MIGRATE YOUR LEGACY IBM® DATABASE ENVIRONMENT TO THE LATEST ORACLE® TECHNOLOGIES

MOVING TO ORACLE SOLARIS™ WITH ORACLE DATABASE 11^g FROM IBM AIX® WITH DB2® ON AN IBM POWER® SYSTEM

A migration guide commissioned by Intel Corp. and Oracle

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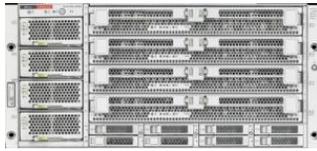
Sun Fire X4800

With its ability to yield significant benefits such as increased performance, reduced implementation time and reduced costs, Oracle's Sun Fire™ X4800 Server is an excellent system for upgrading critical applications running on IBM® AIX Power® Systems to Oracle® Solaris™. Migrating to Oracle's Sun Fire X4800 Server powered by the Intel® Xeon® Processor 7500 series is a straightforward process that highlights some of these benefits. Such a migration also presents opportunities for server consolidation that can reduce server footprint in the datacenter resulting in lowering hardware, maintenance, and support costs.

To help you evaluate options for replacing your older IBM AIX Power systems (such as an IBM Power 5), Principled Technologies (PT) has performed hands-on testing and research of a migration to the Intel Xeon platform.

The Sun Fire X4800 Server, based on the Intel Xeon Processor 7500 series, is a much more capable system than the IBM Power system we tested. (See Appendix A for detailed system information.) The Sun Fire X4800 Server is an expandable four- to eight-socket server supporting up to 64 processor cores, 1 TB of RAM, and over 2 TB of internal storage. With Intel's latest Intel Xeon Processor 7500 series, we see even greater functionality and an even greater performance increase over the Intel Xeon Processor 7400 series. In addition, we expect to see a greater ability to configure high-availability systems with the support of hot-swappable I/O, disks, service processor, cooling fans and power supplies.

Oracle Solaris provides features and flexibility—all on industry-standard x86 hardware. We describe below some of the Oracle Solaris features, such as Predictive Self Healing, and Oracle Solaris Containers.

Scope of this Guide

This Guide reviews the approach that we recommend for planning and implementing the migration of applications on an IBM Power System running AIX to Oracle's Sun Fire X4800 Server with the Intel Xeon Processor 7560 running Oracle Solaris Operating System (OS). We explain how to move a sample application with an IBM DB2 database on an IBM Power System to an Oracle Database 11*g* Release 2 on a Sun Fire X4800 Server running Oracle Solaris 10. We also explain how to install Oracle Solaris 10 and Oracle Database 11*g* Release 2 on the Sun Fire X4800 Server and migrate user databases from the IBM Power System to the Sun Fire X4800 Server.

A move that will yield real benefits

This migration has the potential to deliver considerable cost and performance benefits. The combination of the Intel Xeon Processor, which is based on the industry-standard Intel Architecture, and the Oracle Solaris operating system will let you boost performance while lowering costs. Current IBM Power-based systems typically have a high ratio of price to performance because they are expensive to purchase and maintain The Oracle Sun Fire Server with Intel Xeon processors is less expensive to acquire, easier to maintain, and less expensive to support than an IBM Power-based system.

Features of the Sun Fire X4800 Server with the Intel Xeon Processor 7500 series

The Sun Fire X4800 Server is excellent for consolidation, virtualization, running database applications, and running enterprise high-performance computing applications. Its 5RU form factor provides enterprise-class configurations: up to 64 processing cores, and 1 TB of RAM (in 128 slots). Additionally, it supports up to eight internal SAS disk drives, two Flash module (FMOD) slots, and up to eight hot-swappable PCIe 2.0 ExpressModule slots. Its available RAS features, including Oracle Integrated Lights Out Manager (ILOM) running on a hot-swappable server processor module, add to the impressive features of this powerful, highly expandable server.

With four times the memory capability of its predecessors and the capacity for up to 16 DIMMS per CPU socket for a possible total of 128 DIMMS, this machine proves an effective replacement for more expensive, larger reduced instruction set computing (RISC) systems. With the addition of MCA Recovery, the processors will have error-correcting capabilities to detect system errors originating in the CPU or system memory and will work with the operating system to correct them. In addition, the newer processors and systems are even more power efficient, providing even better performance while consuming less energy depending on the configuration.

The Intel Xeon Processor 7500 series itself provides plenty of headroom for consolidation via virtualization of business-critical applications. The Intel Xeon Processor 7500 series offers a threefold performance increase on benchmarks compared to earlier processor generations and can be expected to replace 20 single-core servers with one new system.[1] Additional features include up to 24 MB of L3 cache and a reduction in power consumption through the use of power saving modes, or increases in

[1] Extracted from the Intel Xeon Processor 7500 series press release at http://www.intel.com/pressroom/archive/releases/2010/20100330comp_sm.htm

performance through the use of Intel's Turbo Boost feature, which allows for dynamic clock speed increases when environmental conditions and workload allow.

Features of Oracle Solaris 10

Oracle Solaris 10 introduces a wide variety of features. Some of the Oracle Solaris 10 features, such as Oracle Solaris Containers, which offers operating system-level virtualization, are not available in AIX 5L, but are comparable to Workload Partitions (WPAR), offered as a standard feature starting with AIX 6. Furthermore, there is usually a cost associated with purchasing different components for AIX, while most Oracle Solaris features are either included or free to download. Most of these key features can save you time and money while giving you better functionality in your operating system. While there are far too many features to discuss in this guide, the following list mentions some of the more significant ones associated with Oracle Solaris 10:

Oracle Solaris DTrace. Oracle Solaris 10 provides a comprehensive view of application and operating system activity. In a single scriptable tool, Oracle Solaris DTrace allows you to examine both kernel and user-level activity. Oracle Solaris DTrace was designed to run on live production servers with often negligible impact on performance. Per Oracle's documentation, for probes that are never enabled, there is no performance impact at all.

Oracle Solaris Containers. Oracle Solaris 10 provides operating system-level virtualization. Solaris Containers combine the isolation of Solaris Zones with resource controls. Because Solaris Containers are not bound to processors or host bus adapters (HBAs), they can be configured dynamically. If an application requires a separate processor, the container can be assigned one. Additional features of attach, detach, and clone make it easier to get different applications or databases up and running quickly without affecting a production environment. In addition, Oracle Solaris Containers can be used inside VMware® to extend and complement the features of virtualization of both products.

When migrating, you may want to take advantage of this virtualization feature to create separate containers in which you can install the application, database, or multiple database instances. This will allow greater isolation and flexibility in security, services, and administration. The added ability to clone zones greatly expedites setting up and installing multiple containers, therefore decreasing your migration time if you choose to take advantage of these containers. Oracle Solaris Containers also provide enhanced Physical to Virtual (P2V) capabilities to allow administrators to seamlessly move from existing Oracle Solaris 10 physical systems to a virtual container quickly and easily.

Predictive Self Healing. Oracle Solaris 10 can diagnose and assist in the recovery from many hardware and software problems. The Oracle Solaris Fault Manager can automatically detect many hardware and application problems, while the Oracle Solaris Service Manager gives administrators a uniform interface for managing application services.

Oracle Solaris Trusted Extensions. Oracle Solaris 10 includes security capabilities that were formerly available only in the Oracle Trusted Solaris product. These allow combined mandatory access control with fine-grained control of user privileges.

Service Management Facility. A replacement for UNIX init.d scripts, the Service Management Facility gives administrators a single interface for managing software services. Among the features it provides is the ability to limit the privileges available to a service, thus allowing non-root users to do more tasks.

Fault Management Architecture. This Oracle Solaris 10 feature provides automated diagnosis of hardware and can take proactive measures to correct hardware faults it may find on the system. Features include the ability to offline memory pages or take a faulty CPU offline if the agent deems necessary.

Oracle Real Application Clusters (RAC). Oracle Solaris 10 also provides networking and database optimizations for Oracle RAC. These allow tighter integration into the high availability offered by the clustered environment.

Outside of possibly using Oracle Solaris Containers for installation, most of these features do not have a direct bearing on migrating from one system to another or database migration, but do offer great benefits in administering the systems once implemented.

