A Proposed Disaster Recovery Model for Customer Relationship Management using Cloud Computing

Engr. Ali Ahmed Huma Ali Ahmed

***Abstract*—These days we have seen that data has been generated in very huge amounts which requires recovery services. Cloud computing provides a huge platform for sharing the data on many places. It introduces a lot of services like infrastructure as a service (IaaS) that provides virtual and physical resources, software as a service (SaaS) which delivers software that provides remote accessibility for consumers over the Internet, platform as a service (PaaS) that delivers computing tracks mostly includes in programming languages and operating systems and network as a service (NaaS) that provides actual network transport data connectivity services. Now we have another recovery service named disaster recovery as a service (DRaaS) which is used to replicate data on multiple servers. DRaaS can be used at the time when servers lost data and unable to provide information. In this research paper, we are going to propose a model for customer relationship management (CRM) using DRaaS which will reduce the problem for data loss. This model will also resolve the latency issues over the cloud for CRM users.**

***Index Terms*—Disaster recovery, Cloud computing, Customer relationship management, Disaster recovery as a service**

I. Introduction

These days cloud computing becomes more popular and growing throughout the world. It provides scalable resources that offer computing tracks. The biggest names in IT organizations are maintaining their data centers to support different types of services of cloud computing. However, many security challenges have been raised like trust and recovery mechanism. The major problem we have seen is the recovery of disasters in cloud computing [1][2]. Disasters can be human made or natural that can create expensive services issues. Two types of different disaster recovery models are used to find failure in a network. One is traditional and another is cloud based service model. In traditional model, we use shared approach or a dedicated network. Based on cost and speed, customers can choose the model as per their needs. Speed and cost becomes high in a dedicated network assigned to a single customer. On other side what we have seen in shared model which is also called distributed approach a network is allocated to the multiple users. This kind of approach decreases both speed and cost of recovery. Cloud computing is a technique to gain both shared and dedicated service model benefits as shown in Fig. 1 [3].

II. CLOUD COMPUTING

Cloud computing provides hosted services over the Internet. It gives a platform for computing resources for companies to consume rather than to develop different costly infrastructures in house [4]. Cloud computing is a pool of several appealing advantages for businesses and consumers like self-service provisioning, mobility, elasticity, broad network access, resource pooling and pay per use. Cloud computing services can be public, private and hybrid which provide on-demand services. Consumers can rely on their applications and also retrieve the assigned resources directly by dealing with cloud service providers.

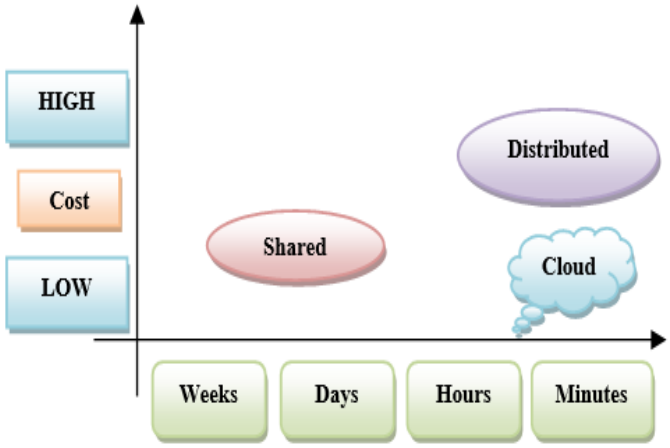

Fig. 1: Difference between Cloud Disaster Recovery and Traditional Model

III. DISASTER RECOVERY

Disasters can be expected anytime in our life. Sometimes it can be made by nature (like an earthquake and tsunami) or sometimes it is by human and also we have seen some technical failures like software and hardware. There is a probability of data loss due to system crashes or power disruption which may result huge financial loss sometimes. The companys main focus is to secure their data from an expected loss at the time of a disaster. Some global organizations like Amazon, Google, Microsoft etc., also experienced cloud disaster already in the past.

Some disaster recovery techniques are needed by organizations for their business growth. Based on the cost and speed, dedicated and shared approaches for disaster recovery exists. There should be a documented standard of procedure for disaster recovery process which should be tested at least twice a year by every organization.

