

Database Migration using Recovery Manager

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Abstract

Objectives: Migration of databases merging the databases the acquisition of organization is the one of the major problems are Integrity, accuracy, business continuity and technical advances for any organization. **Methods/Statistical Analysis:** At the time of database migration is observed with the effect of the changes in the parameters of the sources and target platform databases. Database capability is maintained by changing the character set and Endian conversion is done if required. **Findings:** The Oracle cross platform new technology used to transport databases is XTTS which makes transportation is very easy within shorter period of time even though the size of the file is large. The Oracle provides Recovery Manager to convert the data format from one endian format to other endian format. **Applications/Improvement:** The results of extrapolation for different datasets are done to estimate the relationship between the size of datasets and the required time for migration.

Keywords: Endian Conversion, Migration, Network File Systems (NFS), RMAN, Short Time, XTTS (Cross Platform Transportable Table Space)

1. Introduction

The main constraints of migrating databases are selecting appropriate technology and the corresponding tools which are required for source and target servers. The most popular selection technology and tools required to transport the entire database needs a careful assessment considering the source and target servers. This has been decided by the major factor migration speed. At the same time the negative aspects of the tools^{1,2} usage which come across are high complexity interfaces, exentensive environmental setup, and manual intervention. It also affects the target of moving the dataset in minimum time. In this export/import was chosen based on the way by which moving the data. The third party tools with XTTS were provided for essential characteristics of the tools is focused here. In this paper it is focused the effort needed for data migration environment^{3,4} to transport databases. This leads to complicated technical problems. When large amount of data migrations based on the speed which we need by using XTTS and data pump, it is mandatory to accept any secondary negatives.

2. Table Space

The old version of the Oracle was not able to store more data in a shorter period of time. In the subsequent stages Oracle8 introduced which uses TTS concept which permits larger volume of data of same block size within the databases. After that Oracle9 was introduced and which requires homogeneous operating systems. In forthcoming platform TTS introduced Oracle10 g which allows TTS function across heterogeneous platform. The table spaces can be shifted towards databases of uneven block sizes which are exist in various operating systems. This allows shifting table spaces virtually to different database environments.

- It reduces the difficulty of transportation of vas amount of data as it is a high level technology.
- It resolves integrity issues and moves the data unit wise and hence is highly accurate.
- It does not require recreating and indexing the database.
- It helps to move the tables across different operating systems.

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- It need not be collected again for tables and indexes which are to be moved. It is shown in Table 1.

The Cross Platform Transportable Table Space provides a major facilities to handle different byte orders. When an attempt is made to write the data into file, the bytes of the word can be written either least significant byte first or most significant byte first. Generally the order of the byte will be in big Endian if the most significant byte is first. The actual Endian conversion will be done by RMAN (Recovery MANager) in Oracle. This is done by CONVERT command of Oracle. The Oracle tools are used to create an appropriate and suitable environment as well as to convert Endian format of the source and target machines. It is shown in Table 2.

The more important functions such as import and export are required to introduce the special utilities called

data bump. It is a technique which assists to carry out the functions very faster and supports for various types of database migration operations. Also it renders the services of pulling of table spaces in order to substitute the concepts in the target database. The major advantage of this method is to reduce overheads of transporting popular packages which are used to provide the automation and interface with web. It improves the restart capability.

3. The Testing Environment

The third party tools are used to gather the information about migration related data. For this purpose it uses data pumps and XTTS technologies. The testing environment setup and migration details are explained here^{4,5}. It is shown in Table 3.

Table 1. XTTS Process

S.No	Event	Comments
1.	Check endian format on both source and target databases	Query V\$TRANSPORTABLE-PLATFORM as discussed later
2.	Fix TTS violations in source database for the table spaces being moved	Execute dbms_tts transport _set_check(ts1,ts2,true)
3.	Place tablespaces being moved in read only mode in source database	Alter tablespace ts1 read only
4.	Validate the source database environment	For example, ensure that ORACLE_SID, ORACLE_HOME are set as expected, etc.,
5.	Create directory in the source database for the data pump export	Create a directory exp_dir as 'tmp2 dir export' only needed if you want export dumps on target for import
6.	Grant read for the directory	Grant read on directory exp_dir
7.	Export metadata from source database	If you plan to take a dump file and move it to the target platform
8.	Drop or rename the tablespaces of same name in target database	A tablespace must have a unique name within the database . If the tablespace is shared between target database drop from all
9.	Create the user concerned in the target database	If the user does not exist in the target database.
10.	From RMAN CONVERT to convert to target endians	Only needed if endian format is different
11.	Validate target database environment	For example, ensure that ORACLE_SID, ORACLE_HOME are set as expected, etc.,
12.	Oracle database link to source	Only needed if you want to import meta data over link
13.	Export meta data into target	Run the import script
14.	Run the imported meta data in another target database	If the tablespaces are to be shared between the databases
15.	Make tablespaces in source and target read write	Do not make attempt to read write when the tablespaces are shared between databases.