Planning the migration

This section reviews some of the topics you should consider prior to migrating your platform and any applications.

Considerations for moving your applications

Java-based applications

Sun developed the original Java language in the 1990s and, continuing on through its acquisition by Oracle, has maintained a strong commitment to Java ever since. Because Java applications run in a Java Virtual Machine, they are largely machine-independent and run as is in the Oracle Linux for x86 (64-bit) environments.

A note about application data

You should never simply copy the raw data files from one system to another system of a different architecture. The data formats that applications write to disk are not generally portable. Bit orders, padding, and alignment are examples of elements that can differ as you move from one system to another. Most applications, however, provide some ability to back up or export data to portable formats. For example, DB2 provides portable export formats that Oracle Solaris can import. The restore/import process on the target system is likely to resolve any issues with the data layout. In our example, we show how easy this process is by using the Oracle SQL developer tools that take advantage of the performance of the system.

Considerations for moving platforms

Application compatibility

One benefit of moving from the IBM AIX to Oracle Solaris is a greater range of available applications. Before migrating, make sure that your other AIX applications have an Oracle Solaris version, or that you can find compatible programs. On the x86 platform alone, there are already close to 8,000 applications available for Oracle Solaris 10.[2]

Difference in operating systems

Oracle Solaris and AIX are both UNIX-based operating systems, and both are derived from BSD UNIX and System V. However, there are differences in the way that they operate, both in some of the commands and in the configuration files.

For a quick reference guide to commands, refer to Rosetta Stone for Unix (http://bhami.com/rosetta.html). All the Oracle Solaris System

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[2] Oracle Solaris 10 Applications Library – Oracle Partner Network – Solutions Catalog http://solutions.oracle.com

Administrator documentation is freely downloadable at
http://docs.sun.com/app/docs/coll/47.16.

Considerations for moving your database

Database administration

A key benefit for moving from IBM DB2 to Oracle Database 11*g* is in the
ease and fewer operating steps involved in the administration of your
database, including installation and day-to-day tasks. Oracle Database 11g
has a single point of management in its Oracle Enterprise Manager tool,
where IDM DB2 has a Command Center that gives access to individual
consoles. The Oracle Enterprise Manager can also be accessed via a Web
interface while the DB2 Command Center console tools must be installed at
the client.

Inexpensive disk storage

The Automatic Storage Management (ASM) that is part of Oracle Database
11*g* lets you greatly reduce related storage cost. A prime example is that of
benefiting from the decreasing price of high-volume, low-cost SATA drives.
You can utilize many different storage options and can even configure your
existing storage.

NOTE

The Sun Fire X4800, as tested, does not qualify SATA drives at this time, and
we are mainly referring to options with external storage and the potential
for utilizing your existing inventory.

Another option to consider is the Sun Storage F5100 Flash Array, which
offers faster I/O and a lower total cost of ownership (TCO). Designed to
accelerate database applications and cut transaction times in half, it can
greatly increase your database performance while also lowering energy
cost.

Limitations

Depending on the complexity of the application and size of your data, you
should consider several factors when using the Oracle SQL Developer Tool.
Stored procedures and functions may not port easily and may need to be
rewritten to run in Oracle Database 11g. Very large databases will take more
time to process, which leads to longer downtime for migration and possibly
a different manual method for moving the data, which increases the time
and complexity of the migration.

Moving from IBM AIX to Oracle Solaris 10

In planning the move, keep the following key issues in mind:

- Database size/storage

- Downtime
- Method for migrating the database
- Complexity of the applications and any related stored procedures that may reside in the associated database

All of these points are interrelated and relevant to a successful migration.

Database size/storage
Make sure your storage is adequate to accommodate the current size of your data and, if using the same storage, you need room to host both existing data and new data that will be converted.

Downtime
The associated downtime greatly depends on the amount of data and complexity of applications to be moved. In most cases, you will be able to get both systems operational and plan for when the final data will be migrated.

Method of database migration
In most cases, using Oracle's Development Tool is sufficient and very easy to use, as our example demonstrates. If your databases are fairly large, a more manual process may be required in exporting and importing the data, using command-line tools on each database server.

Complexity of applications
More complex applications and large terabyte databases may require assistance from Oracle Services and Support.

Installing and setting up Oracle Solaris 10 and Oracle Database 11*g* Release 2

In this section, we focus on how to install and set up Oracle Solaris 10 and Oracle Database 11*g* Release 2 on the Sun Fire X4800 Server. We begin by defining the specific environment we used in our work. Next, we present an overview of the steps needed to configure both Oracle Solaris 10 and Oracle Database 11*g* Release 2.

Configuring the IBM storage

Overview

Oracle Database 11*g*'s Automatic Storage Management, or ASM, relieves administrators of much of the responsibility for allocating and managing storage. (Appendix B provides more detail.)

We used the existing IBM disk array for our configuration. We split it into two LUNs and used the second LUN for our ASM drive.

NOTE

Plan on at least 45 minutes for completing the drive configuration.

Oracle recommends that you allocate an amount of swap space equal to three-quarters of the RAM for servers with more than 8 GB of RAM.

Installing Oracle Solaris 10

One of the benefits when purchasing a system from Oracle is the option to have Oracle Solaris 10 pre-installed from the factory. For those who elect not to take advantage of this benefit, this section provides an overview of the operating system installation process. (Appendix C provides complete, detailed installation instructions.) We downloaded the operating system from Oracle's Web site (http://www.sun.com/software/solaris/get.jsp) and burned DVDs from which we installed. The installation of the Sun Fire X4800 Server is accomplished by utilizing the integrated ILOM Remote Keyboard/Video/Mouse functionality, providing a remote graphical console connected via the ILOM management network interface to install the operating system. Please see the Sun Fire X4800 Server Installation Guide (http://docs.sun.com/app/docs/doc/821-0285?l=en) for setup information.

NOTE

Estimated time for completion ranges from 40 minutes to 2 hours. Each step below takes at least 1 minute.

1. Insert the Oracle Solaris 10 DVD into the DVD drive of the machine connected to the NIC management port, and reboot the system. Several command-line options for the Oracle Solaris install will

appear. Select the default to run an interactive graphical installation.

2. Select English as the language, and respond to the tests for screen legibility. These tests time out after 30 seconds, at which point Oracle Solaris reverts to a command-line installation. Then, configure your network information, as well as time and date. (See Figure 1.)
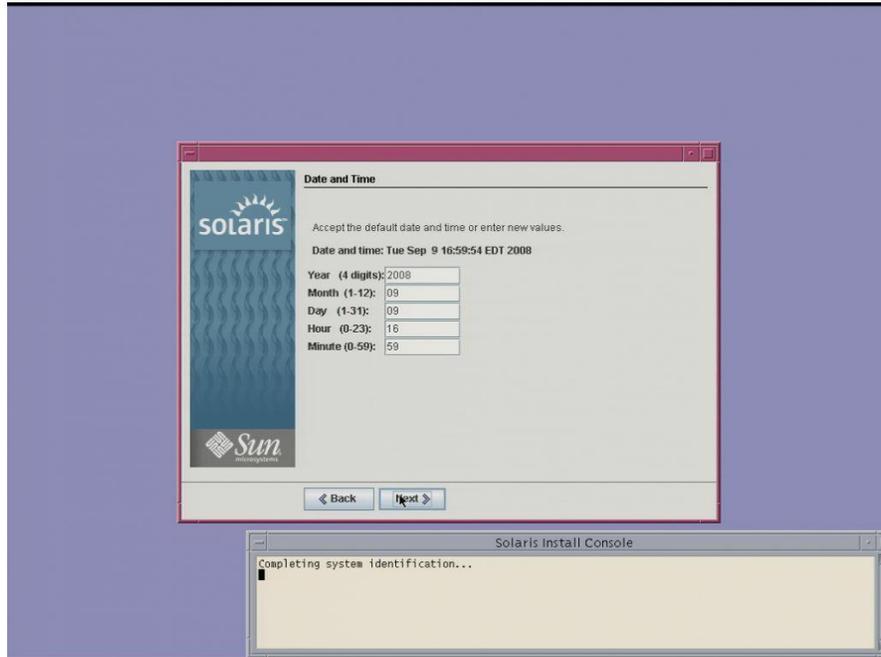
Figure 1. Confirming time and date.

