

Replication System of Oracle Database Standard Edition by Utilizing Traditional Archived Log

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Abstract - In this article will be described replication system of oracle database standard edition by utilizing traditional archived log, because in this database version doesn't have replication feature like in oracle database enterprise edition. The research methodology which being used by this research are data collection, analysis, and design. Literature study is used for data collection methods. Analyze current replication system such as data-guard and Golden-gate are used for analysis methods. Design is method by development of prototype application to run extract, transport and recovery function for source and target database. The result of this research is a replicator application prototype for oracle database standard edition by utilizing traditional archived log was created by transaction at database. The conclusions of this are replication performance by utilizing traditional archived log has quite similarly function compared by data-guard that exist in Oracle enterprise edition in terms of data replication.

Keywords: Replication systems; Replication Database; Replication Oracle Database Standard Edition

I. INTRODUCTION

Information technology today are growing very rapidly. Information technology is closely related to the capturing, processing, collection, storage, and presentation of information so that the information becomes more useful. Information technology has become one of the main pillars of doing business in an organization. Almost all sectors of industry and government (production, trade, finance, transportation, health, education, telecommunications, public sector, etc.) has been implemented information technology in their organization of the low scale up to more complex scale. Information technology has been considered to be a supporter of business success as well as enabler of new business.

Information services to be paramount for an organization for running and development of their businesses. Disasters that cause of negative effects and cessation of continuity for an organization is a risk that is not expected to be occurred. Disruption of business operations, decreased of productivities, increment in operation costs, service user problem, and a bad image at customers, all those are impact of disaster emergence. Disaster that will befall it cannot be ascertained due course, but an organization can attempt to prepared in order to survive on

emergency for preventing or minimize negative impact of catastrophic happens.

In these context of information technology, efforts for preparation in question is by conditioning the information technology system is always available when required by the business process. When the impact of the disaster are threatening information technology services, information technology systems need to be prepared in order to remain able to support business processes.

Disaster recovery plan can be achieved to make replication in an information technology system. At this research devoted for replication on oracle database standard edition. Replication database in this research may present as a comprehensive solution to help organizations anticipate and respond at disasters that could potentially interfere operation of information technology systems.

II. RELATED WORKS

Oracle stream divided by three processes. (1) Capture, this process is to read transactions at redo log. LCR (logical change record) is name of background process that read redo log. (2) Propagation, after LCR formatted then message will created and put in staging area. Then with propagation process message will sent to database target. (3) Consumption is applying process. That processed will applied message to database target [1].

Replication processes with Goldengate are also divided by three. (1) Extract is process to capture changes of database. The result of extract process is trail file. (2) Data pump is process for transport trail file to database target. (3) Replicate is process to apply trail file at database target [1].

Research base on replication database that have purposed not only for standby database, it can used for reporting database. There are a lot of replication tools but it is only active-passive replication. By logical replication then target database can used for reporting database. Because of that resource at database source will reduced. Transactional will use database source and reporting will used database target [2].

Role of oracle active data guard in high availability database operations, describe replication database by using active dataguard. Active dataguard function is high availability method, disaster recovery and data protection which is feature at oracle database. This replication can replicate more than one

database target (max 30 database target). It also database target can do real-time query data [3].

Replication unidirectional on heterogenic database. This research describe replication database at heterogenic database. Heterogenic at this research is used SQL Server on Windows replicate to Oracle Database on Linux by using Goldengate. The result of this research is Goldengate can used to replicate for heterogenic database [4].

SAP database will replicate to other database by using data-guard. This research is for preventing hardware failure, disaster, and any error and data corruption. This research also changes role of database by doing switchover [5].

Replication by using data-guard will used for upgrading database to achieved minimal downtime. This research is for upgrading database from version 9i to 10g. This research had done at Adidas whose made apparel [6].

Database migration and replication with Goldengate. This research describe migration database from MySql to Oracle Database by using SQL Developer and replicate multi-master by Goldengate [7].

III. METHODOLOGY

The steps to develop the oracle database replication in this research are: study of literature, collecting data about oracle database and replication architecture that exist in oracle database, replication implementation, and analysis of results of replication.

