

# About Migration from Sybase® Adaptive Server® Enterprise on Solaris to Red Hat Enterprise Linux on HP Servers

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## INTRODUCTION

Sybase®, Red Hat and HP are working together to provide a low total cost of ownership Linux® solution for Sybase ASE (Adaptive Server® Enterprise) with enterprise-quality performance, robustness, and scalability for mission-critical applications. This paper describes why Sybase customers and many other IT organizations are moving to Linux and why Sybase customers running Sybase ASE workloads on Sun/Solaris® platforms should consider Sybase ASE on Red Hat Enterprise Linux® for HP Systems as a migration alternative. This document also outlines the process of migrating Sybase ASE from Solaris® to Red Hat Enterprise Linux on HP and options to help in the migration process.

## WHY COMPANIES ARE CONSIDERING LINUX FOR SYBASE ASE

The pressure to reduce and contain costs while protecting transaction processing capabilities and services while planning for expected growth puts tremendous strain on IT budgets and resources. In response to this pressure, IT organizations are constantly evaluating the potential benefits of different approaches for managing their computing infrastructure. Today's challenging and uncertain economy has accelerated the adoption of technologies and architectures that improve price/performance and reduce total cost of ownership.

### Using Linux to reduce costs and provide a safe long-term direction

Many IT organizations were early adopters of Linux platforms to address these needs for print servers, mail servers and other parts of their infrastructure. Today, technology professionals agree that Linux has developed into a mature platform that handles many of the world's most demanding workloads, and at a much lower cost than traditional, proprietary UNIX® offerings. At the same time, Linux leverages the open source development model, which guarantees a constant stream of technology innovation fueled by a healthy multidimensional community of users and developers.

Linux is both a safe choice, because of the significant investment by many major infrastructure companies, and is also at the center of today's most innovative approaches. Linux-related software growth will continue to lead the industry according to industry experts<sup>1</sup>, and Linux is closely aligned with major trends such as virtualization and cloud computing. The convenience of using Linux with virtualization for deploying additional virtual servers has greatly expanded the use of Linux in development, test and production environments. Linux is also a key component of many cloud computing infrastructures, as well as an operating environment for working with these systems. These factors make Linux a highly desirable platform for short-term and long-term future architectures.

### Now proven for mission-critical environments

As the use of Linux-platforms has expanded, the balance of workloads has shifted from traditional infrastructure workloads to enterprise-level database and application workloads. IDC quantifies this trend with forecasts for relational database systems for Linux and open source operating environments that are the highest growing sector by far<sup>2</sup>. This means that suppliers will continue to invest strongly in supporting Linux-based systems for enterprise and mission-critical deployments. Sybase, HP, and Red Hat, as well as most major IT technology providers, have consulting practices to help customers deploy and support Linux-based systems in mission-critical environments.

### Of special concern to Sybase ASE customers on Sun

The trend to evaluate and move to Linux platforms has been accelerated by the economic climate driving an emphasis on reducing cost of ownership, industry consolidation creating uncertainty about long term technology roadmaps, and the desire to avoid infrastructure vendor lock-in. This is especially important to Sybase customers who have deployed their Adaptive Server Enterprise workloads on Sun and Solaris platforms and are now concerned about the future of legacy Sun systems, the SPARC® architecture and Solaris operating system. Sun Solaris platforms have been a popular, powerful, and proven environment for Sybase ASE and many customers with aging Sun systems are now evaluating Linux alternatives. While the long term consequences for the future of SPARC and Solaris are unclear, many customers are faced with making platform decisions now, triggered by operational considerations.

<sup>1</sup> IDC April 2009, The Opportunity for Linux in a New Economy, #217798

<sup>2</sup> IDC October 2009, Worldwide Database Management Systems 2009- 2013 Forecast, #219232E

### **Operational issues that drive consideration of Linux**

For customers running Sybase ASE 12.5 on Solaris 8, the long-planned end of support for that platform, by Sun as of March 2009, and by Sybase effective December 2009, means that they must move their workloads to a new environment or face special support contracts. For many customers, the resources and changes required to upgrade both the operating system and database server prompt a consideration of whether a Linux alternative can reduce costs and uncertainty for a comparable migration effort.

Support renewals for older systems are generally considerably more expensive than the original support contracts. New platforms usually offer better performance, at a lower cost, including bundled support contracts. When faced with renewing service contracts, IT departments can evaluate the TCO of a new platform over the life of the proposed contract and find savings from a new Linux-based platform that is smaller, more energy efficient and may offer comparable or greater performance.