3. Set the root password, and then verify and confirm all your information. Accept the license agreement, and choose to perform an initial, custom install. Select the character set and products you want to install.
4. Select and customize your disk layout. When you are done, you should see a screen similar to Figure 2. Review your information, and click Install Now to start the installation.
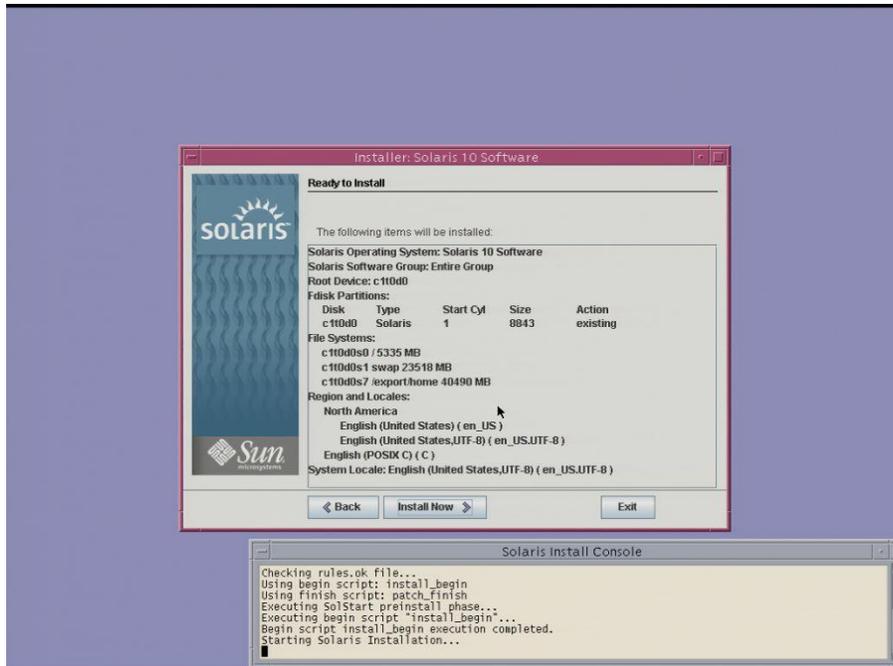
Figure 2. Ready to install.

TIP

When the system reboots, remember to eject the disk. Otherwise, Oracle Solaris 10 will try to install itself again.

5. After the system finishes booting, log on as root, and select your desktop.
6. Configure all database servers with static IP addresses. Doing so assures that Oracle Database 11*g* resources remain available even in the event of a DHCP server failure. It also increases the stability of your networking and DNS environments.

Installing Oracle Solaris 10 patches

For new Oracle Solaris 10 installations, refer to the following instructions for an overview. For more detailed instructions, or to install a specific patch, please refer to Appendix D.

1. Go to the Patch Cluster & Patch Bundle download page of the SunSolve Web site (found at http://sunsolve.sun.com/show.do?target=patches/patch-access), and download the most recent patch cluster.
2. Unzip the patch cluster, and change the system to single-user mode to prevent complications.
3. Type `./install cluster` to install the Recommended Patch Cluster.

Oracle Database 11*g* Release 2 pre-installation tasks

Before you can install Oracle Database 11*g* Release 2, you must first perform a number of preliminary tasks. For further details, see *Oracle Database Installation Guide 11g Release 2 (11.2) for Solaris Operating System (x86-64)*, Chapter 2: Preinstallation tasks, at http://download.oracle.com/docs/cd/E11882_01/install.112/e10848/pre_install.htm#BABFDGHJ.

We provide detailed instructions for these tasks in Appendix E.

NOTE

Our server met many of the prerequisites for installing Oracle Database 11*g* Release 2, so we do not discuss checking those prerequisites in our document. The Oracle document we cite above covers that topic in detail.

Configuring the data drives

The next step is to prepare the data drives for Oracle Database 11*g* to use. We used the Oracle Solaris format utility to do the following to each disk:

1. Use format's `fdisk` command to create an Oracle Solaris partition on the disk.
2. Use format's `partition` command to edit the partition table.
3. Label the disk to make the changes permanent.
4. Once the format utility finishes, use the Oracle Solaris `chown` and `chmod` commands to give the Oracle Solaris account rights and ownership to slice 6 on each configured disk.

Installing Oracle Database 11*g* Release 2 on the Sun Fire X4800 Server running Oracle Solaris 10 OS

We provide an overview of installing Oracle Database 11*g* Release 2 here. For detailed instructions, see Appendix F. We downloaded the following files from http://www.oracle.com/technology/software/products/database/index.html, copied them to the Sun Fire X4800 Server, and unzipped them locally:

- solaris.x64_11gR2_grid.zip
- solaris.x64_11gR2_database_1of2.zip
- solaris.x64_11gR2_database_2of2.zip

1. Working as the Oracle user, go to the directory where you unzipped the Oracle Grid Infrastructure 11*g* R2 distribution, and type `./runInstaller` to start the Oracle Universal Installer.
2. Select the option for doing a Grid Infrastructure installation. (See Figure 3.)

NOTE

The command is case-sensitive, and the `./` prefix is necessary.
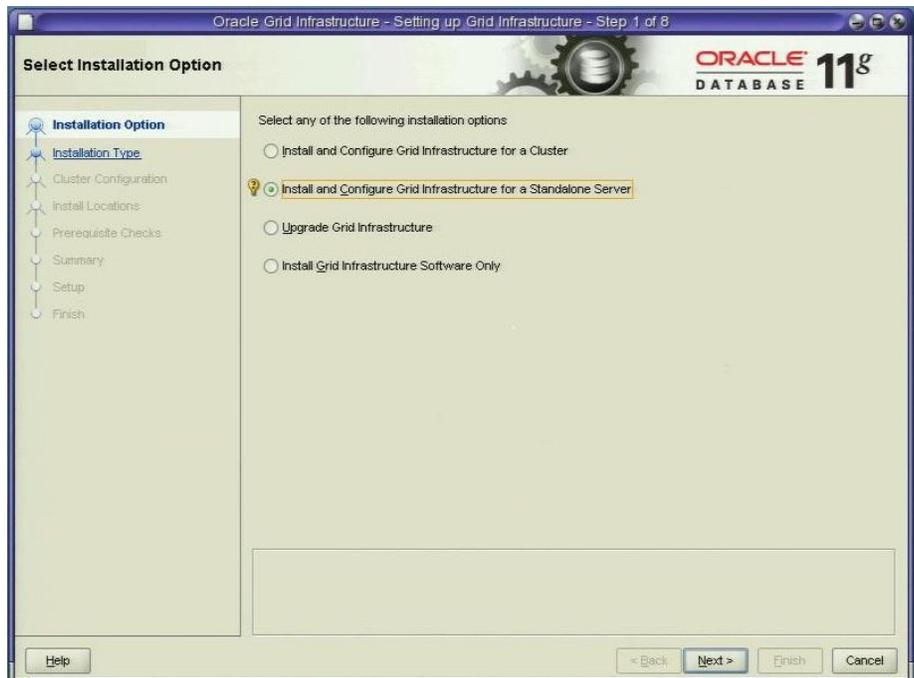
Figure 3. Installing and configuring Grid Infrastructure.

3. Accept the defaults on the next few screens.

NOTE

On the Product-Specific Prerequisite Checks screen, we received one warning that some of our kernel settings were above, rather than at, the values the install checked for. If you receive such a message, ignore it.

4. Review your settings, and start the installation. (15 minutes)
5. At the End of Installation screen, click Exit, and click Yes to confirm that you really want to exit.
6. After the installation completes, go to the directory where you unzipped the Oracle Grid Infrastructure 11*g* R2 distribution, and type `./runInstaller` to start the Oracle Universal Installer.

NOTE

As before, the command is case-sensitive, and the `./` prefix is necessary.

