Intelligent reliability management in software based cloud ecosystem using AGI

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Abstract
Cloud computing provides efficient and flexible ways to offer services and computation facilities to users. Service providers acquire resources according to their requirements and deploy their services in cloud ecosystem. Service consumers can access these services across the networks. In order to provide the stable, smooth and fault free services to their customer, reliability in the cloud is an important factor to measure the performance of a cloud platform.
There are so many factors can cause faults, such as network failure, browser crush, request time out or hacker attacks. When users are facing these types of faults, they usually resubmit their requests. To enhance reliability, we need to identify faults, during the execution of cloud services. An intelligent or autonomous system that is capable to enhance the reliability of software as service on cloud by monitoring, analyzing, healing of services provided. This framework can predict critical system fault and switch the healthy service to users. Intelligent cloud service reliability framework will increase the reliability during execution of cloud service. For automation in reliability monitoring, an agent based approach is helpful where diver diverse provision of software services is required. This approach will support in automated system in every unconditional situation where software behavior possible to specify. In autonomous situation, agent can evolve, learn, cooperation with entities and negotiation can perform.

1. Introduction

Cloud computing is the large computing systems that are connected in a public or private network for providing a dynamic infrastructure for computer applications, file storage and statistics. Cost of software web hosting, computation, content garage and delivery has been reduced substantially due to service driven technology. It is a storage medium where data is more secure and globally accessible. Cloud computing is a realistic method to experience the direct advantage.

Cloud computing is cheap and pay-per-use, this attitude of cloud computing putting resources over cloud infrastructure. Cloud computing service uses internet to provide service to consumer and use data centers to host applications. Cloud services are available for consumer as pay-per-use, quality and services over the internet. [1].

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Cloud computing is totally based on fundamentals predominant of re-liability of IT services. The only difference is that cloud computing brings in comparison conventional concept of framework computing, utility computing, distributed computing and autonomous computing is to increase horizons throughout organizational obstacles. By using cloud systems, we can access any of our document, media file, website and any other resources a wherever we want to access at any point time at anywhere on the internet. Cloud computing is a system where we can store, compute and rearrange our data and information reliably and more quickly so that anyone can access data even in other countries as well

1.1 Essential characteristics of Cloud Computing:

Some of the most important characteristics of cloud computing is following:

1.1.1 Immense network access:

Most of the cloud services are provided by web based applications to the requested users. The users can access different services by using different platforms like laptops, mobiles, desktop computers from anywhere in the world.

1.1.2 Flexibility

Any user can get access on cloud resources at any certain point and when needed, even without any knowledge of technical infrastructure and human help. The capacity will be maintained by the cloud service vendors.

1.1.3 Reliability

Cloud computing main objective to provide reliability to cloud users. Due to high availability, reliability and trust, most of the enterprises recommend cloud to deploy their data storage and applications. Cloud provide multiple access to their users.

1.1.4 Rapid Elasticity:

Cloud just provides their services to their users very easily and their users can easily get the services and get advantage of these services on demand. The cloud users can get extra storage space to have more resources from cloud provider in this way they can use more services.

1.1.5 Backup and Recovery

Measured service is a term that IT experts apply to distribute computing. This is a reference to services where the cloud supplier measures or screens the arrangement of services for different reasons, including charging, successful utilization of assets, or general prescient arranging.

1.2 Cloud Service Models:

The most commonly used service models offered by different cloud service provides are following:

- Infrastructure as a service
- Software as a service
- Platform as a Service

1.2.1 Infrastructure-as-a-Service

Infrastructure as a service is a shared computing service offering wherein vendor offer customers access to registering tools, for example, servers, storage structure, and systems administration. It is a kind of distribute computing that gives virtualized processing property over the net. Using IaaS model, an outsider provider has equipment, programming, servers. IaaS providers host client's applications as well and deal with undertakings which include framework aid, reinforcement and flexibility arranging.

1.2.2 Platform-as a- Service

Platform as a service is a worldview for conveying working frameworks and it is used to provide the cloud users all the facilities through internet which is a worldwide network. We can access and download anything but the difference is quite simple that these facilities are provided by the cloud service providers and you just need to pay for what you used on cloud. PaaS provides apparatuses to test, create, and have programming applications in a similar domain.

1.2.3 Software as-a-Service

This model provides a complete software to a customer for their specific work that can be service on demand and hosted by cloud vendor or service provider. That single software runs on cloud and made available for customer to provide services over network. For customer's side, there's no need for any upfront payment for server or license for software but on the other hand, providers pay cost for running and hosting a single application. SaaS also provide the facility that is pay-as-you-go subscription licensing model.

1.3 Software ecosystem

There are different categories that are unquenchable required all around over every one of the controls. In most recent couple of years, the development of information has raised the measure of all the accessible information to a totally new level. Software ecosystem can consist of all types of data and software services.

