



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2016

A Review on Hospital Information System

Prachi Verma, Suman Aggarwal

M.Tech [Dept. CSE] Pursuing Student of AITM, Palwal, MD University, Haryana, India

Assistant Professor [Dept. CSE] AITM, Palwal, MD University, Haryana, India

ABSTRACT: In today's scenario, ERP plays a vital role for almost all types of business applications including retails applications and all other online applications. For each and every front end application, a database is there at backend as a backbone of that application, which holds the data with its robustness and with its structured format. In Healthcare industry, they use Oracle Database as their ERP, which have market share in worldwide as 40% as per Gartner report and HIS (Hospital Information System) as their front end application, which have all the information about all the patients. There are many ERP present in the market, but because of their structure, industry has to use different ERP for different area or different application. Oracle makes all these data centralized. By Healthcare industry, we mean a very crucial process to get the required data on time which can save someone's life and is a major concern here when we talk about a patients database. So, in this project we will go through all the database administration techniques, using Healthcare industry administrators. We understand the overall techniques of taking backup and disaster techniques to prevent the data loss from HIS.

To enhance the technology, we give the solution to the hospital, so that they can have zero downtime. This solution is named as Active Data Guard Solution and with this we provide them best way to take backup. This would prove as a great help for the people in Healthcare industry to work more efficiently.

KEYWORDS: Hospital Information System, Active Data Guard Solution, Backup, Disaster Recovery, Database Administration Techniques.

I. INTRODUCTION

HIS system is large data bases system, the primary purpose of this system is to communicate with all sections present, store all the information about patient's health and prescription as well as administrative information. This has been proved that the use of HIS helps end user to reduce clinical errors and support the doctors, to remind every detail about the patient and provide them best facility. By remembering each and every detail about the patient like their position in which he was discovered, when he reaches to the doctor for the first time, the prescription which have given to patient as well as their current position. All these details collectively help a lot a doctor to make accurate decision. So, we can say fault tolerance power is very much high after this system. The efficiency of doctor's statement & quality of patient care increased drastically. After having this system installed, patients do not have to carry his/ her documents and reports at every meeting. With the given figure it will be clear in detail, that how much the sections become more connected to each other [1].

The clinical engineering department (CED) in the hospital is responsible for the patient and clinical staff safety in using medical devices. Besides, the cost control in related operational activities of medical devices (such as purchase, contract, repair, and maintenance) is another important job for this department [2].

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2016

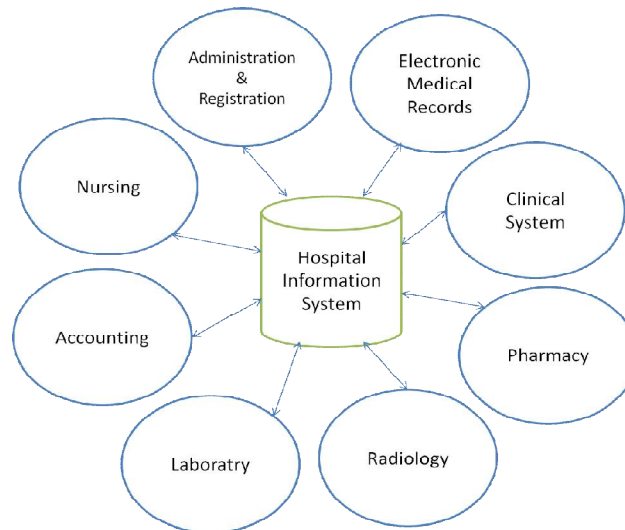


Fig. 1: Hospital Information System

II. RESEARCH OBJECTIVES

The Active Data Guard Solution should encompass the below objectives to ensure a reliable database in any healthcare industry.

Highest Availability client of any industry always needs the availability of their data. And, if we talk about any hospital, availability becomes crucial task to have. So, with this project we are able to have the data, when we need it. It will be available for us at anytime, anywhere.

Reduce downtime industry always demands zero downtime for their data. Obviously, there doesn't exist any hospital, which can bear large downtime. Shutting down the database is a very big deal for anyone, for these off hours, they can have a huge loss. So, by this Data guard solution we can achieve this goal.

Better performance for end user, every company wants hardware and a database structure which can give them the fastest result. After giving this solution to the hospital they are able to get even more efficient performance.

