Hospital Information System: A Disaster Recovery Solution Using Oracle Database

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ABSTRACT: ERP is a business management software allowing different organisations to use integrated applications system to manage and automate functions related to technology, services and human resources. In Healthcare industry, Oracle Database is used as ERP, and HIS (Hospital Information System) as front end application. The purpose of this document is to enhance the technology and give a hassle free database and disaster recovery solution to the hospital, so that they can have zero downtime. Active Data Guard Solution provided is the best way to take backup which would prove as a great help for the people in Healthcare industry to work more efficiently.

I. INTRODUCTION

The primary purpose of HIS system is to communicate with all sections, store information about patient´s health and prescription as well as administrative information. HIS helps end user to lessen the clinical errors and assist the doctors, to remind every detail about the patient and provide them best facility. By learning minute details about the patients like the position in which he comes to the doctor for the first time, the prescription given to patient as well as their current position. These details altogether helps a doctor to make accurate decision. So, fault tolerance power is a lot high after using this system. [1].

II. ARCHITECTURE

Generally all types of hospital information system (HIS) are supported in Client-Server Architectures for processing and networking. Hospital Information System architecture has three main levels :
- Central Government Level, Territory Level, and Patient Carrying Level

Enterprise HIS with Internet architectures have been successfully deployed in Public Healthcare Territories and have been widely adopted by further entities.The Hospital Information System (HIS) is a business-wide drive designed to upgrade access to patient information using a central electronic information system. HIS's goal is to streamline patient information flow and its accessibility for doctors and other health care providers. These changes in service will improve patient care quality and patient safety over time.

III. LITERATURE REVIEW

Hospital information systems (HIS) are increasingly becoming an emerging tool in health care arena to efficient delivery of high quality health services [3]. It is common computer systems, which is designed to support hospital services. HIS have all the information from patient level to administrator level in its database flowing over all computer system of hospital. It gives so much support in decision making, from broad knowledge to specific knowledge for any domain. Different HIS modules:
- Patient Module
- Financial Module

- Diagnostic Center Module
- Payroll Module

After collecting all the information about the **Healthcare Industry**, we realize that there is no need to take full data backup in routine. Taking level 0 data backup again and again, will increase the redundancy as well as it affect the storage system. Our client use the "Tape" as there storage system, if it will get fill very usual then the cost will affect on a very large scale. This solution also fulfill our primary objective of the project i.e. Cost Optimization.

Tool for Backup & Recovery: RMAN (Recovery Manager) is used to have physical backup and recovery tool provided by Oracle Databases after Oracle 8 Version. The beauty of this tool is that we can have backup from a single table to the whole database backup. The main concern to develop RMAN is to check block level or file corruption in the backup process and restoration process. [7]

Days	Types of Backup	Level
Sunday	Full backup	Level 0
Monday	Incremental backup	Level 1
Tuesday	Incremental backup	Level 1
Wednesday	Differential backup	Level 0 & 1
Thursday	Incremental backup	Level 1
Friday	Incremental backup	Level 1
Saturday	Full backup	Level 1

Table 1: Table of Proposed strategy for Backup

Data Guard with Example

Take for example an existing Data Guard configuration that uses asynchronous transport between a primary in Nepal, and a standby in Gurgaon. Upgrade to Active Data Guard and implement zero data loss by simply deploying a far sync instance at a third location within synchronous replication distance (estimated at 30-150 miles) of Nepal. Any server that is compatible with the primary will suffice. No proprietary storage, no special network devices, no additional licensing, and no complex management are needed. If the primary fails, the same failover command used in any Data Guard configuration or automatic failover using Fast-Start Failover will quickly transition the database in Gurgaon to the primary role, with zero data loss. Any server that is compatible with the primary will suffice. No proprietary storage, no special network devices, no additional licensing, and no complex management are required. If the primary fails, the same failover command used in any Data Guard configuration or automatic failover using Fast-Start Failover will quickly transition the database in Gurgaon to the primary role, with zero data loss.