7. Accept the defaults for the next several screens.
8. Review the settings for the database installation, and start the installation. (See Figure 4.) (15 minutes)
9. When the progress bar completes, the install asks you to run two more scripts as root. Open a terminal as root, and cut and paste the paths to the scripts into the command line terminal. Click OK.
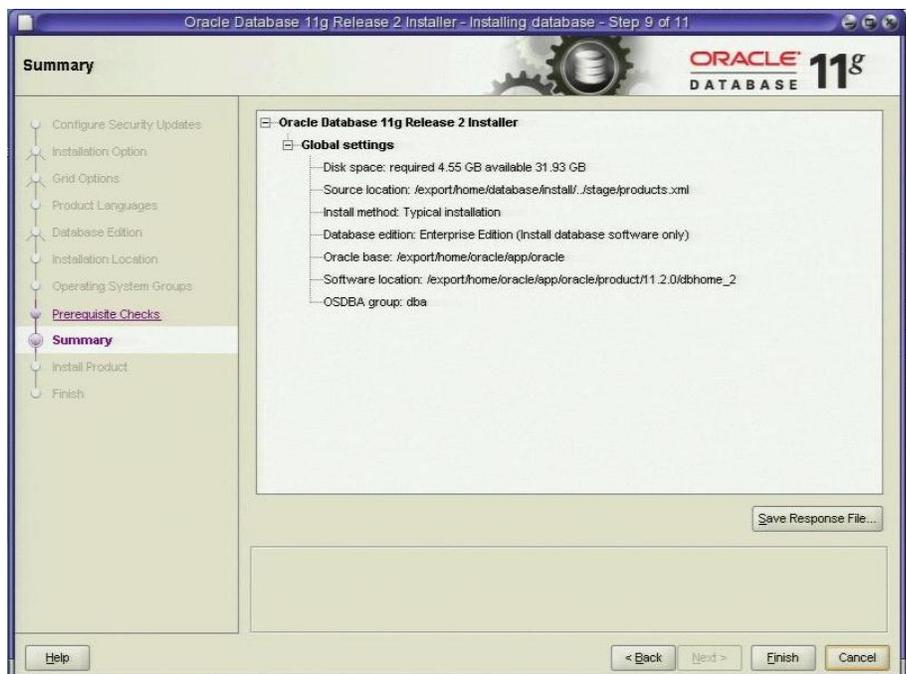
Figure 4. Review the database settings.

10. At the End of Installation screen, click Exit, and click Yes to confirm that you really want to exit.

1. After exiting, set your Oracle Database 11*g* environment variables as we describe in Appendix E. From a command prompt, type `dbca` to launch the Database Configuration Assistant. (See Figure 5.)
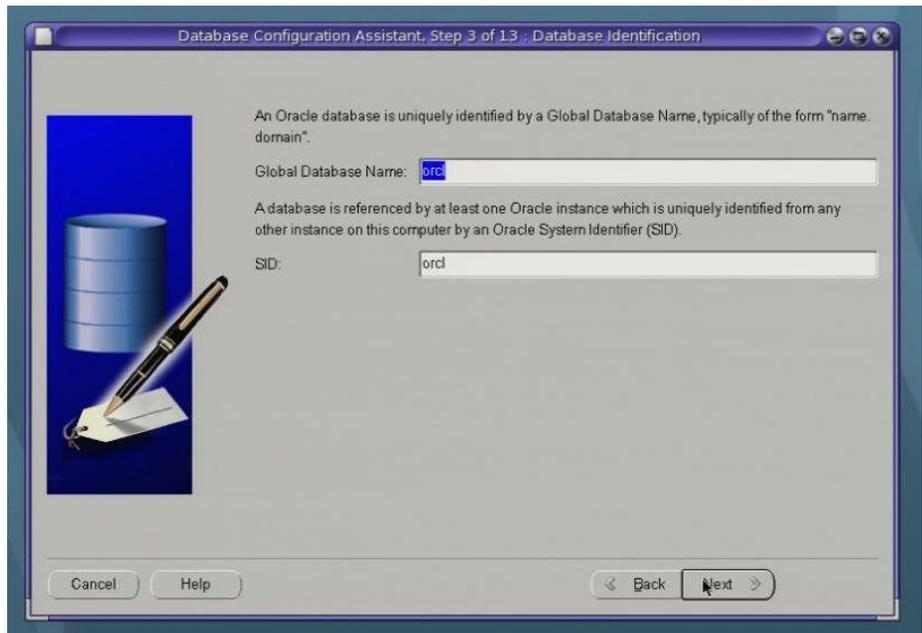
Figure 5. Naming the database.

2. Accept the defaults for the Management Options, enter a password for the database, and select ASM for the storage. Enter the ASM password, and select the diskgroup you selected earlier.
3. Accept the default for the remaining screens, and click Finish. (30 minutes)
4. When the "Database creation complete" screen appears, click Exit.

Migrating the Oracle Database 11*g* database

In this section, we provide details about migrating an IBM DB2 user database. We demonstrate the ease of this process by moving a sample application and database running on IBM AIX 5L V5.3 to Oracle Solaris 10 and Oracle Database 11*g* Release 2 on the Sun Fire X4800 Server using Oracle's SQL Developer Migration Tools. We include a more detailed process in Appendix G. The Oracle SQL Developer is an excellent tool for helping manage Oracle databases and database migration. Depending on the size and complexity of your application and data, you should also consider using the services available through Oracle Service and Support.

Migrating your data

For our example, we used Oracle's SQL Developer Migration Tools application, which is a free download from Oracle's Web site at http://www.oracle.com/technology/software/products/sql/index.html. We provide detailed instructions in Appendix G. For more information on the sample application and database, please refer to Appendix A, where we define our test environment.

NOTE

Oracle refers to the user data and its associated metadata as *schema*. We use that term where appropriate.

1. Export and convert your IBM DB2 database. Create a set of offline capture scripts using SQL Developer. Go to Tools→Migration→Third party database offline capture→Create database capture scripts. It then prompts you for a location to store the exported files. (See Figure 6.)
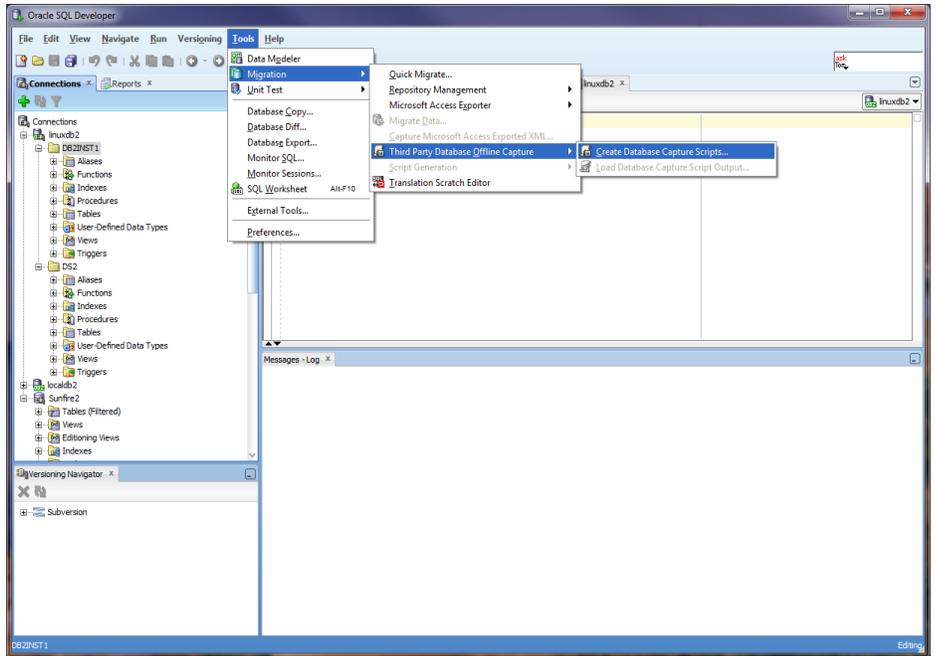
Figure 6. Oracle SQL Developer Generate Database scripts for DB2 to Oracle Database 11*g* R2 migration.

2. Copy files to database server, and run the startDump.sh that was created from the location the files were copied to. This will generate folders and DAT files containing the schema and table structures for the database you selected.

3. Copy files back to the Oracle SQL Developer machine and load files to generate captured model by going to Tools→Migration→Third party database offline capture→Load database capture script output…

4. Convert the IBM DB2 model to an Oracle Database 11*g* model. Right-click the captured model, and select Convert to Oracle Database 11*g* Model.

