
Sweden: +46-8-623-90-00
Switzerland: +41-1-825-7111
Taiwan: +886-2-514-0567
Thailand: +662-636-1555
Turkey: +90-212-236 3300
United Arab Emirates:
+971-4-366-333
United Kingdom: +44-1-276-20444
United States: +1-800-821-4643
Venezuela: +58-2-286-1044
Worldwide Headquarters:
+1-650-960-1300