IV.   IMPLEMENTATION AND RESULTS

We can have backup from single table to all physical files. To use RMAN we have to connect with SYSDBA (i.e. System Administrator). To get connected with SYSDBA user we have to write specific username and password. Administrative privileges that are required for an administrator to perform basic database operations are granted through two special system privileges, **SYSDBA** and **SYSOPER**. You must have one of these privileges.

- ➢ **Implementation steps of Active data guard**

Check that 'archive log' mode is enabled (P)
Use the following command when the database is open, to check if the database is in archivelog mode.
Sql> archive log list;
Database log mode   No Archive Mode
Automatic archival   Disabled

Archive destination   /ora/archive
Oldest online log sequence   1
Current log sequence   1
If the database is in NoArchive log mode then change it
1. Shut down the database
        sql> shutdown immediate
2. Start the database in Mount Mode
        sql> startup mount
3. Change the logging mode.
        sql> alter database archivelog;
4. Shut down and open the database
        sql>shutdown immediate
        sql> startup.
5. Check the log mode
        sql> archive log list;
Database log mode   Archive Mode
Automatic archival   Enabled
Archive destination   /ora/archive/
Oldest online log sequence   1
Next log sequence to archive   2
Current log sequence   1

Backup the Primary dB for restore to Standby node

Restore the cold backup of the Primary Database to the Standby Site
        Restore controlfile from 'path of controlfile';
Create standby controlfile (P) and 'scp' to standby site.
        SQL> STARTUP MOUNT;
Then, create the control file for the standby database, and open the primary database
to user access, as shown in the following example:
        SQL> ALTER DATABASE CREATE STANDBY CONTROLFILE AS '/tmp/stby.ctl';
        SQL> ALTER DATABASE OPEN;
Database restart is required in order to create Standby Controlfile.
This downtime can be avoided by creating standby controlfile using Oracle Recovery Manager
rman target / nocatalog msgno
         backup current controlfile for standby format '/tmp/DR/%d.CTL';
exit
Start the listeners on both Primary and Standby
        >lsnrctl start
Startup the Standby Database
        sql> startup nomount;
        sql> alter database mount standby database;
Put Standby database in 'managed recovery mode
        sql> recover managed standby database disconnect from session;
Check the database protection mode on the Primary
        sql> select protection_mode from v$database;
            MAXIMUM PERFORMANCE
Verify log shipping to Standby is working
Initiate a log switch on the primary database
        sql> alter system switch logfile;
On the standby site perform the following operations.

sql> select process, status, thread#, sequence#, block#, blocks from v$managed_standby; //(This query will display the activity of the background process viz MRP(Managed Recovery Process), ARCH (Archive Process),RFS (Remote File Server) process. It also displays the sequence number of the log file being applied currently, Waiting, Receiving, Writing etc)

Verify log apply to Standby

sql> select thread#, sequence#, first_change#, to_char(first_time,'dd/mm/yyyy:hh:mi:ss'), next_change#,applied,to_char(completion_time,'dd/mm/yyyy:hh:mi:ss') from v$archived_log; //(This statement will help in determining what time the log was generated, what is the next sequence no. to be generated, when the log file reached the standby destination. Check the alert log file of the standby database to check the log apply time.)

Check the archive log destination status.

sql> select status, error from v$archive_dest where dest_id=2;

Example   Output
STATUS   ERROR
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VALID //(This query will display the connectivity status between the primary and the standby database. This has to be run on the primary database logged on as sys user. If there are any errors, the same will be reported in the ERROR column else the value in the column will be null.)

Check the archive gap

sql> select * from v$archive_gap;

Determine the application of the archivelog to the standby database

sql> select thread#, max(sequence#) as "last_applied_log" from v$log_history group by thread#;

You can delay the application of the archive logs

sql> alter database recover managed standby database delay 30 disconnect from session;

V.   CONCLUSION

In the above solution, the users are able to decrease their backup downtime time as well as can very well manage and recover their database during any kind of disaster within 30 seconds as well as donot need to spend a lot of amount for this solution. Also no need to take daily backup.

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