5. Create and run the `unload_script.sh` to extract the data from the database on the source machine and store the data in a delimited ASCII file. Doing so also generates the control files that the SQL*Loader will use to import the data back into the correct location on the target server.

6. Copy all files to the target server in a directory.

Importing the database into Oracle Database 11g Release 2

1. Generate the scripts for creating the database and schema by right-clicking Converted Model and selecting Generate. This displays the script in the right pane.

2. From the drop-down list on the top right corner of the workspace pane, select the connection where the user has privileges to

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execute the scripts, create users, and grant privileges. Right-click, and select Run Script.

3. On the Sun Fire X4800 Server, take the following step: Using Oracle SQL Developer, import the offline exported data. It should automatically create the appropriate schema and data. See Appendix G for details.

NOTE

Once your import is complete, check your database and verify that all the components imported correctly. You may have to correct some problems. For example, we had to recompile some of our procedures.

Post-migration considerations

After you have completed your side-by-side migration, you will typically need to perform some additional tasks. Your specific list of post-migration tasks will depend heavily on your pre-migration research and planning. In this section, we briefly discuss a few of the most common tasks, but this list is not comprehensive. For more information, see http://download.oracle.com/docs/cd/E11882_01/server.112/e10819/afterup.htm#i1008954.

Environmental and configuration changes

Updating environment variables. In the Oracle Solaris environment, you will need to make sure that the following environment variables point to the new Oracle Database 11*g* directories:

ORACLE_HOME
PATH
ORA_NLS10
LD_LIBRARY_PATH

Connecting to the database. Oracle Database 11*g* has several connection methods. Locally, there is SQL*Plus, accessible by typing `sqlplus` in a properly pathed terminal. On a client machine, you can use xclient or Oracle's freely available database tool, Oracle SQL Developer, to connect to the database.

Creating new users. While the export scripts will move the schema and data from your AIX server to your Sun Fire X4800 Server, it will not move users. You will have to create new users for your database. You can create new users in SQL*Plus with the following command:

```
SQL>CREATE USER username IDENTIFIED BY password;
```

You can modify user privileges with the following command:

```
SQL>GRANT privilege1, privilege2, ...
TO user1, user2, ...;
```

Updating SSL users. If you have externally authenticated SSL users, you must upgrade them as well. Do so with the following command:

```
$ORACLE_HOME/rdbms/bin/extusrupgrade --
dbconnectstring <hostname:port_no:sid> --dbuser <db
admin> --dbuserpassword <password> -a
```

Changing passwords on DBA accounts. Oracle recommends you change the passwords on all Oracle Database 11*g* -supplied accounts. One good way to make sure this happens is to lock all those accounts, except for SYS and SYSTEM, and then set their passwords to expire immediately. This technique forces users to change those passwords the next time they log into those accounts.

You can use following SQL statement to check the status of the accounts:

```
SQL> SELECT username, account_status
FROM dba_users ORDER BY username;
```

To cause passwords to expire, issue the following SQL statement:

```
SQL> ALTER USER username PASSWORD EXPIRE ACCOUNT
LOCK;
```

Updating the initialization parameter file. Tuning may be required on the database based on the load and utilization metrics of the system. This can include reviewing and making changes to your init.ora parameter file to make changes necessary to support your particular system.

Oracle Database 11*g* performance tuning. To get an additional boost in performance, you may want to consider some best practices like partitioning and compression. For performance tuning details, please see the Oracle Database Performance Tuning Guide 11*g* at http://download.oracle.com/docs/cd/B28359_01/server.111/b28274/toc.htm.

Backing up your database

After the successful migration of the DB2 database from the AIX environment to the Oracle Solaris/Oracle Database 11*g* R2 environment, you should make a full backup of your production database. This will ensure that you do not have to repeat the import should any problems occur. It will also serve as a baseline for all future backups. Oracle provides excellent tools in Recovery Manager (RMAN) and using the Enterprise Manager to configure RMAN backups in just a few clicks. Please see the Oracle Database Backup and Recovery User's Guide for detailed information at http://download.oracle.com/docs/cd/E11882_01/backup.112/e10642/toc.htm.

Summing up

Moving your IBM DB2 on AIX Power Systems to Oracle Database 11g on Oracle's Sun Fire X4800 Server with the Intel Xeon Processor 7560 can provide better performance at a lower cost, as well as lower maintenance and support costs for hardware.

Considerations

Although moving across platforms, moving applications, and moving databases can be challenging tasks, moving to Oracle Solaris on the Sun Fire X4800 Server from IBM AIX and DB2 can be a manageable effort considering the size of application and databases. The hardware and operating system are easy to configure, and, with proper planning, migrating applications and data is straightforward. As we have demonstrated in this Guide, the process of deploying these products on a Sun Fire X4800 Server, including migrating your database to the Oracle Database 11*g* R2 environment, can take less than a day. Spending time planning can help you avoid potential problems during your migration. Please note that larger terabyte size databases or more complex applications may require Oracle Service and Support.

Conclusion

The most significant benefits of changing platforms are better performance and a lower price tag for comparable systems. Lower energy consumption and the possibilities of virtualization further reduce the server footprint in the data center. Whether you are replacing existing systems or establishing an original installation, the Intel Xeon Processor 7500 series running in the Sun Fire X4800 Server is a good combination for a low-cost, high-performance system. You will also find that the extremely efficient database administration of Oracle Database 11*g* reduces costs associated with day-to-day administration.

The Automatic Storage Management feature of Oracle Database 11*g* can assist in managing your database storage. Additionally, you can reduce your time associated with administrating the operating system and the database by using the inherent and freely downloadable features available from Oracle. Tools such as the Oracle SQL Developer and the Oracle Systems Management console will make any migration and administration more manageable and will prove to be great assets.

The Intel Xeon Processor 7500 series on the Sun Fire Server can provide better performance while also reducing costs. The combined performance enhancement coupled with the added benefits of the OS and database administration features will help solidify and capitalize on this investment, which is much less than that for comparable IBM Power systems.

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Information in this document is subject to change without notice.

Appendix A. Defining the test environment

Our test bed starting point consisted of an IBM System p5 505 Express server running AIX 5L V5.3 and DB2 connected to an IBM TotalStorage® DS4300 storage array. Our destination server was Oracle's Sun Fire X4800 Server running Oracle Solaris 10 Operating System for x86-based systems (64-bit) and Oracle Database 11*g* Release 2 Enterprise Edition for Oracle Solaris on x86_64-based systems. We connected all components via a gigabit switch. Figure 7 illustrates our setup.
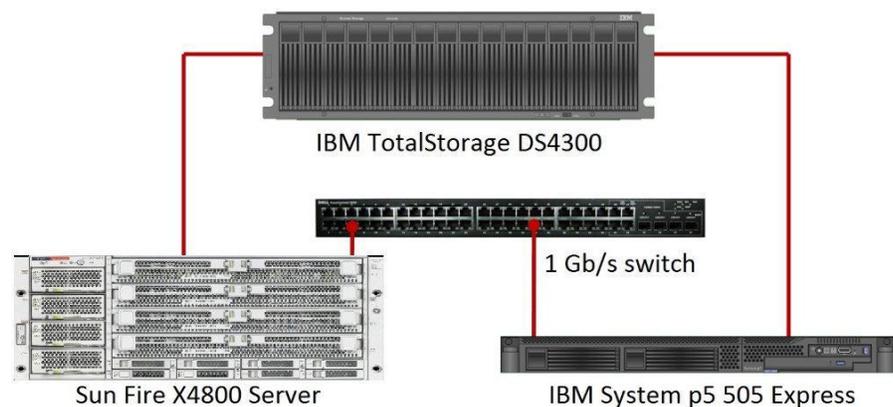
Figure 7. The setup we used in our hands-on testing and research for this Migration Guide.

TIP

Use the latest tested and validated software, firmware, and driver versions for NICs, storage arrays, and other components. You can find these software components at http://wikis.sun.com/display/SystemsComm/Sun+Fire+X4800+Server+-+Downloads+and+Firmware.

Figures 8 and 9 present the hardware and software we used in our Oracle Database 11*g* servers.