Meet SLA which stands for Service Level Agreement. This is an agreement between the client and the provider. In this service level agreement, they have given the levels to the query like: level 1, level 2 & level 3. These levels tell about the criticality of the query. They have their particular resolve time according to their level.

Optimizing the cost of the customer, as in the real market every client or a company has their own specifications. They have their own budget, so, as an administrator, this is our duty to give them a solution within their budget, and with this project, we get this goal too.

Scalable structure for data, that whatever solutions we are giving, they should be expandable. The dedicated solution for the company should be efficient enough, that they can be at least able to stand for the next three years of technology.

III. CONTRIBUTION IN DISSERTATION

In this dissertation, it is being proposed that a solution called 'Active Data Guard Solution' will be given to the Healthcare Institution to enhance their availability of accessing data and give industry zero downtime. Basically in this hospital, they were using HIS system. In this system all the information about the patient will be saved with the generated unique patient ID. Due to which when we actually need any information about the patient, we can go to any system and



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2016

retrieve information from anywhere at any time. But, sometimes there could be some issues that bring the system down for some time. At this time, when systems are not working, end user can't write the data within, even we are not able to retrieve the information. So, we are now locked to do anything until & unless our server will be able to work again in its right manner. For this point of time, with this project we propose the Active Data Guard solution. On which we can rely totally for giving us zero downtime.

Another contribution for this hospital which we have given is, giving them the best way to take backup. So, that their storage utilization will become dramatically low as well as our backup becomes so much more impactful. We have suggested them to use **Netbackup tool** which automatically calls Rman for backup and gets the backup directly to tape (which they are using as their storage.)

IV. LITERATURE REVIEW

Hospital information systems (HIS) are increasingly becoming an emerging tool in the health care arena to efficient delivery of high quality health services [3]. It is a common computer system, 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 systems of hospital. It gives so much support in decision making, from broad knowledge to specific knowledge for any domain. HIS work with many modules some of the modules are explained below:

- **Patient Module**

Patient module is primarily intended to have all the patient specific knowledge. First, in a certain way patient registers him/herself into the hospital this could be with the Website, phone or he/she can visit by himself/herself.

After that the registration took place at a particular department and a patient-id will be generated by then. This patient-id with appointment fees will be published to the HIS, so, that it could be able to get the information from any system of any department. This helps the administration and patients too, to have all the important details and to take the best decision. See fig 2.

- **Financial Module**

In the Financial Module, all the information related to patients billing, his accounts in Diagnostic centers are stored. Blood bank financial statements are there for hospital's end users. Information about main stores is also being there. Equipments which are being for a particular patient used have also an account here.

The transaction which patient made whether it is online or offline, it will be supposed to be there. The chances of having any error within the system will become very less.

- **Diagnostic Center Module**

This module contains diagnostic information of each and every patient. This information includes the tests which doctor has advised to patient. These tests include the blood tests, ECGs, MRIs etc. The statements which come as a result of test are stored as a report at a patient's table, with any other information. HIS also give the facility to open the reports like X-ray.

- **Payroll Module**

This payroll module is basically made up for hospital's end user, not for the patients. In this module PRO information is kept and it is intended to give administrator best of his knowledge. So, that he can take best decision about the patient and can handle him in a best way. It also contains the information of user like their attendance.