Data-as-a-Service, Data Mining-as-a-Service, Failure-as-a-Service, Database as a service and everything is service will be future of software ecosystem

1.4 Software as service reliability

Software reliability means delivery of acute services during execution of software. Software reliability in cloud computing refers to working the virtual machines during provision of cloud service. Intelligent reliability in cloud computing refers if the exceptions and malfunctioning occur, tackle it through automated system.

1.4.1 Service functionality in cloud

The Service functioning is error free and in good conditions for service delivery. Service consumers consider reliability as proper functioning, security, and ease of use. Service providers also consider reliability in service creation, deployment, integration and separation. The reliability in cloud computing environment also includes providing proper functioning in different stages in service lifecycle.

1.4.2 Service integration in cloud

Service integration and separation allow service providers to offer both full set of functionality and part of functionality to service consumers according to service level agreements. The base line of the reliability is to provide healthy functioning services. [2]

1.5 Cloud Service Failure

A cloud service can be down and out of order in any types of system failures. Different categories of failures like VM failure, Software Failure, Hardware Failure, Cyber Attack, Power Failure and network failure can decease the performance of cloud service. In domain category, failures contain content failure, early timing failure, late time failure, halt failure, and erratic failure. Every type of

failures focuses on different aspects of system abnormal behaviors.

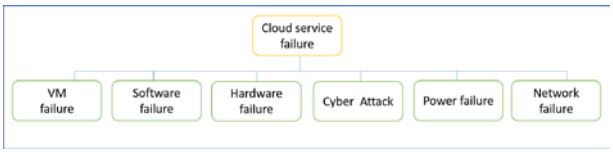

Fig. 1 Cloud Service Failures

1.5.1 System Failure

In order to prevent system failures, we may need a unified framework for most of these types of system failures. In conventional software engineering reliability, four main approaches to design a reliable software system.

1.5.2 Fault Handling

These four approaches are fault prevention, fault removal, fault tolerant, and fault forecasting. However, in cloud computing environment, cloud applications only accept fault-prevention techniques and fault removal techniques to develop fault-free software systems.

1.5.3 Working of Virtual Machines

The large scale cloud services involve large number of virtual machines and middle ware layers. Failures of these components affect reliability of cloud applications directly. The idea of Most cloud service providers deploy their services in large datacenters. All of services are running in virtual machines that reside in physical machines. There are usually multiple virtual machines running in one physical machine. When a virtual machine is initialized, the administrator or virtual machine monitoring system gets resources from a resource pool to build requested virtual machine. Reliability is cloud computing under the different conditions like network resources, latency and cloud monitoring can result in low performance. Such conditions must be observing by autonomous system to avoid the delivery of cloud services failures.

1.5.4 Monitoring cloud services through event logs.

In order to enhance reliability, we need to identify faults through monitoring process. system event logs record most of system events that include system fault related events. We can trace system faults through system event logs. There are always system critical events happened before system enter fault states. Therefore, if a system could predict system critical events, it can predict system faults before they really happen. Researchers dig into this problem from different aspects. Following study presents several techniques for system fault monitoring. Through machine learning techniques, we can find some patterns that always appear when system. faults occur. Statistical data is used in mining and detecting fault patterns in service event logs are normalized according to domain information in knowledge base.

2. Related Work

Cloud security is difficult to maintain when it becomes public and integrity of data is questionable. Many procedures have been designed to check cloud data. Now with standing issues with existing system are weak authorization and access data control which is likewise a danger to reliable services. In this paper structure is proposed for securing protection furthermore, reliable delivery and its information is focused.[3]

Cloud computing is one of the present most energizing innovation of the IT business. It moves the application programming and database to the large data centers. Distributed storage empowers the client to remotely store their information. Client can store and get their information with the assistance of web. Guaranteeing the security of distributed computing is a central point in cloud computing. In this article, author focused on cloud information by the execution of virtual machines in cloud computing. [4]

Fault prevention and fault tolerance intend to give the capacity to convey an service that can be trusted, while fault expulsion and fault forecasting mean to achieve trust in that capacity by defending that the utilitarian and the steadfastness and security details are sufficient and that the framework is probably going to meet them. It is significant that repair and fault tolerance are connected ideas; the refinement between fault tolerance and support in this paper is that upkeep includes the cooperation of an external agent. [5]

For automation in reliability monitoring, an agent based approach is helpful where diverse provision of software services is required. This approach will support in automated system in every unconditional situation where software behavior possible to specify. In autonomous situation, agent can evolve, learn, cooperation with entities and negotiation can perform. Expanding system required agent behavior role while rapid change occur. [7]

3. Propose Methodology

In proposed methodology, the Intelligent reliability management in software based cloud ecosystem will work in autonomous way as shown in figure 2.

In proposed model, in first iteration, it will collect the job request, cloud service audit, QoS parameters, service

security parameters and service execution time. After collecting the service detail, it will analyzed the virtual machines status and calculate the utility, if the existing pattern are available in knowledge base. In provision of reliable services in cloud computing, system will determine the service response, failure analysis, sensing layer.