The short term need for additional capacity on a Sun system may involve upgrades that are more expensive, or effectively as complex as migration to a new platform. Increasing capacity for a system that has reached its practical limits may result in the need to consider system clustering, data partitioning, or data replication to a new server, which also opens the consideration of the cost of migrating to a Linux-based alternative.

### **WHY SYBASE, RED HAT AND HP ARE WORKING TOGETHER**

#### **Commitment to Linux for enterprise and mission-critical environments**

Sybase is recognized as a leader in Enterprise Database Management Systems in Forrester Research's 2009 Database WAVE report and Sybase ASE has earned numerous awards including Enterprise Open Source Magazine's "Best Linux Database"; SD Times 100 for leadership in Database and Data Tools; and Best Enterprise Data Management Vendor by Waters Magazine. Sybase ASE is designed to meet the increasing demands of large databases and high transaction volumes and customers worldwide rely on Sybase ASE, including Blue Care Network, Agriculture Bank of China, Avis Europe, BNP Paribas Securities Services, Globe Telecom, Bayer BioScience, TriZetto, IXIS Bank, China Telecom and Cargill. Sybase is used by 24 of top 25 global banks and 46 of top 50 global banks and securities firms.

Sybase has been an innovator on Linux since 1998, when the company released its flagship database, Adaptive Server Enterprise (ASE), as the first enterprise-class database for the Linux platform. Sybase ASE is especially well-suited to Linux because it was originally designed from the ground up for UNIX environments. Today, many Sybase products are deployed on Linux, including Sybase Adaptive Server Enterprise, Replication Server®, Sybase IQ, SQL Anywhere® Studio, and Financial Fusion® Tradeforce™.

Sybase supports Linux as a core platform, with mission-critical customer support services for Linux, Linux technical competency centers in the United States, Europe and Asia, as well as consulting and managed services from Sybase Professional Services. Sybase has partnered with Red Hat and HP to deliver a Linux-based enterprise data management platform that can meet the needs of customers running Sybase ASE on Sun Solaris and are now considering a Linux-based platform for the future.

Red Hat is the leader in enterprise Linux and is the most recognized open source brand in the world. Red Hat Enterprise Linux platform is the foundation of the grid and Service-Oriented Architectures (SOA) of many leading financial institutions<sup>3</sup> and is used by the majority of financial institutions on Wall Street, including the NYSE, Merrill Lynch, Credit Suisse UBS Warburg, Morgan Stanley and is used in mission critical systems for organizations such as McKesson, Amazon.com, AOL, DreamWorks, VeriSign, Charles Schwab, FincoBank, Daiwa Securities, Deutsche Boerse Systems, GE Money Bank, Millennium Global Investments (MGI), NorTel, Verizon Communications, Covad Communications and local, state and federal governments. CIOs have ranked Red Hat as one of the top vendors delivering value in Enterprise Software for five consecutive years in the CIO Insight Magazine Vendor Value survey.

HP certifies more platforms on Red Hat than any other vendor. From versatile HP blade servers to mission critical HP Integrity servers, HP servers set the standard by demonstrating outstanding performance across the industry's most demanding and diverse workloads. Today, there are more HP servers running Linux than any other server—making HP the undisputed platform of choice for Linux distributions (Per the IDC Quarterly Server Tracker Report Q209, HP has sold more than 3.1M servers for Linux since 1998) HP delivers server environments that offer tremendous savings in

<sup>3</sup> Waters, Nov 2006, Networking, The Big One

software licensing, floor space, power and administrative costs. In addition to tremendous cost savings, HP also offers solid partner relationships covering the most popular commercial and enterprise solutions employed by Sun customers.

Working with Red Hat and HP, Sybase provides a low-cost platform with low total cost of ownership that reduces the risk to customers of adopting Linux as a new platform for Sybase ASE workloads currently running on Sun Solaris, and delivers the enterprise-quality performance, robustness, and scalability they expect for mission-critical applications.

## **WHY TO CONSIDER MIGRATING SYBASE ASE FROM SOLARIS TO RED HAT AND HP**

The performance of Sun SPARC systems and the robustness of the Solaris operating system made this a compelling platform for running Sybase ASE workloads. But, as the price, performance, and reliability of industry standard x86\_64 servers have increased, and Red Hat Enterprise Linux has emerged as the open source operating system of choice, the reasons to continue buying SPARC hardware and standardizing on Solaris have become less and less compelling.