Server	Processor	Memory	Disk
IBM System p5 505 Express	2 x POWER5 2.1 GHz	16 GB	2 x IBM 80P6321, 10K SCSI, 146 GB
Sun Fire X4800	8 x Intel Xeon X7560 2.26 GHz	256 GB	8 xSAS, 10K , 300 GB

Figure 8. Servers we used in our hands-on testing and research for this Guide.

Server	Server operating system	Database version
IBM System p5 505 Express	AIX 5L V5.3 operating system	DB2 Enterprise Edition 9.1 AIX systems (64-bit)
Sun Fire X4800	Oracle Solaris 10 10/09 operating system for x86-based systems (64-bit)	Oracle11*g* R2 Enterprise Edition Release 11.2.0.1.0 for Oracle Solaris on x86-64 based systems

Figure 9. Software we used in our hands-on testing and research for this Guide.

For our test data, we migrated a 20GB database that we generated using the DVD Store Version 2 (DS2) test tool. (For more information about DS2, please see http://www.delltechcenter.com/page/DVD+Store.)

Appendix B. Methodology: Configuring the IBM storage

Allow at least 45 minutes to prepare the disks.

1. Using IBM DS Storage Manager (http://www-947.ibm.com/systems/support/supportsite.wss/docdisplay?lndocid=MIGR-5082865&brandind=5000028), right-click the attached storage subsystem, and select Manage Storage Subsystem.
2. In the new window that opens, right-click Total Unconfigured Capacity in the Logical pane on the left, and select Create Logical Drive.
3. In the Introduction window, select Next.
4. In the Specify Array window, choose your RAID level (we chose 5), select the number of drives you wish to add to the array (we chose the maximum allowed), and select Next.
5. If an informational window about selecting drive space appears, click OK to continue.
6. In the Specify Capacity/Name window, accept the default of the maximum available capacity, name your logical drive, and select Next.
7. In the Specify Logical Drive-to-LUN Mapping window, make sure that the Default Mapping radio button is selected, choose Solaris in the Host type drop-down menu, and select Finish.
8. If a Completed information window appears, select OK to continue.

NOTE

Depending on the size of the logical drive, it can take from 30 minutes to several hours for the logical drive to complete creation.

9. While the drive is initializing, select the Mappings View tab in the storage manager, right-click Default Group, and select Define Host.
10. In the Introduction window, select Next.
11. In the Specify Host Name/HBA Attributes window, write a name for your host in the Host name text box, select the host you are trying to add, select Add, and select Edit.
12. In the Edit Identifier/Alias window, enter a name that will help you to identify your server, and select OK.
13. In the Specify Host Name/HBA Attributes window, select Next.
14. In the Preview window, review your changes, and click Finish.
15. If you see an information window asking you to define another host, select No.

Appendix C. Methodology: Installing Oracle Solaris 10 on the Sun Fire X4800 Server

Install Oracle Solaris 10 by following these steps.

Allow at least 40 minutes to complete the installation. We used version Oracle Solaris 10 10/09 Operating System for x86-based systems which we downloaded from http://www.sun.com/software/solaris/get.jsp and burned to a DVD.

NOTE

In this appendix, we use the primary network interface name, which for this example is ixgbe0. You should use the name of the primary network interface that you encounter, which may differ slightly from what we present here.

1. When Starting Oracle Solaris Interactive (graphical user interface) Installation appears onscreen, press Enter.
2. Reboot, and wait for the GNU GRUB boot screen to appear. (1 minute)
3. At the next menu, select menu item 1, Solaris interactive (default). This is the default and the system automatically uses it after 30 seconds. The system then continues its initialization.
4. At the Configure Keyboard Layout Screen, select US-English. This is the default, and there is no timeout. Press function key 2 (F2) to continue.
5. At the Select a Language prompt, select choice 0, English, and press Enter. After this, a Please Wait While the System Information is Loaded screen appears. (less than 1 minute)
6. After a few seconds, a Welcome message appears. Click Next.

NOTE

An Oracle Solaris Install Console message screen appears during many of these steps. It presents messages, but you do not interact with it.

7. On the Network Connectivity screen, select Networked, and click Next.
8. On the Configure Multiple Network Interfaces screen, select ixgbe0, and click Next.
9. On the DHCP for ixgbe0 screen, accept the default of No. The default agrees with the best practice of using hard-coded addresses for database servers. Click Next.
10. On the Host Name for ixgbe0 screen, enter a valid name for the interface. DO NOT use any upper-case letters. An upper-case or mixed-case host name can cause the Oracle installation to fail. Click Next.
11. On the IP Address for ixgbe0 screen, enter a valid IP address, and click Next.

12. On the Netmask for ixgbe0screen, enter the correct netmask for your network. The default is 255.255.255.0, which may not be correct for you. Click Next.
13. On the IPv6 for ixgbe0 screen, accept the default of No, and click Next.
14. On the Set the Default Route for ixgbe0 screen, select Specify One, and click Next.
15. On the Set the Default Route for ixgbe0 screen, fill in the appropriate address for your network, and click Next.
16. On the Kerberos screen, accept the default of No, and click Next.

Because this choice affects network security, check with your administrator regarding this setting.

17. On the Name Service screen, select None. Because you have to enable your NICs later, you will add your DNS information then as well. Click Next.
18. On the NFSv4 Domain Name screen, accept the default of Use the NFSv4 domain derived by the system, and click Next.
19. On the Time Zone screen, accept the default of Geographic Continent/Country/Region, and click Next.
20. On the Continent and Country screen, select Americas→United States→Eastern Time, and click Next.
21. On the Date and Time screen, accept the date and time displayed, and click Next.
22. On the Root Password screen, enter the root password for your server, confirm it, and click Next.
23. On the Confirm Information screen, verify that all the information for your interfaces is correct. Resize the window to view all the information if necessary. Click Confirm. The following message appears onscreen: Please wait while the system is configured with these settings.
24. The dialog disappears and the screen is blank for a few seconds before a Welcome screen appears. On the Welcome screen, click Next.
25. On the Installer Options screen, accept the default of Yes for Reboot automatically after software installation? and Eject additional CDs/DVDs automatically after software installation? Click Next.

We received a notice saying that we needed to also manually eject the CD/DVD or select a different boot device after reboot to avoid repeating the installation process. We clicked OK.

26. On the Specify Media Screen, accept the default of CD/DVD, and click Next.
27. On the License screen, select Accept to accept the license agreement, and click Next.

28. On the Select Upgrade or Initial Install screen, select Initial Install, and click Next.
29. On the Select Type of Install screen, select Custom Install, and click Next.
30. On the Select Software Localizations screen, select North America (or the appropriate selection for your location), and click Next.
31. On the Select System Locale screen, select English (United States,UTF-8)(en_US.UTF-8) (or the appropriate language), and click Next.
32. On the Additional Products Screen, select None, and click Next.
33. On the Select Solaris Software Group screen, select Default Packages Entire Group, and click Next.
34. On the Disk Selection screen, accept the default, and click Next.

NOTE

In our case, the default was c0t0d0, which we use in the examples below.

35. On the Select Disks for fdisk Partition Customization screen, select c1t0d0, and click Next.
36. On the Customize fdisk Partitions – Disk c0t0d0 screen, accept the default, and click Next.
37. On the Preserve Data screen, select No.
38. On the Layout File Systems screen, click Modify.
39. On the Disk c0t0d0 screen, increase the swap to Oracle's recommended level, and click Apply. Oracle recommends three-quarters of RAM for systems with more than 8 GB of RAM. Because our server had 256 GB of RAM, we allocated 192 GB. We took the space from /export/home. Click OK to exit the layout File systems screen. Click Next to continue.
40. On the Ready to Install screen, review the information, and click Install Now. (40 minutes)
41. The Installing… screen appears, with a progress bar. After the installation completes, the system pauses for 90 seconds. You can skip the pause by clicking Continue in the Pausing dialog box.
42. After installing any additional software, the system again pauses, this time for 30 seconds. You can skip the pause by clicking Continue in the Pausing dialog box.
43. Before rebooting, the system pauses for 90 seconds. You can skip the pause by clicking Continue in the Pausing dialog box.

NOTE

Remember to eject the DVD during the reboot, or Oracle Solaris will start installing itself again.

