Improving Service Reliability in Cloud Computing Environment

Jeenia Jain, Ramandeep Singh

Abstract— Cloud computing is a technology which is new in marketing and is used for complex systems with massive-scale service sharing and is different from grid computing, utility computing and transparent computing. Due to its large scale and complex structure, it's not an easy task to analyse and model its reliability. As there is huge amount of applications that are deployed on a cloud, reliability, security and availability are a big concern. Cloud computing provides a mean to improve or add abilities on- demand without making an investment in setting up infrastructures, training new employees. Reasoning processing involves any subscription-based or pay-per-use support that, immediately over the online, expands its current abilities.

Index Terms— Availability, Cloud Computing, Fault-Tolerance, Flexibility, Prediction, Reliability, Services

1 Introduction

NOWdays cloud computing has become the main concern. It is the latest technology which is almost adapted by a number of organisations. . Increasing demand and releasing computing resources in a cost-effective manner has resulted in wide adoption of the Cloud computing paradigm. It provides the infrastructure for a large number of consumers for various things such as storing data, running different applications, using applications on a cloud. Handling such huge data is quite difficult. Cloud computing plays very important role for its customers as it provides resources according to their demand in a very less cost. Cloud computing has played a significant role in many organisations. Improving reliability services in cloud computing can be a big factor for dealing with enormous data. Reliability means the ability of the system or components to perform various functions under some condition for a time period. Or it's the maximum faults that the system can sustain. As most of the people in today's world rely on cloud computing, it is necessary that high reliability services are provided in Cloud computing environment. To improve reliability of the system should be fault tolerant. Reliability in the concern of consumers can be that how much they are reliable providers. Improving service reliability is one of the main issues in Cloud Computing. Reliability means how much fault a system can endure. Or it also means how accurate the data are. There are numbers of systems for fault tolerance management in cloud computing and some organisations also have FTM for increasing reliability services by detecting and removing faults. Fault tolerance systems can help to improve reliability services.

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2 Reliability in Cloud Computing

By reliability mean availability, i.e. how many minutes or seconds of downtime are acceptable. If we buy one instance of the cloud and it's got an availability of 99.95% then, you will have potentially 21.6 minutes of downtime in any month. If, however, we get 99.99% of available, then are into realms of only 4.32 minutes of downtime. Cloud computing can offer some benefits for planned downtime, but the place that it can have the largest effect on a business is in reducing unplanned downtime.

Planned downtime is usually the result of having to do some sort of software maintenance or release process. Upgrades or scheduled equipment repairs. Most cloud vendors have some planned downtime, but because their business is built on providing high uptime, scheduled downtimes are kept to a minimum.

Unplanned downtime is usually due to disasters such as earthquake, floods, cyclones, etc. and for maximum uptime we need 4 nines which raise the cost also.

B An influential component of reliability is a good backup strategy. With cloud computing systems like AppLogic offering highly reliable storage as part of the package, many consumers are tempted to skip backup. However, data loss and the resulting unplanned downtime can result not just from failures in the cloud platform, but also software bugs, human error, or malfeasance such as hacking. If we don't have a backup, we will be down a long time and this is also applicable to cloud and non-cloud solutions. The advantages of cloud solutions are that there is usually an inexpensive and large storage facility coupled with the cloud computing offering which gives you a convenient place to store your backups. Another aspect of reliability that often escapes cloud computing clients new to the world of computing services is monitoring. A remote monitoring service can scan the servers in the cloud on a regular basis for faults, application problems, or even measure the performance of the application.

3 Cloud Computing

The cloud itself is a collection of hardware, networks, storage, services, and interfaces that enable the delivery of computing as a service. Cloud services include the delivery of software, infrastructure, and storage over the Internet (either as separate

components or a complete platform) based on user demand.

Cloud computing infrastructure is built by interconnecting large-scale virtualized data centres, and computing resources are delivered to the user over the Internet in the form of an on-demand service by using virtual machines. It refers to applications and services that run on a distributed network using virtualized resources and accessed by common internet protocols and networking standards. Cloud computing is more service-oriented than resource-oriented as users do not care much about resources but are more concerned with services they are using. Cloud computing is distinct from but related with grid computing, utility computing and transparent computing. Grid computing is a form of distributed computing where host and virtual resources are composed of clusters of loosely coupled resources, which are independent of each other and perform large tasks. Utility computing is the packaging of computing resources such as computation and storage, as a metered service which is similar to a public utility such as electricity. Transparent computing means complex backend services that are transparent to users who only see a simple and easy-to-use front end

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3.1 Pros

Reduced IT cost: Cloud services can be purchased based on pay-per-use or subscription pricing which reduces or eliminates the consumer's IT capital expenditure (CAPEX).