For Union Bank, moving the infrastructure for their branch banking and cash management applications from Sun SPARC to HP ProLiant Servers on Red Hat Enterprise Linux reduced their IT spend by 80%, their cost per transaction by 25-40%, improved their system availability, improved their time to market and reduced the effort required for IT maintenance.

As a result of these kinds of benefits, many IT departments have begun to migrate away from SPARC to achieve a better price/performance and lower total cost of ownership (TCO), with Red Hat Enterprise Linux on HP servers as a compelling platform for migration of Sybase ASE workloads.

### **Improves TCO**

Total cost of ownership (TCO) analysis can be a complex exercise, with company-specific practices and requirements accounting for different aspects of migration. It typically includes the initial purchase costs, the deployment costs, the production costs, and the decommissioning cost. The TCO savings a customer can expect to achieve by switching from a legacy SPARC platform to an x86 platform comes primarily from the savings associated with hardware acquisition of a new, less expensive system, reduced power and cooling costs, conditioning, floor space, simplified administration, and new service and support contracts. For systems administrators, the number of features that are supported as part of the Red Hat Enterprise Linux subscription versus the Solaris x86 subscription give a cost advantage to Red Hat Enterprise Linux.

### **Meets mission-critical platform requirements**

#### ***Performance and scalability***

Migrating from Solaris on SPARC to servers running Red Hat Enterprise Linux on HP x86 servers doesn't mean accepting lower performance or scalability. Many customers have migrated and found great out of the box performance improvements for their applications as a major benefit. Red Hat Enterprise Linux not only provides good out-of-the-box performance on HP x86, but also enables even greater performance via customization. Red Hat Enterprise Linux also provides the tools needed for performance monitoring and tuning as part of the operating system distribution.

While the individual performance characteristics of each application is unique, the ability of Sybase ASE, Red Hat Enterprise Linux, and HP x86 servers to deliver great transaction-processing and decision support performance under a variety of workloads has been tested and proven in industry-standard benchmarks.

Red Hat Enterprise Linux was used to achieve the first TPC™ benchmark result on an x86 server that exceeded the one million tpmC mark for the TPC-C benchmark, at over 1.2 million transactions per minute for a cost of US\$1.99/tpmC<sup>4</sup>. Red Hat Enterprise Linux and other RHEL-based distributions such as CentOS and Oracle have been used in four of the ten most recently published leading TPC-C benchmarks.<sup>5</sup> Red Hat Enterprise Linux is also heavily used for TPC-H benchmarking.<sup>6</sup>

<sup>4</sup> IBM System x3950 M2; 1,200,632 tpmC; \$1.99USD/tpmC; Available as of 12/10/2008. See [http://tpc.org/tpcc/results/tpcc\\_result\\_detail.asp?id=108081902](http://tpc.org/tpcc/results/tpcc_result_detail.asp?id=108081902) for details.

<sup>5</sup> Ten Most Recently Published TPC-C Results. See [http://tpc.org/tpcc/results/tpcc\\_last\\_ten\\_results.asp](http://tpc.org/tpcc/results/tpcc_last_ten_results.asp) (as of Apr 18, 2010)

<sup>6</sup> Complete TPC-H Results List. See [http://tpc.org/tpch/results/tpch\\_results.asp?orderby=hardware](http://tpc.org/tpch/results/tpch_results.asp?orderby=hardware) (as of Apr 18, 2010)

HP x86 servers also hold numerous benchmark records, and have been featured in five of the ten most recently published leading TPC-C benchmarks<sup>5</sup> as well as in five of the top ten leading price/performance TPC-C benchmarks<sup>7</sup>. These benchmarks records include configurations from one to 128 core clustered and non-clustered systems.<sup>8</sup>

Sybase ASE continues to hold transaction performance records for systems running Linux, including with Red Hat Enterprise Linux.<sup>9</sup>

### ***Reliability & Support***

In addition to the performance and scalability required for high volumes of transaction processing, mission-critical Sybase ASE workloads should be complemented by a highly robust and reliable platform, with support options that backstop rigorous service level agreements.