Table 2. Query - Determining Endian format

Select * from V\$ transportable platform

Platform-ID	Platform-Name	Endian_Format
1	Solaris[tm] OE (32-bit)	Big
2	Solaris[tm] OE (64-bit)	Big
3	HP-UX (64-bit)	Big
4	HP-UX IA (64-bit)	Big
5	HP Tru64 UNIX (64-bit)	Little
6	AIX-Based Systems (64 bit)	Big
7	Microsoft Windows IA (32 bit)	Little
8	Microsoft Windows IA (64 bit)	Little
9	IBM # series based LINUX	Big
10	Linux IA (32 bit)	Little
11	Linux IA (64 bit)	Little
12	Microsoft windows 64 bit for AMD	Little
13	Linux 64 bit for AMD	Little
14	HP open VMS	Little
15	Apple MAC OS	Big
16	Solaris Operating systems (X86)	Little

Table 3. Testing environment

Attribute	Source Server	Target Server
Operating systems	Tru64 5.1b – A little endian OS	HP-UX 11.11-A big endian OS
CPU's	4 at 667 MHz	2 at 1 GHz
RAM	4 GB	32 GB
Database size	15 GB	None before migration
Database	10.2.0.1	10.2.0.1
Database global name	PROD	PROD1
Database mount point(s)	/plad02/oradata/prod /olap003/oradata/prod /dmex002/oradata/prod, /plad03/oradata/prod	/ona7/app1/ oracle/oradata/ prod

The set of processes which are involved in data migration identical except the size are larger. Hence it is mandatory to move more files to desired location and mount larger files based on the size of the data. In this paper 15GB has been taken as an example and hence it is manageable in terms

of performance issues. Before the testing is applied for the migration process, the operating system level preparations are made to be ready. This is shown in Figure 1.

The testing is needed to fulfill the following functions:

- To establish a gigabit connection between the source and the target server
- The Mounting through NFS over the gigabit connection of data files to the target server from the source server.

The main advantage of NFS is that it does not require an additional amount of space equal to the database being transported. If a method using FTP is applied which requires 10TB's of data which has been transported via FTP to 10 TB location^{6,7}. The recovery manager cannot finish the endian conversion “in place”. The Endian format for target is shown in Table 4.

Most of the organizations will not provide extra temporary space needed to hold data and hence this approach is not feasible. More over the entire task will

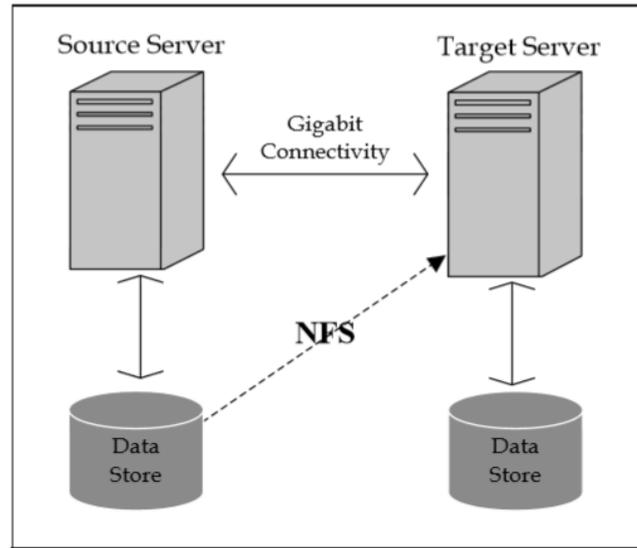


Figure 1. NFS used to present source storage to target server.

Table 4. Determining source and target Endian

Select D. Platform_Name Endian_Format From V\$Transportable_Platform Tp, V\$Database D Where Tp. Platform_Name = D. Platform_Name	
Platform_Name	Endian Format
HP TRU 64 UNIX	Little
HP-UX (64-bit)	Big

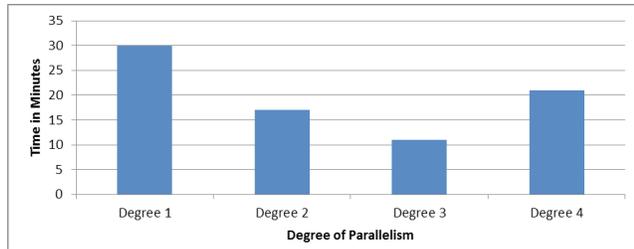


Figure 2. Degree of parallelism vs. Ti.

be completed in one step. If FTP (File Transfer Protocol) mechanism is used for transporting the files. Always the function of linking the databases will be done first and then the conversation will be done next. The NFS approach leads to high overhead. The main function of the FTP will be optimized for the network throughput. Even though NFS was not supported for reducing overheads, it simplifies the overall design. But NFS is reliable technology and implementation is straight forward. The RMAN process has been fed with FTP. In this special case the FTP will be allowed to use single step process with no need of temporary storage but the approach was deemed to be very complicated. It is shown in Figure 2.