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2016

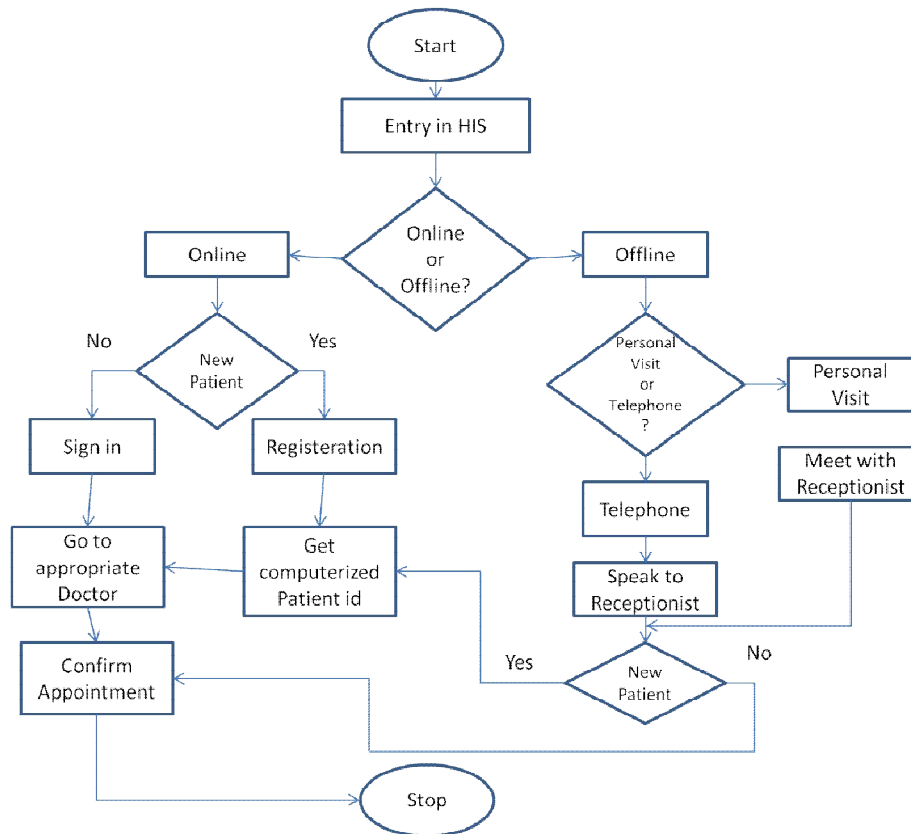


Fig 2: Patient module flowchart

V. PROBLEM STATEMENT

In this paper, we introduce a disaster recovery solution for the healthcare industries, since the Healthcare Industries uses a very time taking backup as well as storage utilization is also very much high. So, this is the first problem they are facing.

Second problem of this hospital is, even after taking backup their system is not secure. Because at the time of any disaster, we lost the system, database as well as the backup. Which would be prove as more disaster.

So, these are the problem which we have to solve in our project, we have to give **Healthcare industry** solution, with best of our knowledge. So, that they reduce their storage utilization, as well as keep their data available and secure all the time.

A. Problems in daily practice of Backup

In **Healthcare industry**, administrators use to take their backup of such a large database, to prevent hospital for any data loss. There are two types of storage to store the data of any organization:

1. Disk
2. Tape

Our client use Tape to store their data as well as to keep the backup of the data within. The configurations and commands are different for these different storages. For taking backup, administrators of **Healthcare industry** use to take full backup in daily practice. By taking full backup daily, the performance at the storage utilization became very large. When every day we take full backup, it will occupy the unwanted space and redundancy will be increased. This was the major problem for Healthcare industry, because with an increase in data, we have to put more storage. Basically, there are two kinds of data we stored in storage.

1. Information kept in database i.e. patients information, hospital's information.
2. Backup taken of that information.

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2016

This increase in storage, effect the cost.

B. Problems in Disaster and downtime

Healthcare industry is an upper level hospital, so that we can conclude the amount of patients, doctors within. In brief we can say, if we lost our data by any reason, we can have a huge loss. In this hospital, they have backup for these data loss situation. But there comes any kind of Disaster both it is planned or unplanned, and we have to be prepare for all this. Basically there are two main types of Disasters:

Natural Disaster: These disasters are like floods, hurricanes, tornadoes or earthquakes. This is very difficult task to prevent ourselves from natural disasters. Because no one knows, when there could be natural disaster and how to stop them in a sufficient time.

Man-Made Disaster: The second disaster categorized by the man-made disasters, such as hazardous material spills, infrastructure failure, bio-terrorism, and disastrous IT bugs or failed change implementations. In these instances, surveillance, testing and mitigation planning are invaluable.

So, in the Healthcare industry we need to give the solution of these two categories of disasters. Now, we are talking about the condition when we lost data as well as the backup. When the whole data or the server has lost, then what steps should be taken.

PROPOSED SOLUTION FOR DISASTER RECOVERY

In a Data Guard configuration, a production database is referred to as a primary database. Using a backup copy of the primary database, you can create from one to nine physical and logical standby databases and incorporate them in a Data Guard configuration. Primary and standby databases can be running on a single node or in a Real Application Clusters environment [13].