Business agility: Cloud computing has the potential to allocate and scale computing capacity quickly. It can cut the time required to provision and deploy new applications and services from months to minutes. This enables business to take action more quickly to market changes and reduce time-to-market.

Flexible scaling: Cloud computing enables consumers to scale up scale down and scale out the demand for computing resources easily. Clients can automatically scale computing resources without any interaction with service providers. The flexible service provisioning capability of cloud computing often provides a sense of unlimited scalability to the cloud service customers.

High availability: Cloud computing had the capability to ensure resource availability at varying levels depending on the consumer's policy and priority. Redundant infrastructure components enable fault tolerance for cloud deployments. These techniques can encompass multiple data centres located in different geographic regions, which prevent data unavailability due to regional failures.

3.2 SPOTLIGHT ON CLOUD SERVICE

There are three types of cloud services in which they are as follow:-

- Infrastructure as a Service
- Platform as a Service
- Software as a Service.

In which SaaS is king of all the services.

- **IaaS :**
  - Deliver computer infrastructure as a utility service, typically in a virtualized environment.
  - Also known as utility computing.
  - Provide enormous scalability.
  - . E.g. Amazon web services.
- **PaaS**

Way to rent hardware, operating systems, storage and network capacity over the internet to develop applications.

Sits on a top of the IaaS architecture and integrates with development and middleware capabilities as well as database, messaging and queuing functions.

E.g. window Azure.

- **SaaS :**

This is where users simply make use of a user interface to access software that others have developed and offer as a service over the web.

Built on underlying IaaS and PaaS Layer.

E.g. sales force.com.

4 OBJECTIVES

- To propose a system which can predict fault before it occurs and to handle the fault so that QoS does not suffer.
- To enhancing FTM by adding more features (timer and resource allocation module) in order to predict faults with high rate of accuracy.

5 LITERATURE REVIEW

Reliability in cloud computing systems relies on the probability of occurrence of failure in different architectural layers. Virtualization plays an important role in cloud computing. Many virtual machines with different operating systems are able to run on one physical machine. L. Arockiam and Geo Francis E proposed concept of achieving optimum fault tolerance in virtual machines which can be achieved by imposing middle layer placed between application layer and virtualization layer in cloud system architecture. Motive of this middle layer is to tolerate node failure and this can be achieved by combining various fault tolerant strategies. The functionality of fault tolerance is despite of errors the system should go on and error should be detected and removed but the services should not get affected. L. Arockiam and Geo Francis E proposed the fault tolerance model.

Ravi Jhawar, Vincenzo Piuri and Macro Santambrogio proposed a system i.e. Fault Tolerance Manager in which they explained the working of different managers such as Replication manager, Fault masking manager and fault prediction manager. The working is described as:

- **Replication manger provides:** replication mechanism by managing individual replicas of client's applications which includes their location and synchronization between them.
- **Fault Detection or Prediction Manager:** provides various techniques to predict or detect failures.
- **Fault Masking Manager:** comprises set of techniques that are used to mask present failures in the system.
- **Recovery Manager:** includes the services that help the faulty nodes to recover back to operational mode

6 RESEARCH SCOPE

The emphasis of this research is tantamount to impose reliability services in cloud computing environment. Most of the organizations are now beginning to depend on cloud computing environments for their day to day operations as well as storing confidential business data. It handles a large amount of data at reduced cost.

Improved Service Reliability is very important in cloud computing environment as many people are dependable on it. Fault Tolerance System helps to improve reliability services.

7 RESEARCH METHODOLOGY

The planned research methodology that will be carried is about the model, Fault Tolerance Manager which is used:

To predict faults to increase the service reliability of Cloud computing. This model consists of various managers who have different workings which are divided into two phases: -

- **Storage of data**
- **Processing**

Storage of data is handled by two managers i.e. recovery manager and replication manager. Recovery manager takes care of two failures i.e. database failure and hardware failure. It helps in recovering the data if these failures occur. In case of hardware failure which occurs due to natural calamities, it's not possible to failure, which occurs due to faults in programs are also handled by the recovery manager. Replication manager, stores data at different servers in different parts and the data are encrypted. There is a backup i.e. data warehouse in the whole data, whenever the data at different servers is lost due to attack or any faults. The particular part is fetched from the data warehouse. In case, if the whole server crashes then data warehouse acts as primary data.

Processing is managed by Fault Prediction Manager and Fault Masking Manager. Fault Prediction Manager works as RAM which maps the memory, processor, etc of virtual machines and whenever there is a new resource that needs to be stored in these virtual machines, manager first checks the RAM and allocates the machine according to the space it has. Fault Masking Manager works as a time checker which is present in every virtual machine and checks the execution time of processors, in this if the execution time of processor exceeds it will lead to failure. So, before sending a request to any machine at the time checker will first check its execution time and if the execution time is more the request will be discarded as it can lead to failure.

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