Most surveys by industry analysts show that CIOs, IT managers, and system administrators find that Red Hat Enterprise Linux delivers the reliability needed for business-critical workloads and is comparable to UNIX (HP-UX, AIX, and Solaris) for mission-critical applications. Red Hat Enterprise Linux kernel and other core operating system components have a well-deserved reputation for running months, even years at a time, without crashing, freezing, or needing to be rebooted. HP's Integrity and ProLiant servers running Red Hat Enterprise Linux can be configured with fault-tolerant options that are strong enough to match Solaris and other UNIX systems on proprietary hardware. Sybase ASE meets the same high quality and stringent standards for certification on Red Hat Enterprise Linux as it does on Solaris and other UNIX platforms.

Sybase, Red Hat and HP all offer special mission-critical support options to assure success. The Red Hat Advanced Mission-Critical Program offers assurance that customers' hardware and software platforms are qualified and supported at levels previously available only on mainframe-class systems. HP Services also provides a single point of service and support accountability for the entire Red Hat Enterprise Linux product family on HP platforms. Sybase support plan options include dedicated support engineers, guaranteed response times and tailored support to meet specific service requirements.

### **Reduces risk from migration with experts and proven migration practices**

Whether an IT organization has the resources and sufficient time to execute a migration themselves, or wants a variety of levels of assistance, there are many options available for migrating Sybase ASE workloads to Red Hat Enterprise Linux on HP systems, from step-by-step guides to on-site consulting services.

Sybase ASE for Linux is compatible with Sybase ASE for Solaris for current Sybase applications and provides the same administration tools and interfaces, making it simple to adopt and use for database administrators and application developers. Sybase ASE includes cross platform data migration capabilities that simplify moving data from Sybase on Solaris or other platforms to Sybase ASE for Red Hat Enterprise Linux on HP.

Solaris is generally considered to be the variant of UNIX® closest to Linux, so porting applications from Solaris to Red Hat Enterprise Linux on HP systems with x86 architectures in many cases requires only minor changes to the source code and high-level changes to the build environment (makefiles, directory paths, compiler, and linking switches).

Sybase, Red Hat and HP reduce your risk of deploying Linux for mission-critical applications with proven migration support and consulting services. HP alone has announced the migration of more than 350 customers from Sun systems to HP solutions during the 12 month period ending Oct 31, 2009, and has expanded the HP Complete Care program to provide additional incentives.

Sybase Professional Services, Red Hat Professional Services and HP Services all offer Solaris to Linux migration services that can address the entire process and range of infrastructure from hardware, application and database migration assessment through monitoring and support of the deployed systems.

<sup>7</sup> Top Ten TPC-C by Price/Performance. See [http://tpc.org/tpcc/results/tpcc\\_price\\_perf\\_results.asp](http://tpc.org/tpcc/results/tpcc_price_perf_results.asp) (as of Apr 18, 2010)

<sup>8</sup> Complete TPC-C Results List. See [http://tpc.org/tpcc/results/tpcc\\_results.asp?orderby=hardware](http://tpc.org/tpcc/results/tpcc_results.asp?orderby=hardware) (as of Apr 18, 2010)

<sup>9</sup> IBM Power 550 Express; 276,383 tpmC; \$2.55USD/tpmC; Available as of Dec 16, 2008. See [http://tpc.org/tpcc/results/tpcc\\_result\\_detail.asp?id=108061602](http://tpc.org/tpcc/results/tpcc_result_detail.asp?id=108061602), IBM System p5 520; 81,439 tpmC; \$2.99USD/tpmC; Available as of Jun 23, 2006. See [http://tpc.org/tpcc/results/tpcc\\_result\\_detail.asp?id=106062301](http://tpc.org/tpcc/results/tpcc_result_detail.asp?id=106062301)

### **Offers a broad portfolio of certified applications and tools**

The support of a large number of independent software vendors (ISVs) is a good indication of a vibrant ecosystem around a platform, resulting in lots of options for applications and tools that enhance productivity. Solaris/SPARC was a popular platform and enjoyed strong ecosystem support, while Solaris on x86 has been slow to garner a similar level of support. In contrast, Red Hat Enterprise Linux has established itself with not only the large and vibrant community of open source developers, but also a rapidly growing number of ISVs in its broad ecosystem. These ISVs represent not only niche applications in vertical markets, but also broad-based applications that the companies use with their enterprise infrastructure such as reporting, business intelligence (BI), and enterprise resource planning (ERP).