44. After the system has booted, log in as root.
45. Select your desktop. We accepted the default of Sun Java Desktop System Release 3.

46. If a message with the following text appears, click Log in anyway: Could not look-up Internet address for <hostname>. This will prevent GNOME from operating correctly. It may be possible to correct the problem by adding <hostname> to /etc/hosts. You will fix the /etc/hosts file below.
47. On the Welcome to the Sun Java Desktop System splash screen, click Close.

Appendix D. Methodology: Installing Oracle Solaris patches

Installing Oracle Solaris recommended patch clusters

1. Go to the Patch Cluster & Patch Bundle download page of the SunSolve Web site (http://sunsolve.sun.com/show.do?target=patches/patch-access). Future access to patches may need to be routed through your Oracle MySupport website.
2. Maximize Recommended Patch Clusters, and select Download for the Solaris 10 x86 Recommended Patch Cluster.
3. While the patch cluster is downloading, refer to the README file for the patch cluster.
4. After downloading the patch cluster, type `unzip -q 10_x86_Recommended .zip` to unzip it.
5. Type `init S` in the system console to change Solaris to single user mode.
6. Type `./install_cluster` to install the Recommended Patch Cluster. There may be patch failures during installation. Return codes 2 and 8 are common and can be ignored. For other errors, refer to the README file.

Installing specific Oracle Solaris patches

1. Go to the Solaris SunSolve Patches and Updates Web page (http://sunsolve.sun.com/show.do?target=patchpage). Future access to patches may need to be routed through your Oracle MySupport website.
2. After the patch has downloaded, type `unzip patchfile.zip`, replacing patchfile with the name of the patch you downloaded.
3. Once the patch has unzipped, type `patchadd patchfile` to install the patch to your server, replacing `patchfile` with the fully qualified path to the patch directory.

Appendix E. Methodology: Pre-Installing Oracle Database 11*g* Release 2 on the Sun Fire X4800 Server

Oracle Database 11*g* Release 2 pre-installation tasks

Before you can install Oracle Database 11*g* Release 2, you must first perform a number of preliminary tasks. For further details, see *Oracle Database Installation Guide 11g Release 2 (11.2) for Solaris Operating System (x86-64)*, Chapter 2 Preinstallation Requirements, at http://download.oracle.com/docs/cd/E11882_01/install.112/e16763/toc.htm

NOTE

Please note that our server met many of the prerequisites for installing Oracle Database 11*g* Release 2, so we do not discuss checking those prerequisites here. The Oracle document we cite above covers this topic in detail.

Allow at least 30 minutes to complete the preparation.

1. Log in as root.
2. The server needs to display X applications. To work locally, you can use the command `xhost local:`
3. Verify that networking is set up correctly, using the following set of commands:

   - `cat /etc/nsswitch.conf | grep hosts` The output should contain an entry for files.
   - `hostname` should list a hostname for this system.
   - `domainname` should not return any results.
   - `cat /etc/hosts | grep <hostname>` should have an entry for the fully qualified host name.

NOTE

If you install Oracle Database 11*g* on a system using DHCP or on a multi-homed system, you will need to take additional steps. Please see the Oracle Database 11*g* Release 2 Preinstallation Requirements document for further details.

4. Create the Oracle inventory group with the following command:
   `/usr/sbin/groupadd oinstall`
5. Create the Oracle dba group with the following command:
   `/usr/sbin/groupadd dba`
6. Create the Oracle software owner user with the following command:
   `/usr/sbin/useradd –g oinstall –G dba oracle`
7. Set the password of the Oracle user with the following command:
   `passwd –r files oracle`

8. When the command prompts you, enter the new password.
9. Create and set the home directory of the Oracle user with the following commands:

   - `mkdir /export/home/oracle`
   - `chown -R oracle:oinstall /export/home/oracle`
   - `chmod -R 775 /export/home/oracle`
   - `usermod -d /export/home/oracle oracle`

10. Oracle requires that the nobody account exist. In our installation, Oracle Solaris 10 created it by default. You can verify the account exists with the following command: `id nobody`
11. Because this is a fresh install, we would not expect an Oracle project to exist. Create one with the following command:
    `projadd -U oracle user.oracle`
12. Verify the Oracle user's project ID with the following command:
    `id -p oracle`
13. You should see output of the form uid=100(oracle) gid=100(oinstall) projid=100(user.oracle).
14. You now need to set the kernel parameters. Type `projmod`. See the Oracle documentation listed above for a full explanation. You will use the `projmod` command instead of the `prctl` command because you want the changes to persist across reboots.
15. Increase the amount of shared memory available to the Oracle user.

NOTE

We found that DBCA, when creating a database, would, by default, attempt to obtain 40 percent of RAM, so, to be safe, we gave the project a maximum shared memory segment size of 50 percent of RAM. Use the following command to do that:

```
projmod -s -K "project.max-shm-
memory=(priv,128gb,deny)" user.oracle
```

16. Create the Oracle Database 11*g* base directory with the following commands:

    - `mkdir -p /export/home/oracle/app/oracle`
    - `chown -R oracle:oinstall /export/home/oracle/app/oracle`
    - `chmod -R 775 /export/home/oracle/app/oracle`

17. Using a text editor, create the file .profile in /export/home/oracle. Type the following lines, and save the file:

```
umask 022
DISPLAY=:0.0
export DISPLAY
```

18. Give the Oracle user ownership of the file with the following commands:

- `chown -R oracle:oinstall /export/home/oracle/.profile`
- `chmod -R 770 /export/home/oracle/.profile`

Preparing disks for Automatic Storage Management

Allow at least 15 minutes to prepare the disks.

1. Type `format` at the command line prompt, and select 1. If you configured the drives as described in Appendix A, you will see four choices. The operating system will be on choice 0, so configure only the disk that was added using iSCSI.
2. Type `fdisk` to create the Oracle Solaris partition.
3. Type `partition` and type `print` to see the partition table. Slice 2 will contain the entire drive. Do not modify slice 2, as this can destroy the partition table on your drive. However, look at its entry to get the number of cylinders on the disk. (In our case, it was 8,840.)
4. You will be updating partition 6, so type `6`, and press Enter.
5. Accept the default of unassigned for the id tag.
6. Accept the default of wm for the permission flags.
7. Type `1` for the starting cylinder. Never start at cylinder 0, as you would overwrite the partition table.
8. Type `8840c`, and take all the space on the disk except for cylinder 0.
9. Type `label` to make the partition table changes permanent. When prompted, type `y`.
10. For ASM, Oracle must own the candidate drives. To give Oracle ownership, use the following commands:

- `chown oracle:dba /dev/rdsk/c1t1d0s6`
- `chmod 660 /dev/rdsk/c1t1d0s6`
- `chown -h oracle:dba /dev/rdsk/c1t1d0s6`

Appendix F. Methodology: Installing Oracle Database 11*g* Release 2 on the Sun Fire X4800 Server running Oracle Solaris 10

We downloaded Oracle Database 11*g* Release 2 from http://www.oracle.com/technology/software/products/database/index.html. We copied the solaris.x64_11gR2_grid.zip file to the Sun Fire X4800 Server, and unzipped it locally by right-clicking the file and choosing Extract Here.

Allow at least 20 minutes to set up Oracle Grid Infrastructure.

1. In a terminal window, run the command xhost [hostname], replacing [hostname] with the fully qualified domain name of your server.
2. Use the command `su oracle` to become the Oracle user. You cannot run the Oracle Universal Installer when logged in as root.
3. From the Oracle user's home directory, type
   `. ./.profile` to set up your environment. The . ./ (dot-space-dot-slash) is necessary.
4. Change your directory to the top level directory of the Oracle distribution you unzipped.
5. Type `./runInstaller`. The name is case sensitive and the leading ./ is required.
6. On the Select Installation Option screen, select Install and Configure Grid Infrastructure for a Standalone Server, and click Next.
7. On the Select Product Languages screen, leave the default of English, and click Next.
8. On the Create ASM Disk Group screen, leave the default name of DATA, select External redundancy, select your configured drives, and click Next.
9. On the Specify ASM Password screen, select Use same passwords for these accounts, put a password in the Specify Password and Confirm Password fields, and click Next.
10. On the Privileged Operating System Groups screen, select the groups for ASM access, and click Next (for simplicity, we changed the groups to dba. Ask your administrator before setting your groups to dba).
11. On the Specify Installation Location screen, leave the defaults, and click Next.
12. On the Create Inventory screen, leave the defaults, and click Next.
13. On the Summary screen, click Finish to start the installation.
14. After the installation is complete, follow the instructions on screen to run the two install scripts as root.
15. On the Finish screen, click Close to finish the installation.