In the early stages of research begins by determining the background and purpose of the research as well as defining the scope. Literature study is used to explore regarding feature replication oracle database by using data-guard and also the steps for configure replication. In addition, the literature study is also conducted to determine the research direction of replication so that data collection has a better focus.

The second stage of this research is data collection, it collect oracle database architecture and how process replication by data-guard on oracle database.

The third stage is the implementation of database replication. At the time of the implementation phase is divided into three stages according to the results of literature study and data collection. Wherein the three stages is extract, transport and replicate.

- Extract. Extract is process to capture of changes at database source which is have transaction inside database. The transaction at database will produce archived log.
- Transport. At this part of process, it will send archived log from database source to database target.
- Replicate. Replicate process is same with recover process. This process will read archived log then apply those all archived log to database target.

Recover oracle database to get the newest data by using archived log. For example backup full database by RMAN (recovery manager), to restore and getting current data it

should be restore archived log. [1]. In this case archived log is used to recover and get current data.

At the stage of verification or analysis that replication has been successful, it will use data generator to load or populating data in database. After that data will compare by count row of query between database source and database target.

IV. RESULT AND DISCUSSION

Base on replication step at methodology, all replicate divided by three processes. All those processes are (1). Capture changes data at database source. (2) Send changes data to database target. (3) Apply all changes at database target, after all that processes database content will identic by comparing between database source and database target.

Performance or the workings of replication in this research also divided into 3 stages, basically all stages are the same like processes at literature study. Stages at this research are (1). Extract to capture database (2) Transport to send archived log to database target from database source. (3). Recover to apply archived log at database target. All those stages become content data identic at database source and target.

Replication processes at this research are using SQL query and C language to develop interpreter application for running replication. Detail stage replication on C shown below.

A. Extract & Transport

On extract process is for knowing archived log has been produced because transaction at database source. After that, archived log will send to database target. Process of sending archived log is transport.

Information place of archived log is shown on `log_archive_dest` parameter database. After that comparing continuously of archived log by using `diff` or `rsync`. It should be continuously because as long as database is being used then it always doing transaction and produced archived log.

```
#include <stdio.h>
#include <stdlib.h>
for (;;) {
    system("rsync.exe /arch_dest/* -e ssh
    user@host_dest:/arch_dest");
    Return 0;
}
```

Source code above `for(;;)` is used for looping never ending process, it will continues processing and send archived log. It will stop base on flag file.

B. Recover

When archived log database source arrived at database target, then next process is recover database at database target. Recover will made database source and target become identical. To recover, it will use SQL syntax. SQL syntax shown below.

```
RECOVER STANDBY DATABASE
AUTO
```

Save as that script above and give it name of file with extension `sql`. Recovery will also continuously process and never stop. To continuously run, it have done by `cronjob`

process or looping. At this research continuously process is achieved by looping process by using c language. Script show below. It the same above, for looping is used for(;;).

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
int main (int argc, char *argv[] {
for (;;) { system("sqlplus -s / as sysdba
@script_name); }
return 0;
}
```

C. Interface on Research Replication

Interface at this research is interpreter application by using C language. After compiling that C language, it will produces interpreter application. That interpreter application will has responsibility as replicator. Shown below is source code.

```
void cmd_start(arg_t *args) {
(void) args;
FILE *fp;
fp = fopen("/flag_file.in", "w");
fprintf(fp, "1");
fclose(fp);
system("extract.exe &");
return;}