While major ISVs like Sybase will continue to certify products for Solaris on SPARC, many develop their code on the Red Hat source code base months before porting to UNIX code bases like Solaris or Microsoft® Windows®. In fact, Sybase has adopted Linux as a core development platform nearly ten years ago.

This trend is quantified by the size and growth rate of the ISV catalog for Red Hat Enterprise Linux. Although Solaris on SPARC has been around longer than Red Hat Enterprise Linux on x86-64, the number of independent software vendors (ISVs) that have certified on Red Hat Enterprise Linux is already comparable, and now exceeds 3,400.

### **CONCLUSION**

Sybase ASE for Red Hat Enterprise Linux on HP systems offers a powerful and low total cost of ownership migration option for Sybase ASE workloads currently running on Sun Solaris. Sybase, Red Hat and HP have proven capabilities for mission-critical environments and offer compelling benefits for reducing total cost of ownership, meeting mission-critical platform requirements such as performance, scalability, and reliability, with enterprise-quality support options. Red Hat's broad portfolio of certified applications and tools, comparable to Solaris, make it a compelling choice for Linux. Working together, they reduce the risk of migrating any portion or type of infrastructure that involves Sybase ASE workloads with expert migration services, resources and migration methodologies.

## SUPPLEMENT: GUIDE TO MIGRATING SYBASE ASE FROM SOLARIS TO RED HAT LINUX

### Migration Overview

Moving Sybase ASE databases from a Solaris system to Red Hat Enterprise Linux requires migrating databases from the source platform to the target Linux platform. It is not possible to dump a database on the source platform and load this dump on the target Linux platform. This restriction is due to the differences in storage characteristics on each hardware platform (Intel, Sun UltraSPARC, and others). The dump/load process cannot account for such differences between source and target platforms.

Migrating a Sybase ASE database and application to the Red Hat Enterprise Linux platform typically requires the following steps:

1. Preparing the target Linux system.
2. Installing Sybase ASE on the target machine.
3. Migrating the Sybase ASE server structure.
4. Migrating the Sybase ASE database(s).
5. Validating migrated data, stored procedures, and application queries.
6. Migrating application program(s) (required only if the client program will also be running on the Red Hat Enterprise Linux platform).
7. Testing the system end-to-end in the migrated environment.

There are various options available for migrating a Sybase ASE database from Solaris to a Red Hat Enterprise Linux platform. These are the most common methods to use in the Sybase environment:

- sybmigrate, a flexible and easy-to-use utility provided by Sybase to migrate the database to the Linux platform
- bcp scripts to migrate data from the source to the target server, and tools such as DDLGen to migrate the database schema and other information separately
- Sybase or third-party tools such as PowerTransfer, InfoMaker, PowerDesigner, or Embarcadero DBArtisan.

Sybase recommends that customers use the sybmigrate utility to accomplish migration tasks. The tool performs most of the required migration tasks, requires minimal scripting and internal knowledge about the source database structure, and is therefore easier to use and less error-prone than other tools. To perform cross-platform migrations, however, sybmigrate requires the source Adaptive Server to be at version 12.5.0.3 or higher. For source Adaptive Server systems not meeting this criterion, other options should be considered.

This discussion covers migration using sybmigrate and an overview of other available options.

### Preparing a Red Hat Enterprise Linux System for Adaptive Server Enterprise

Before installing Adaptive Server Enterprise on a Linux system, complete the following tasks:

1. **Check operating system version and patches** – Adaptive Server Enterprise 15.5 is certified on the following configurations. Make sure the target system meets these requirements or apply the required patches to bring it into compliance.

Red Hat Enterprise Linux 4.0 update: 5  
kernel-2.6.9-55.EL  
glibc-2.3.4-2.36

Red Hat Enterprise Linux 5.0 update:1  
kernel-2.6.18-53.1.13.el5  
glibc-2.5-18

Please visit the Sybase on Linux Web page at <http://www.sybase.com/linux> for up-to-date information on supported platforms and certification.