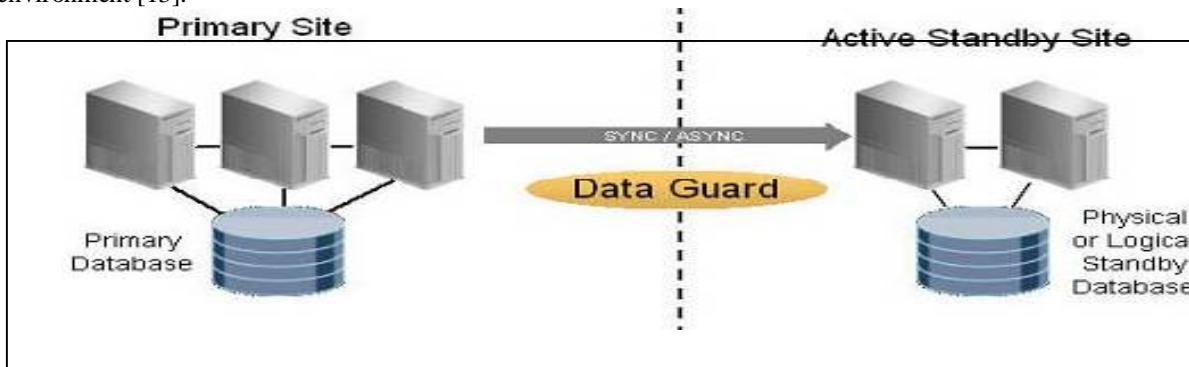


Fig. 12: Architecture of Data Guard

Data Guard is unique among Oracle replication solutions in supporting both synchronous (zero data loss) and asynchronous (near-zero data loss) configurations. Administrators can chose either manual or automatic failover of production to a standby system if the primary system fails in order to maintain high availability for mission critical applications. An overview of Data Guard architecture is provided in Figure 12.

The Oracle physical standby database is kept synchronized with the primary database by using media recovery to apply redo data that was generated on the primary database Redo Apply[16].

Reasons of proposing Data Guard

- I. Full database redundancy
- II. Fast recovery in the case of a failure
- III. Ability for clients to automatically reconnect after a failure
- IV. Ability to offload the backup process to another server
- V. Provides very good Mean Time To Repair
- VI. Not overly complex

Using Data Guard to Reduce Planned Downtime

Data Guard can be used to reduce downtime and risk for many kinds of planned maintenance. The general approach is to first implement changes on a standby database, test, and then switchover. The production database runs unaffected

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2016

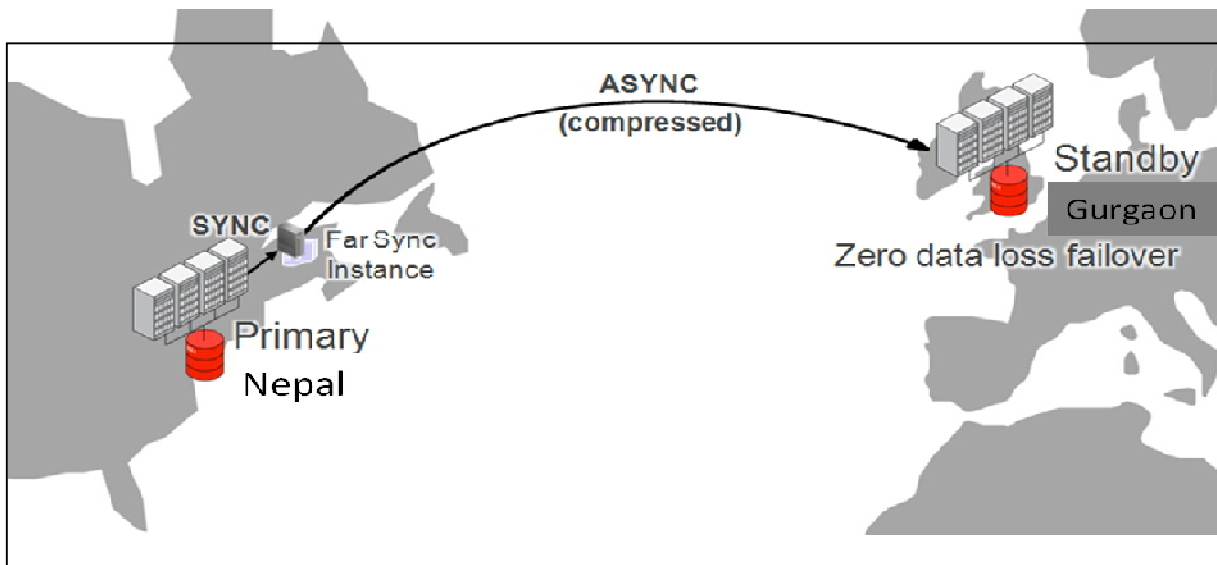
on the primary database while maintenance is being performed at the standby. Downtime is limited to the time required to switch production to the upgraded standby. Specific details of the process used depend upon the type of maintenance being performed.