The proposed framework of Intelligent Cloud Service Reliability as shown in fig. 2 consists of six major modules.

- Service Audit Layer
- Sensing Layer
- Knowledge base
- Learning Module
- Service failure history

3.1 Service Audit Layer

Service Audit Layer is divide into two sub modules

1). Service security Layer

2). Service response Layer.

The service audit layer is responsible for monitoring virtual machines, service logs and network resource.

When cloud services are provisioning over the network through user interface, the service are being execute will monitor through our proposed intelligent cloud service reliability framework. In service Audit layer, service execution i.e virtual machine analysis will be monitored.

In service audit layer, there are three sub module to monitor the virtualized cloud service through different check points.

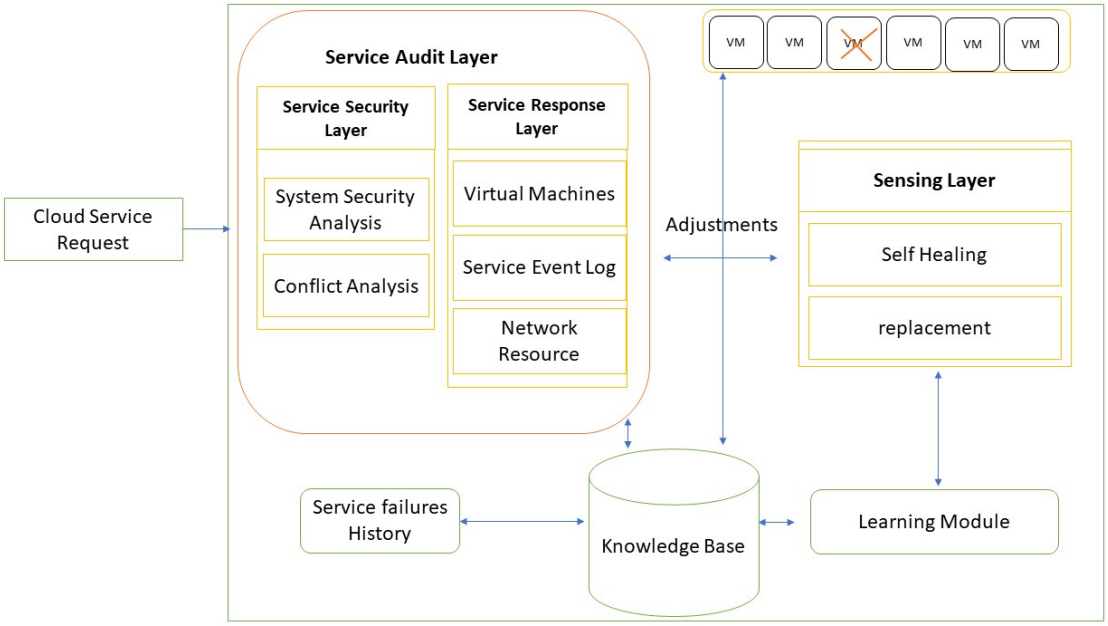

Fig. 2 Intelligent Cloud Service Reliability Framework

Service response layer is further sub divide into three layers

1. Virtual machine Response
2. Service Event Log Response
3. Network Resource Response

In **Virtual machine response**, the health status of all virtual machine will be monitored. In VM response layer, all the virtual machine status will be checked. If any virtual machine is not working then the alternate virtual machine will be replace in term of self-healing and replacement of VM during service execution over the network.

Service Event Log Response checking will responsible for the auditing of cloud service in the form of log checking and log will be analyzed.

Network resource response check include the physically resources during provision of cloud services.

3.2 Learning Module

Learning module will keep track of all type of cloud service failure and connected with sensing layer.

After event failure, it will be analyzed with stored failure type and decide on the basis of failure type and available resources.

3.3 Sensing Layer

Sensing layer will responsible for recovery of failure components in cloud service provision. Sensing layer will replace faulty virtual machines on the basis of service response layer and keeping the track of such failures.

In provision of reliable cloud service provision, the replacement will be performed if, the recovery of virtual machine is not possible.

The adjustment will be done on the basis of service response layer.

3.4 Service security layer

This module consists of two analyses.

1. Service security analysis
2. Conflict analysis

While service healing process the recovery of service is subject to service security analysis. During recovery of failure, the requested service is for the same device. During recovery process, the system will check the service examination in term of virtual machine, Host machine, designation machine, current service status, network resource.

Conflict analysis will be done while doing the recomposing the cloud service. Both the analysis will be made during recovery of cloud service.

4. Conclusion

In cloud computing, service failure can be occurred due to physical and network. Reliable services delivery to customers or data recovery after failure event is cloud service provider responsibility. By using intelligent recovery mechanism can reduce high risk of data failure in software as a service. Autonomous environment can increase the creditability in customized services with various configurations. Error free and seamless functionality during cloud service execution need intelligent and recovery base techniques in such type of failures.

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