2. **Sybase account** – Create a Sybase account for performing the Sybase ASE server installation.
3. **Shared memory segments** – Depending on the number of devices used for backup and recovery, it might be necessary to adjust the shared memory segment parameter in the operating system file. The operating system shared memory default for most Linux system releases is 32MB. The minimum shared memory required by Adaptive Server is 64MB. To adjust the shared memory segment size, change the directory to /proc and check the available operating system size as follows. All of these operations need to be performed using an account with root permissions:



```
# ipcs -lm | grep 'max seg size'
```

```
max seg size (Kbytes) = 32768
```

Choose a new size for the operating system shared memory parameter. For example, to change the shared memory to 1024MB, enter: 3

```
#echo '1024 * 1024 *1024' | bc > /proc/sys/kernel/shmmax
```

or add the following in /etc/sysctl.conf and run /sbin/sysctl -p (as super user)

```
kernel.shmmax = <max memory in bytes>
```

Verify that the changes have taken effect:

```
# ipcs -lm | grep 'max seg size'
```

```
max seg size (Kbytes) = 1048576
```

Since these changes involve dynamic Linux kernel tuning, there is no need to restart the operating system.

To avoid having to make this change after each restart, add this line to the /etc/rc.d/rc.local file:

```
echo '1024 * 1024 *1024' | bc > /proc/sys/kernel/shmmax
```

4. **Create Raw Partitions** – Sybase recommends placing database devices on raw disk partitions. Complete specific system administration tasks to set up these raw devices. Please refer to Installation Guide Sybase Adaptive Server Enterprise for Linux/Intel and the appropriate Linux system administration guide for more information about setting up raw devices.

## Installing Adaptive Server Enterprise

Adaptive Server Enterprise should be installed on the target system using the Adaptive Server Enterprise installation CD. The software is distributed in the Red Hat Package Manager (RPM) format. Use RPM command line or GUI tools to install Adaptive Server on the system. Please refer to the Installation Guide Adaptive Server Enterprise for Linux/Intel for more details.

Obtain and apply the latest Adaptive Server maintenance release and patches from the Sybase support site, <http://www.sybase.com/support>.

Use the “asecfg” or “srvbuild” utilities to configure a new Adaptive Server. To configure server-wide options on Adaptive Server use sp\_configure or Sybase Central.

## Migrating the Server and Database Structure

To migrate the server and database structure, complete the following steps:

1. Allocate storage space for databases on the new Adaptive Server. Create devices for the data areas as well as the transaction logs.
2. Create the databases using the scripts from the source server, if available. Once the database is created, set the database owner to the appropriate server login.
3. Using the sp\_dboption, set the options for the newly created databases. Database option settings can simply be copied from the Solaris source server.

## Migrating the Database

The following section discusses how to perform database migration using the sybmigrate utility provided by Sybase. To perform migration using other options, please refer to the “Alternate Migration Options” section of this document.

### Using the sybmigrate Utility

The sybmigrate utility was first introduced with Adaptive Server Enterprise 12.5.0.1 to manage the database migration process. It accomplishes migration using existing Adaptive Server features and utilities such as DDLGen and Component Integration Services (CIS). Since sybmigrate is installed as part of the core Adaptive Server, this utility is available with all Adaptive Server installations.

The sybmigrate tool can handle the following aspects of database migration: server data (master database metadata), database data (user database metadata), user objects, user table data. For more details on the scope of the sybmigrate utility, please refer to the migration utility documentation found in the “Migration Utility” chapter in the Adaptive Server Enterprise manual. Sybmigrate can be used in either GUI mode or with a resource file. Please refer to the sybmigrate guide for more information.

The syntax for sybmigrate is as follows:

```
sybmigrate [-v] [-h] [-l Interface file] [-r resource file] [-m setup | migrate | validate]
[-l log file] [-t output template resource file] -f
```

where:

-v prints version string

-h prints help information and usage syntax

-l identifies which interface file to use to find a specific server name

-r specifies the resource file to be used for migration process

If -r is used, specify the type of operation to be performed using the -m argument and either migrate, validate, or setup:

-m designates the type of operation to be performed

migrate – performs data and object migration

validate – validates the migrated objects

setup – sets up the repository and migration working database, and migrates the server-wide data

-l designates the user-defined log file

-t directs sybmigrate to generate an output template resource file for use in subsequent migrations in resource file mode

### Performing Manual Migration Tasks

Sybmigrate supports the migration of a subset of the schema and configuration listed in this migration document. Migrate other schema objects and configuration information manually to ensure that the target Adaptive Server is fully functional. Statistics for indexes are automatically re-created when indexes are rebuilt on the target server. However, statistics from non-index columns are not re-created. No user-defined step values for index statistics are retained as part of the migration process. To obtain statistics for the target-side Red Hat server that are similar to those for the source side Solaris server, use `optdiag` to identify the tables with non-index columns that include statistics, and update the statistics manually.