IV. DISASTER RECOVERY AS A SERVICE

DRaaS is a unique service which is a part of cloud computing. In comparison of traditional disaster recovery DRaaS is a low cost service. It is reliable to use for replicating the data virtually or physically. It provides flexible steady recovery for applications like database servers. Some prebuilt alternatives exist for virtual recovery situations when frequently replications in between servers are needed like network connectivity, server failover and security. At the time of a disaster, backup has to be taken so that our applications can be executed on service given by disaster recovery until the primary site gets the backup. DRaaS provides critical servers replication and data center infrastructure in cloud. The following models define the architecture of DRaaS [5]:

A. From Cloud

This model describes that data or primary application is available in cloud and recovery or backup the location in the private data center.

B. In the Cloud

This model shows that both primary site and recovery site exists in cloud.

C. To Cloud

This model demonstrates that the application is available in primary data banks and recovery or backup the location is in the cloud.

V. CHALLENGES IN DISASTER RECOVERY

There are several challenges in disaster recovery which are stated below [6]:

A. Dependency

Out of some major disadvantages of cloud services, one is that clients dont have command of the system and their data. Backup of data resides at service providers due to which dependency on cloud service providers for clients as well as data loss in case of a disaster becomes a major issue for customers. Dependency also branch outs another issue that is choosing of a reliable service provider.

B. Expenditure

Among the most important factors to choose cloud as disaster recovery is its low cost. Hence, cloud service providers all the time look for cheaper mediums to provide the recovery mechanisms by reducing different types of expenditures. The cost of disaster recovery systems on yearly basis is categorized in the following classes:

1) Starting Expenditure
   Amortized yearly expenditure.

2) Running Expenditure
   Processing expenditure, storage expenditure and transfer of data expenditure.

3) Possible Disaster Expenditure
   Expenditure of recovered disasters and also expenditure of irrecoverable disasters.

C. Failure Detection

In this phase, the time of failure detection robustly affects over the system latency so it is not easy to identify and report the issue of failure for fast and accurate disaster recovery. On another side, in numerous backup locations there arise a most important question that how to differentiate between service disruption and network failure.

D. Security

As we said this before, disaster can be made by human or can be by nature. One of the human made disasters is cyber-terrorism attack that can be accomplished due to many reasons. In this scenario, recovery and protection of essential data will be the actual purpose in disaster recovery tactics beside restoration of the system.

E. Latency Replication

Disaster recovery always relies on the technique of replication to create backups. Synchronous and asynchronous are the existing replication techniques. Though both of these have some advantages and some flaws as well. Synchronized replication guarantees an excellent recovery point objective (RPO) and recovery time objective (RTO) but it is classy, expensive and also affects the performance of the system due to outsized overhead. On the other side, the process of asynchronous replication is cheaper and also the system suffers with low overhead. Hence, tradeoff between performance, price of the system and also latency replication is a questionable challenge in solutions of cloud disasters.

F. Data Storage

Industrial database storage is one of the biggest problems of companies which can be only resolved by cloud based services. Enterprises and business markets need to store huge amount of data in cloud based storages. Cloud storage service is flexible and also saves money. The cloud storage system architecture includes access layer, application layer, physical storage and infrastructure management. In order to satisfaction of applications, it also guarantees the security of data. In that case, computing has to be distributed but storage of data has to be centralized. Data loss is a critical challenge in the storage of data for cloud service providers.

G. Redundancy Deficiency

As soon as the disaster occurs, secondary site has to be activated as the primary site deactivated. In this phase, there is no capability to synchronous or asynchronous replication process in the backup location but data and states of the system always locally stored. This problem is not permanent and it will be eliminated after recovery of the primary site. The best disaster recovery solution among many accessible services like business data storage and it is the best way to deal with uncertain situations.

VI. CUSTOMER RELATIONSHIP MANAGEMENT

CRM is used to manage the business relationships and also provide the interactions with their customers. We can also track out the information in CRM systems which contain sales, clients and contacts [7]. Some impacts of the CRM strategy are stated below:

- Understand the query of customers
- Attract the customers with new ideas
- Profit increase
- Decreases the cost for customers

In this way CRM approach is used to facilitate the businesses. The main purpose of CRM is to maintain the basic needs related to the companies and information for the users over the CRM systems.

VII. CUSTOMER RELATIONSHIP MANAGEMENT CLOUD INVOLVEMENT IN CLOUD COMPUTING

CRM cloud allows the access for application programs via using web browser login. The administrator of the CRM system defines the access level for the hosted enterprises. CRM users can also connect their devices over the cloud to rectify the issues. CRM users always need to interact over the Internet using cloud CRM [8][9]. CRM cloud is very reliable like cloud computing as it provides reliable resources over the cloud. This shows a totally new era of involvement of CRM with cloud computing.