We downloaded Oracle Database 11g Release 2 from
http://www.oracle.com/technology/software/products/database/index.ht
ml. We copied the solaris.x64_11gR2_database_1of2.zip and
solaris.x64_11gR2_database_2of2.zip files to Sun Fire X4800 Server, and
unzipped them locally by right-clicking the files and choosing Extract Here.

Allow at least 30 minutes to complete the Oracle Database 11*g* installation.
1. After the Oracle Grid Infrastructure install, change your directory to
    the top level directory of the Oracle distribution you unzipped.
2. Type `./runInstaller`. The name is case sensitive and the
    leading ./ is required.
3. On the Configure Security Updates screen, enter your Email address
    for You're my Oracle Support and your password for You're my
    Oracle Support password, and click Next.
4. On the Select Installation Method screen, select Install database
    software only.
5. On the Node Selection screen, select Single instance database
    installation.
6. On the Select Product Languages screen, click Next.
7. On the Select Database Edition screen, accept the default,
    Enterprise Edition, and click Next.
8. On the Specify Installation Location screen, accept the default, and
    click Next.
9. On the Privileged Operating System Groups screen, accept the
    defaults, and click Next.

NOTE

On the Product Prerequisite Checks screen, you might see one warning.
Some of the kernel settings we specified earlier were above, rather than
at, the values Oracle expected. If you receive this warning, you can
ignore it.

10. On the Summary screen, review your settings, and click Finish. The
    Install screen, which shows a progress bar, appears. (5 minutes)
11. When the progress bar completes, the install asks you to run two
    scripts as root. Open a terminal by right-clicking the desktop and
    selecting Open Terminal. You can cut and paste the paths to the
    scripts into the command line terminal.
12. The first script is orainstRoot.sh. You only see this script the first
    time you install Oracle Database 11*g* Release 2 on a system. Should
    you need to reinstall the database software, you will not run it
    again.
13. The second script is root.sh. It asks you to type in the name of the
    local bin directory, which is `/usr/bin`. Before this script
    completes, it starts the CSS service. Once you see the message

Oracle CSS service is installed and running under init(1M), you may close the terminal window.

14. In the Execute Configuration scripts dialog, click OK.
15. Next, the Configuration Assistants screen appears. The three assistants should start successfully, and you will automatically advance to the next screen.
16. On the End of Installation screen, click Close.

Creating an empty database

Allow at least 45 minutes to create the database.

1. After exiting, set the ORACLE_HOME environment variable. In our case, the correct command was
   `ORACLE_HOME=/export/home/oracle/app/oracle/product/11.2.0/dbhome_1; export ORACLE_HOME`
2. Set your PATH variable by typing
   `PATH=$ORACLE_HOME/bin:$PATH`
3. Type `dbca` to launch the Database Configuration Assistant.
4. When the Database Configuration Assistant: Welcome screen appears, click Next.
5. On the Database Configuration Assistant, step 1 of 12: Operations screen, select Create a Database, and click Next.
6. On the Database Configuration Assistant, step 2 of 12: Database Templates screen, select Custom Database, and click Next.
7. On the Database Configuration Assistant, step 3 of 12: Database Identification screen, enter the Global Database Name. By default, Oracle uses this name for the SID as well. Click Next.
8. On the Database Configuration Assistant, step 4 of 12: Management Options screen, accept the defaults, and click Next.
9. On the Database Configuration Assistant, step 5 of 12: Database Credentials screen, enter a password. We changed the default of using the same password for the listed accounts. Click Next.
10. On the Database Configuration Assistant, step 6 of 12: Storage Options, select Automatic Storage Management (ASM), select the group you created during Grid Infrastructure installation, and click Next.
11. When the ASM Credentials screen pops up, enter the ASM password, and click OK.
12. On the Database Configuration Assistant, step 7 of 12: Recovery Configuration screen, accept the default, and click Next.
13. On the Database Configuration Assistant, step 8 of 12: Database Content screen, accept the default, and click Next.

NOTE

When you accept the default, the title of the window changes from step 8 of 12 to step 8 of 11.

14. On the Database Configuration Assistant, step 9 of 11: Initialization Parameters, accept the default, and click Next.
15. On the Database Configuration Assistant, step 10 of 11: Database Storage, click Next.
16. On the Database Configuration Assistant, step 11 of 11: Creation Options screen, click Finish.
17. On the Confirmation screen, click OK.
18. The Database Configuration Assistant screen appears and shows a progress bar. (30 minutes)
19. On the Database creation complete screen, click Exit.

Appendix G. Methodology: Migrating the DS2 data

Exporting schema and data on the IBM Power Server running AIX DB2 V9.7

1. Install and launch Oracle SQL Developer. (Make sure to install proper drivers to connect to DB2 database.)
2. Create a migration user in Oracle Database 11*g* and assign the role of Resources and system privileges of 'Create View' and 'Create Session'.
3. Make a new connection to the database using the migration user you just created and create repository by right-clicking on connection and selecting Migration Repository→Associate Migration Repository… This will build and create the repository for the migration while associating it to the migration user just created.
4. Make a new connection to your source database with the user who owns the database.
5. Make another connection to the target database you intend to migrate to as well.
6. Navigate to Tools→Migration→Third Party Offline Capture→Create Database Capture Scripts… This will generate the files needed in a directory to be moved and executed on the source machine.
7. Copy the folder and files to source machine and launch the startDump program to create the model to be used for recreating the schema on the Oracle server.
8. Copy the folder, which should not contain dat files, back to the SQL Developer machine.
9. We then loaded the offline captured information to create the Capture Model by going to Tools→Migration→Third Part Offline Capture→Load Database Offline Capture Scripts…
10. Now that the Captured model is loaded, we ran the conversion process by right-clicking on Captured Model and selecting Convert to Oracle Model… Verify the data rules, and clickApply to continue.
11. Review the Migration Log for any errors that can be addressed before scripts are generated for the actual migration and creation of the Oracle objects.

NOTE

Oracle SQL Developer comes with a Translation Scratch Editor that may assist you in procedural syntax when converting the code to the Oracle Database 11*g* Release 2 platform.

12. Generate the scripts by right-clicking Converted Model and selecting Generate, which then displays the script in the right-hand pane.
13. From the drop-down list on the top right corner of the workspace pane, select the connection where the user has privileges to

execute the script on and will be able to create users and grant privileges to. (See Figure 10.)

Figure 10. Select user connection to create database and user.

14. Run the script by right-clicking and selecting Run Script.
15. Create the scripts in Oracle SQL Developer to move the data offline by going to Tools→Migration→Generate Offline Data Move Scripts…
16. Copy exported scripts to source machine and run the following from a command line: `unload_script.sh`

NOTE   You must be logged in and connected to the source database.

Importing data on the Sun Fire X4800 Server running Oracle Solaris 10 and Oracle Database 11*g* Release 2

Copy folders and all content of the data dump to the target Oracle database server and run the following command from a command line:

`oracle_ctl.sh`

NOTE   Please refer to Oracle document [E15286-01](#) (Oracle SQL Developer Supplementary Information for IBM DB2 Migrations Release 2.1) for details on content of the unload_script.sh and oracle_ctl.sh.

About Principled Technologies

![Principled Technologies logo]

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We provide industry-leading fact-based marketing and technology assessment services that help technology vendors and buyers understand the real differences among products. We bring to every assignment extensive experience with and expertise in all aspects of technology marketing, testing, and analysis; from researching new technologies, to developing new methodologies, to testing with existing and new tools, to delivering the results in whatever form best communicates them.

When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, white papers, PowerPoint presentations, and videos. Every piece of collateral reflects the results of our trusted independent analysis.

We customize our services to focus on each client's requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to assess how it will fare against its competition and to highlight its strengths.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for 25 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.