The following items are not migrated and need to be set manually to the target server:

- Any user-defined thresholds set up in the source server
- All abstract plan definitions maintained in `sysqueryplans`
- Any engine groups, engine bindings, and execution classes used on the source server

### Validating Migrated Data, Stored Procedures, and Queries

With the data migration complete, data administration staff familiar with the application and its data should check the integrity of the data. Ideally, standardized scripts will be available to perform logical data integrity checks with a minimum of administrator effort. Problems discovered at this stage should be checked against the source Adaptive Server data.

All stored procedures on the migrated database and application SQL statements should be tested to ensure that their execution on the Adaptive Server on Red Hat Enterprise Linux is identical to their execution on the source Solaris-based Adaptive Server. After successfully migrating the application queries, rebuild the surrounding client programs if required. Test all clients to ensure that their behavior is identical to that of clients used with the Solaris server.

### Migrating Application Programs

Application programs can be optionally migrated to run on the Red Hat platform. The exact procedures for migrating an applications program will depend upon how the application is written—in which programming language, and using which type of database connectivity technology, for example.

Programs written using platform-neutral language and technology (such as Java) only require retesting on the Linux platform, whereas programs written in programming languages such as C and C++ need to be recompiled and relinked on the Linux platform.

Appropriate language compilers and any libraries used by the program must be available on the Linux platform. The Sybase Open Client SDK library commonly used by many applications is available for the Linux platform.

## Validating the New Environment

The final step is to validate the migration using a thorough testing process. Ideally, an existing automated set of integration, system, and user acceptance tests will be available to allow easy validation of the migration. If such tests are not available, use an alternative testing process to ensure that the migration has been successfully completed.

The testing should include validation of the following:

- User interface
- Batch processing
- Administration procedures
- Disaster recovery
- Application performance

Once testing of these areas is complete, the migration of the application to Adaptive Server on Linux can be considered successful.

## Obtaining Optimal Migration Performance

In order to minimize downtime of production systems during migration, obtaining the optimal performance and throughput is very critical. There are several configuration parameters in Adaptive Server that can affect the performance of the migration process. The “Migration Utility” chapter in Adaptive Server Enterprise manual discusses in detail the various configuration options available with sybmigrate. Based on testing, some of these parameters are described next.

On the **source Solaris-based Sybase ASE server**, configure the following parameters:

- **Max parallel degree** – If the tables are partitioned on the source server, then max parallel degree should be set to a value that is larger than the largest number of partitions in the table with the greatest number of partitions. If the value is not set high enough, migration of these tables will fail.
- **Number of worker processes** – Data migration for partitioned tables requires one worker process per partition.
- **Max network packet size** – To achieve faster data migration, tune network packet size. In most cases, a network packet size of 4K is sufficient.
- **CIS network packet size** – CIS packet size should be set at minimum to the same value as the target ASE page size. Setting it to twice the target ASE page size has generally been observed to give good results.
- **CIS bulk insert batch size** – Controls the number of rows after which data is committed. The default value is 0. If CIS bulk insert batch size is set, only partial data migration will occur if the process encounters an error. In that case, truncate the table on the target server and restart the process.

On the **target Red Hat-based Sybase ASE server**, configure the following parameters to optimize migration performance:

- **Number of user connections** – Should be set up to accommodate the migration of multiple tables and partitioned tables. For parallel data transfer of partitioned tables, worker processes are required on the source table and user connections are required on the target server.

**Number of user connections = # of copy data threads + # of copy index thread**

- **Number of sort buffers** – The default value of 500 is sufficient during data transfer, but this parameter should be tuned for index creation on the target server. This parameter controls the number of buffers in cache that can be used to hold pages from input tables. In parallel sort, the number of sort buffers for each consumer thread equals sortbufsize divided by the number of consumer threads. If the number of sort buffers is less than number of consumer threads, parallel sort is not considered. In our test case, this parameter was set to 2500.
- To enable conversion of character sets that do not have internal Adaptive Server conversion routines, the target server must be configured with the allow Unicode conversion parameter set to 1. Use the following command:  
**Sp\_configure “allow Unicode conversion”, 1**

- **select into/bulkcopy/pll sort option** – Set this with the sp\_dboption stored procedure. Use the following command:  
**sp\_dboption target\_db, “select into/bulkcopy/pll sort”, true**

Remember to turn the option off after the bulk copy operation completes, if it is not further required.