void cmd_stop(arg_t *args) {
(void) args;
FILE *fp;
fp = fopen("/flag_file.in", "w");
fprintf(fp, "0");
fclose(fp);
return;}

```

Base on script shown above, there is file with extension in involved. That file is for flagging process which means never ending looping will always take care with that file. If that file is flagging to stop then replication process also will stop all process.

D. How to Use Replicator at Research

After all source C language was compiled then it will produced an executable application. That executable application is interpreter application replicator. Interpreter application is shown picture below at figure 1.

To run replication with this application just run an exe file. Run an exe file as runext.exe at database source, it will capture database changes and send archived log to database target. At database target run runrep.exe, it will recover database target.

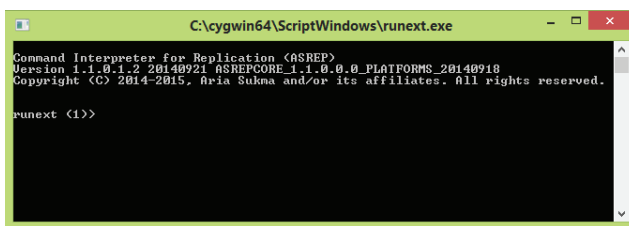


Fig. 1. Interpreter interface application

After prompt replication appear like shown above, then at database source type start for starting replication process. For

database in target, after prompt shown to run recover process by type start replicate.

E. Comparing Data between Database Source and Database Target

In process of proving or verify the replication, the replication of this research analyze, whether the result of replication data can be considered valid in this case data between source and target databases are identical or otherwise fail. To prove replication will be carried out as in previous research. Previous research have been done process like shown below.

- Changes role or function of database by switchover process. Changes role has done by Configuring Oracle Data Guard Using Logical Standby Database [2] and Role of Oracle Active Data Guard in High Availability Database Operations [3].
- Count row of database at database source and database target. This count row has done by research of Replication Unidirectional pada Heterogen Database [4].

Transaction data that is loaded by using data generator will generate a number of archived log in the source database. After that archived log will send to database target and apply at database target. Having obtained some data. Then the data will be carried out comparisons with existing data in the source and target database based on previous research.

Once the database is populated then the next process of verify, whether the replication process can be declared successful. In process of verification is done by comparing row count of data.

Perform queries, comparisons with this query is done by counting the number of rows in the table in the database. Performed with syntax 'SELECT count (*) FROM table_name'.

TABLE 1. COUNT ROW

NO	Table Name	Row Count	
		Source	Target
1	COUNTRIES	23	23
2	SALES	10000000	10000000
3	SUPPLEMENTARY_ DEMOGRAPHICS	1999992	1999992
4	CUSTOMERS	1999992	1999992
5	CHANNELS	5	5
6	PRODUCTS	72	72
7	PROMOTIONS	503	503

Table shown above is the result of query row count for database source and target. Base on comparing result which is shown above then the conclusion is replication by using traditional archived logs declared valid because it has identical data between database source and database target. Table 2 shown below is deference between replication at this research and other replication.

TABLE 2. THE DIFFERENCE REPLICATION

	Oracle GoldenGate	Oracle Data-guard	Replication at Research
Replication	Table and schema level	Database and schema level	Database level
Limitation	Limitation at data type and object	Full Database, all data type and object	Full Database, all data type and object
Capture changes	Extract processing by read redo log	Redo transport	Archived log
Result of capturing process	Trail file	Archived log	Knowing archive log has been produced
Type of replication	Multi Master & Single Master	Single Master	Single Master

Base on table 2 above, Goldengate replication will replicate table and schema level, for data-guard replicate will process at database or schema level. Replication at this research is replicate database. Limitation, capturing process, result capturing process and type of replication shown at table 2 above.

F. CONCLUSION AND FUTURE WORKS

The results of research and analysis using traditional archived log for replication by comparing the amount of row data in database with ad-hoc query can be summarized as follows:

- Traditional archived log which is used as recover process database, it can use also for media replication between database source and target by involved interpreter application as replicator application which is develop at this research using C language.
- The success of the replication process by utilizing traditional archived log declared without an error.
- Results of replication is both database source and target has identical data or has the same contents after comparing by count rows.
- Because the replication of the results in this research is otherwise identical, then replication by using traditional archived logs can be used as a replicator in the manufacturing process of a disaster recovery.
- This solution replication can be used as other solution replication database because it can minimalized or

reduced license cost. License per-core for Oracle Database Enterprise Edition USD 47,500. License Data-guard per-core USD 11,500 [5].

1) Suggestion

This research is still prototype and not replication perfect, because the archived logs can be used as a replication to replicate the oracle database should be facilitated:

- Provide user friendly interface so user can access application with simple way.
- Adding more feature for supporting replication as disaster application, such as easy monitoring and other feature.

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