4. Detailed Migration Test

The migration test involves two major categories. They are Preparation and Execution.

4.1 Transport Data File Preparation

Before transporting data it is needed to carry out the following functions:

- Create the designated target database.
- Use the same character set and national character set as the source.
- Use dictionary managed system table space, In this case a locally managed table space will not be allowed the user table space to be plugged in.
- The partial clone of source has to be created
- The entries of every table space other than the above mentioned functions in step 2.
- The database export dump has to be made ready.
- In source the script for table space has to be created and undo the temporary table spaces. Later this will be used in the target.
- In the target server script will be prepared. It ensures that no users were left out and any data files in the target belonging to other database are not being overwritten during the import.

- In the source database Oracle directories and their paths have to be created.
- When full database is imported, the link has to be created for directory path to the target server.
- With the help of FTP the cloned file moved to its target database.
- Unnecessary table spaces in target have to be removed.

4.2 Transport Data File Execution

- Identify the endian version of the target and the source platforms. The query execution results are considered as final results.
- The violations are checked for the XTTS tables that are being migrated.
- All the violations are removed. Some of them may be included to materialize views. Manual creation should be done after the transportation is done.
- Create a specific set of directories needed for XTTS log files.
- The database link has to be created while connecting with the system to access the metadata source database to be used by the import file utility.
- The RMAN has to be executed on the data files to convert the Endian format. This function will make a copy of data files from NFS mount to the local location.
- The degree of parallelism is 3.
- The object files of external table space are copied to the specified target directories.

The table spaces are altered to read/write for both source and the target databases^{8,9}.

The experimental results are proved that 15 GB of data has been migrated to the target server with parallelism of degree 3. The data migration with manual efforts will take much time and memory. At the same time the manual activities have to be highly automated to minimize the actual migration time of production systems. This test is iterated to achieve the degree of parallelism 2, 3 and the best performance was achieved at degree 3.

5. Non-Database Considerations for Mass Moves

It is well known fact that Oracle provides very high end technologies to migrate large volume of data resides in the databases in an error-free manner with shorter period of time. In latest applications large scale migrations are required. The major reason is the architecture of application and the value of the business.

5.1 Architecture for Application

The data becomes valuable based on the connection to the environment. Presently most of the applications are embedded with warehousing environments. There is an identifier used to load the data to the specified warehouse environment. A set of global keys are used to allow disparate systems to relate it with working environments¹⁰⁻¹². In large perspective, the global identification of huge data values is very complex for the current web applications. The web complexity is identified and the data values will be moved to optimal manner. The data warehouses are used to join more than one data bases with appropriate tools⁸. The function of integration of warehouses causes changes in the old and new instances. At the end of this cross instances joins the old or new instance exclusively. Then it has to be handled by the driving part of the side.

Instead of going for cross instances, the mixed instances are considered in the latest web applications. The final and suitable solution for this problem is to move the database to target as a single unit. When the global keys are cross joins, the data access will become difficult. For this every environment has to have potential and resources to create its own particular challenges. Most of the organizations run their back end systems on the same server as the database. Because of this reason, the databases are considered in between by the bypass listener. The function of moving of databases from one location to another location suddenly will causes data usage problem. Another problem is database conflict. When more than one database make an attempt to move from one location of the database to another location at same time the conflict occurs. Common and optimum solution for this problem is move entire setup at the same time. Oracle provides advanced tools for large data move but it will not support for the process of moving databases first and then move the systems over time. For this the following changes have to be carried out in time.

- The used environmental variable is used to allow systems to find remote databases.
- For database connection, the OS authentication has to be done first and then database systems to be connected. The database triggers are used to enable remote authentication.
- The NFS data mount will be created for source server for all directories.
- The writable NFS mount back to the old server for all directories used for external file operations.

6. Conclusion

In this the database has been migrated from windows 10 to Redhat Linux successfully. Different datasets are migrated to assess the factors which can help to reduce the time of the database migration. A mathematical relationship is determined to extrapolate the results for a database of greater size. But data migration can be done in lesser time. Data Guard scripts are created to ensure that data which does not alter during the migration.

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