- **Number of worker processes** – To take advantage of parallel index creation, set this parameter to an adequate number of worker processes.
- **Max parallel degree** – If the tables are partitioned on the source server, then max parallel degree should be set to a value that is larger than the largest number of partitions in the single tables. If the value is not set high enough, migration of these tables will fail.
- **Max Network Packet Size** – Must be set at least to the same value as 'cis packet size' configured on the source server.

The following parameters can be set in sybmigrate to optimize migration performance:

- **data\_Copy\_Threads** – Number of threads used for data migration. Default value is 6. In the test case, this value was set to 24.
- **create\_index\_threads** – Number of threads used to create indexes on the target server. Default value is 1. In the test case, this value was set to 8.
- **SYBMIGRATE\_MEMORY** – Amount of memory used to invoke JVM. Default memory setting is 512MB.

If a large amount of data on the source database is concentrated in a few large tables, consider partitioning these large tables. Typically such partitioning can be easily accomplished as part of a regular maintenance procedure on the source database. Partitioning the table on the source server will enable migration of the table in parallel, and the create index operation will be able to take advantage of parallel index creation. Sybmigrate provides the ability to start more than one session. A user can start a first session with selected tables to analyze the load on the target server, then examine the load on the source and target systems and start additional sessions to make full use of the resources on the source and target servers.

### **Alternate Migration Options**

If the source Adaptive Server is not at version 12.5.0.3, or to avoid using the sybmigrate utility for any reason, use alternate procedures to accomplish migration to Red Hat Enterprise Linux. These procedures typically require the following steps:

1. Migrate the database structure.
2. Migrate the application's data.
3. Ensure that administrative and security procedures are adequate for the new server.

### ***Migrating the Database Structure***

The purpose of this procedure is to complete the migration of the databases to the Adaptive Server on Linux. Perform the steps that follow to create a database schema that can be populated with application data and then used by applications. The outcome should be an entire empty database structure that is ready to support the application:

1. Obtain the DDL used to create the database objects. If the original scripts are not readily available, use a DBA tool such as DDL Gen or Embarcadero DBArtisan, or a CASE tool such as PowerDesigner® from Sybase, to reverse-engineer them.
2. Use the DDL scripts to recreate the database structure by running them against the new Adaptive Server.

### ***Migrating Data***

There are several fairly easy ways to extract the Adaptive Server data from one server to another. The choice of method depends upon the amount of data to be moved and the budget available for support tools:

- Use the Adaptive Server PowerTransfer tool to stream data from the Adaptive Server on UNIX to the server on Linux
- Use bcp to extract each table into a text file in character mode (with the '-c' and '-6' options) and then use the Adaptive Server bcp utility to load the data from the files
- Use the Sybase InfoMaker tool and its Data Pipeline feature to move the data between the Adaptive Server systems
- Use a third-party product to extract the data into files or to move the data between Adaptive Server systems

In the case of some export approaches (for example, using bcp), the import and export steps are separate. In general, before performing the import, remove indexes, trigger, and constraints from the tables in the Adaptive Server to make the import execute as rapidly as possible. Reapply the constraints, rebuild the indexes, and recreate the triggers after the import is complete.

#### ***Reviewing Security and Administrative Procedures***

During migration of the database structure, the object-level security and administration procedures for the application environment are migrated to the new Adaptive Server. The database should now have adequate security for the application's needs, and it should be possible to administer the environment effectively. Therefore, the database server should be ready to accept application data and be used by the application.

At this point, it is important to review any security-related statements (such as GRANT and REVOKE permissions on the database objects to users, groups, and roles) that are part of the application and to check any other areas of the application that manipulate security-related objects.

#### **Migration Process Summary**

The migration of Adaptive Server from Solaris to Red Hat Enterprise Linux is a fairly simple and straightforward process. The sybmigrate migration tool provided by Sybase eases the migration task by reducing the amount of scripting required and the knowledge required about the structure of the database to be migrated. This allows for quicker, error-free migration. The migration performance can be significantly boosted by tuning the sybmigrate scripts and the source and target Adaptive Server systems. Sybmigrate cannot be used if the Solaris source server is not at version 12.5.0.3 of Adaptive Server Enterprise. In this case, consider upgrading the source Adaptive Server to 12.5.0.3 first or use an alternate migration option.







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