VIII. REQUIREMENT OF DISASTER RECOVERY IN CRM

In past several years, the world has witnessed massive damages due to natural or human-made disasters which become a really big challenge to deal with. Companies are now focusing to find new techniques and tactics for handling disaster recovery. This brings a shift from CRM to disaster recovery management (DRM) [10]. Following key areas need to be considered when utilizing CRM to support DRM:

- Develop a DRM board to find procedures, priorities and the like.
- Build cooperative agreements with the stakeholders.
- Setup contact center scripts for interaction with clients about the scenarios.
- Maintain a backup plan for outsourcing supplementary contact center seats or for switching calls from a main center if it becomes inaccessible due to disaster.
- Invest in a CRM system to enable easy clients outreach.
- Consider customer analytics to find out possible financial damages from affected customers.

This shows that as now we are in customer age where customers increasingly own the relationships so there is a necessary requirement for using CRM to help out the clients during times of disaster recovery.

IX. PROPOSED DISASTER RECOVERY MODEL FOR CRM USING CLOUD COMPUTING

This proposed model is for CRM and we are using DRaaS to facilitate the CRM users and also CRM enterprise employees. Also we are using cloud computing in this model to connect and maintain the network transmission over the cloud. With the help of this model, CRM users can connect their devices using the Internet. CRM users face a lot of issues due to latency in gathering the data. We have designed this model to rectify these issues. The backbone of this model is DRaaS for replicating the data on multiple storage servers. For reliable service, we are using three servers so that if any server responds slowly then other two servers help the DRaaS server for the replication of data. After that the data is transferred over the cloud. This model will reduce the latency and data loss problems of CRM and also will help to maintain the lost data using DRaaS. Fig. 2 illustrates the said concept.

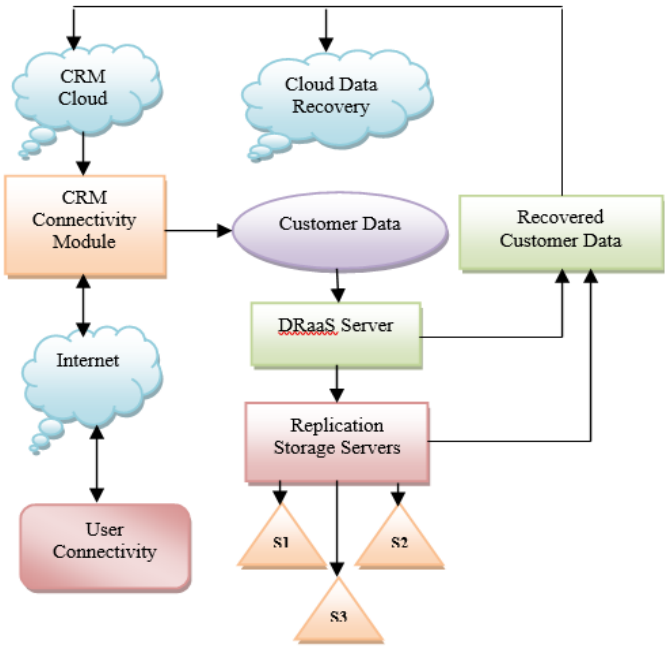

Fig. 2: Disaster Recovery Model for CRM using Cloud Computing

A. Functional Blocks of Proposed Model

1) Internet: Internet provides a medium of connectivity for the whole model particularly for the CRM module where the data logs will be maintained.

2) CRM Connectivity Module: CRM connectivity module maintains the customer data logs and their information. Users can connect their devices with the CRM using this module.

3) CRM Cloud: CRM cloud helps to maintain the data transmission over the network of this model and also controls the recovery of data of customers and updates it on the CRM

module.

4) Customer Data: This module saves all the data of customers like queries, requests and product information. Here users can save their information easily by using the Internet.

5) DRaaS Server: The backbone of this model is DRaaS server where DRaaS is used for disaster recovery. It helps in the recovery of data of customers with the help of multiple replication servers. Downtime will be the damaging factor for the productivity of CRM so DRaaS will play a major role to recover the CRM disasters. DRaaS also replicates the CRM data logs and information in real time servers so the users of CRM can easily get their information. Enterprises will also get benefits from this service.