Platform Migration, Hardware and O.S. Maintenance, Data Center Moves

Data Guard Redo Apply offers some flexibility for primary and standby databases to run on systems with different operating systems or hardware architectures. Redo Apply can be used to facilitate technology refresh and some platform migrations with minimal downtime. Redo Apply can also be used to migrate to Automatic Storage Management and/or to move from single instance Oracle Databases to Oracle RAC, and for data center moves.

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 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. As shown in fig. 13



VII. CONCLUSION

Fig. 13: Example of Data Guard Solution

Mostly, the storage utilization and backup techniques used in health care industries are very time consuming. Due to which these industries have to face difficulty especially at the time of disaster as a result they may lose crucial information of their patients. And if these industries use any HIS system they may not get the appropriate results, the most important being Downtime which should be very less.

As the approaches investigated in this paper clearly show, there is no single optimal approach to foster disaster recovery, less time consumption and pocket friendly in an applicable manner. After a deep study I could reach to a conclusion as per my clients situation and demand and proposed Active Guard solution that not only use for disaster recovery but is a brilliant solution, since it only takes approximately 30 sec to give the results and the other benefit is that is a pocket friendly solution, reliable, SLA compliant. The investigation clearly shows that none other HIS could provide a better solution than The Active Guard solution which itself is a friendly solution.



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2016

REFERENCES

1. G. V. R. K. Acharyulu, "Assessment of Hospital Information System Quality in Multi Specialty Hospitals IJIMT 2012 Vol.3(4): 349-352 ISSN: 2010-0248 DOI: 10.7763/IJIMT.2012.V3.252
2. Andreas Lenel, Caroline Temple-Bird, Willi Kawohl, Manjit Kaur, "How to Organize a System of Healthcare Technology Management", World Health Organization, 2009.
3. Ahmadi M, Barabadi M, Kamkar M. (1389) Evaluation of Hospital Information Systems in the Medical Records, *Health Information Management Journal* 17(1), 16–23.
4. HOU Fei. Application of snapshot technology in distributed environment. *PETROLEUM GEOPHYSICS*. 2007.4(5):45
5. XIE Quan-zhao. Design and Implementation of a Snapshot File System under Linux. Dalian University of Technology. 2006.12.05
6. TheInfoPro. "Deduplication: A paradigm Shift in Backup", TheInfoPro (TIP) Research Paper, January 2011. Available at: <https://community.emc.com/docs/DOC-9720>
7. ORACLE, "Oracle9i Data Guard Concepts and Administration", Release 2 (9.2), March 2002 Part No. A96653-01
8. XIE Quan-zhao. Design and Implementation of a Snapshot File System under Linux. Dalian University of Technology. 2006.12.05
9. HOU Fei. Application of snapshot technology in distributed environment. *PETROLEUM GEOPHYSICS*. 2007.4(5):45
10. YE Yun. Design and Implementation of a Distributed Data Backup and Recovery System. Jilin University. 2008-04-03
11. ZHANG Yong-jun, LIU Bo. An Architecture Design of File Storage for Real Time Historical Data. *AUTOMATION PANORAMA*. Article Number: 1003–0492(2008)04– 0088–03
12. Ratnesh Sharma, Shambhu Kr. Jha "Oracle Recovery Manager" , *INTERNATIONAL JOURNAL OF TECHNOLOGY ENHANCEMENTS AND EMERGING ENGINEERING RESEARCH*, VOL 2, ISSUE 7 50 ISSN 2347-4289
13. J. Adler-Milstein, and D. W. Bates, "Paperless healthcare: Progress and challenges of an IT-enabled healthcare system," *Business Horizon*, vol. 53, no 2, 2010.
14. ORACLE ACTIVE DATA GUARD DOCUMENTATION.
15. ORACLE GOLDEN GATE DOCUMENTATION.
16. Auf Akhtar, Syed S. Rizvi, and Laiali Almazaydeh, "Data Guard: A new approach for recovery and rolling upgrades", *The International Journal of Database Management Systems (IJDBMS)*, February 2010 Vol.2, No.1
17. ORACLE STORAGE REMOTE MIRRORING DOCUMENTATION.