6) Replication Storage Servers: In our proposed model, we are using three different servers (S1, S2 and S3) for replication of data. These servers continuously save the data and also protect the information of users. If any server faces the latency or delay problems the other two will help to restore the data without any interruption.

7) Recovered Customer Data: In this module, we will get the customers data from DRaaS server or from the replication servers as well. Therefore the CRM users will not face any failure to restore their data. CRM enterprise employees will also retrieve the information and rectify the queries of the customers quickly.

8) Cloud Data Recovery: In this module, the recovered data of the customers will be available on the cloud and it will also be updated on the CRM cloud.

9) User Connectivity: This module provides connectivity for the CRM users with their authenticated devices. Therefore users will easily get the solutions for their queries and they will also report their issues using the Internet.

B. EXPECTED RESULTS FOR THE PROPOSED MODEL

1) CRM customers will get faster connectivity by using this proposed model.
2) Users will get their updated data over the cloud.
3) Enterprise employees will easily restore the data with the help of DRaaS platform.
4) Due to multiple servers, the replication process will be faster and also it will reduce the latency and delays issues.
5) DRaaS server will always updates the recovered data over the cloud.
6) CRM connectivity module will also maintain the data logs reliably.

C. CONCLUSION AND RECOMMENDATIONS

As we seen that cloud computing plays a vital role in the global world. Cloud computing platforms provides faster medium for disaster recovery services. DRaaS is a service where the replication process is easy for recovery after the disasters. We have designed our model for CRM to provide a reliable solution for the expected disasters. DRaaS helps CRM users for latency and data loss issues by providing data backup from multiple servers. CRM and DRaaS is a perfect blend of services for users. For future work, we will use this model for different services as well by adding more attributes in this proposed model.

REFERENCES

[1] Long W., Richard E. H., Ruchi M. and Harigovind V. R., Disaster Recovery for Cloud-Hosted Enterprise Applications, IEEE Ninth International Conference on Cloud Computing, pp. 432-439, 2016.
[2] Greeshma R. and Chenni K., DR Cloud: Multi-Cloud Based Disaster Recovery Service, International Journal of Innovative Research in Science, Engineering and Technology, vol. 5, no. 3, pp. 4521-4529, 2016.
[3] Suganya S. and Dhanalakshmi S., Evaluation of disaster recovery in cloud computing, International Journal of Multidisciplinary Research and Development, vol. 2, no. 6, pp. 300-304, 2015.
[4] Mohammad A. K., Azizol A., Rohaya L., Shamala S. and Mohamed O., Disaster Recovery in Cloud Computing: A Survey, Computer and Information Science, vol. 7, no. 4, pp. 39-54, 2014.
[5] Srinivas A., Seetha R. and Venkatesh B., A Study on Cloud Computing Disaster Recovery, International Journal of Innovative Research in Computer and Communication Engineering, vol. 1, no. 6, pp. 1380-1389, 2013.
[6] Akshay A. G. and Devendra E. M., Disaster Recovery in Cloud Computing, International Journal of Advanced Research in Computer Engineering & Technology, vol. 4, no. 5, pp. 1796-1801, 2015.
[7] J. Nmeek and L. Vakov, CRM and Cloud Computing, Recent Researches in Applied Informatics, World Scientific and Engineering Academy and Society, pp. 255-259, 2011.
[8] Webopedia, Cloud Management, 2014. [Online], Available: http://www.webopedia.com/TERM/C/cloud_management.html/. [Accessed: 02-July-2017].
[9] Webopedia, CRM - Customer Relationship Management, 2014. [Online], Available: http://www.webopedia.com/TERM/C/ CRM.html/.[Accessed: 02-July-2017].
[10] 1to1media, Disaster Recovery in Customer Relationship Management, 2010. [Online], Available: http://www.1to1media.com/customer-relationship-management/disaster-recovery-customer-relationship-management. [Accessed: 02-July-2017].

AUTHORS

Engr. Ali Ahmed, aliahmed.bukc@bahria.edu.pk
Computer & Software Engineering Department
Bahria University, Karachi Campus
Karachi, Pakistan.

Huma Ali Ahmed, huma.simran@gmail.com
Department of Computer Science
Newports Institute of Communications & Economics
Karachi, Pakistan.