IJCSE International Journal of Computer Sciences and Engineering Open Access
Review Paper Volume-6, Special Issue-2, March 2018 E-ISSN: 2347-2693

State-Of-The-Art and Research Issues in Cloud Computing

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Available online at: www.ijcseonline.org

Abstract: Cloud computing is an emerging internet based computing technology whereby the services are provided on-demand. The cloud environment basically comprises of the cloud user, broker and the Cloud Service Provider (CSP). Cloud computing basically offers platform, software and infrastructure as its services to its user. Multiple users can access resources in cloud from different devices. The actual resources are stored in physical storage devises and are accessed by the virtual machines (VM) serving a request. These user requests are to be scheduled and provisioned in an optimum time and cost with the help of the resource broker. This paper provides a brief review on cloud computing, its types, service delivery models, cloud architecture, state-of-the-art and the research issues in cloud computing.

Keywords: Cloud Service Provider (CSP), Virtual Machines (VM), Cloud Architecture, Resource Broker.

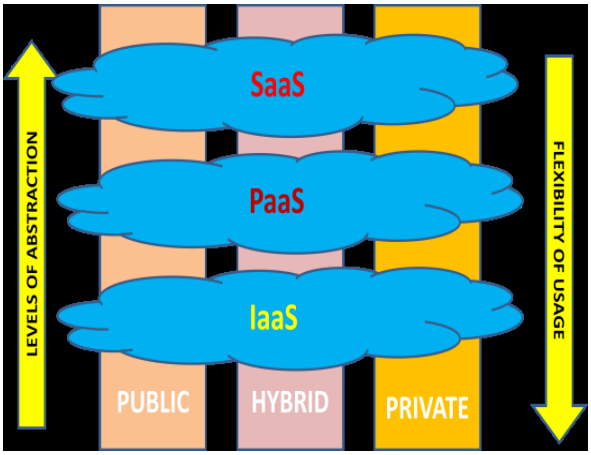
I. INTRODUCTION

Cloud computing is a computing model, to present dynamically scalable infrastructure for application, data and file storage. It is an extension of parallel computing, distributed computing and grid computing. Cloud computing is capable of providing a secure, convenient, quick, computing and data storage with the help of internet. It also represents the supply and consumption of delivery models for IT services. Computational resources are provided to the consumer on an on-demand basis. The services are managed by the CSP. The Cloud Service Consumers (CSC) must have a personal computer and an internet connection. The CSCs do not own the physical infrastructure or do not install anything on the desktop. Private cloud is a cloud computing model that offers similar benefits to a public cloud but is dedicated to a single organization, allowing customization of the environment to meet unique needs and security requirements. It can be managed internally or by a third party and it can be hosted behind the company firewall or externally.

Advantages of Private cloud offers public cloud such as quick scalability and consumption plus ease of use and flexibility, but private cloud gives organizations superior control, better performance. Cloud is something more than the internet. Wherever the user goes he can use the technology. User need not pay for the technology when he is not using it. Four main criteria which are indispensable in cloud environment are,

- Services are delivered through a web browser
- Zero capital investment
- Ubiquitous
- Pay only for what we use [14].

Cloud computing is usually described in one of two ways either based on the cloud location, and on the service that the cloud is offering. The following figure exposes the three types of cloud namely public, private and hybrid and the three basic service delivery models Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS).



A. Types of Cloud

Cloud Computing is essentially classified into three different types as shown in Figure (i).

***1*. Public cloud:**

A public cloud is basically the internet. Service providers use the internet to make resource, such as application (also known as Software-as-a-Service) and storage, available to the general public, or on a public cloud. The representation of model can be security, limit

configuration and SLA specificity, construction it less-than-ideal for services using responsive of data that is subject to the compliancy of regulation [15].

***2*. Private cloud:**

Private clouds are data center architectures owned by a single company that provides flexibility, scalability, provisioning and automation and monitoring. The private cloud for this purpose is not put up for sale "as-a-service" contributions to external consumers but as an alternative to gain the profit of cloud architecture without charitable up the control of your own data center will be maintained. Private clouds can be more expensive with typically modest economies of scale. This is usually not an option for the average small-to-medium sized business and is most typically put to use by large enterprises [15].

***3*. Hybrid cloud**:

Hybrid approach, can maintain control of an internally managed private cloud while relying on the public cloud as needed. When instance during max out periods for portions of applications can be migrated to the public cloud or individual applications. This will also be beneficial during predictable outages: hurricane warnings, scheduled maintenance windows, rolling brown and blackouts [15].

***B.* Service Models:**

Cloud computing contains different three service models as defined in Figure (i)

1. SaaS (Software as a Service**):**

User can use the provider's applications running on cloud transportation. These applications are accessible from client devices through web browser. In SaaS also, the consumer cannot manage the underlying infrastructure [14]. As given in Fig.(i) the flexibility of usage is less when compared to other service models. SaaS particularly doesn't offer the elasticity of creating institution software similar to IaaS [16].

2. PaaS (Platform as a Service**):**

In cloud computing, Platform as a Service (PaaS) is the capability provided to the consumers to utilize the hardware, operating system, storage and network over the internet. Consumers rent virtualized servers and associated services with the help of service delivery models. The consumer is not given authority to manage the underlying cloud infrastructure, but can control the deployed applications [16].

3. IaaS (Infrastructure as a Service):

Infrastructure layer is the set of hardware resources. The basic functions of infrastructure layer are resource abstraction, resource monitoring, load management, data management, resource deployment, security management and billing management. Infrastructure layer abstracts physical resource by virtualization technology and achieves the automation within the process by optimizing resource management to provide dynamic and flexible infrastructure services to external resource users [6].As shown in Fig.(i) IaaS provides more flexibility. The user is responsible for maintaining and updating the system and not the provider.

II. RELATED WORKS

Rabi Prasad Padhy et al. discussed different models of cloud computing, security issues and research challenges in cloud computing. Data security is major issue for Cloud Computing. There are several other security challenges together with security aspects of network and virtualization [1]. Felix Meixner and Ricardo Buettner presented a state of the art overview of the role of trust in cloud computing. clearing up and mapping offline trust to online trust, we showed that the concept of trust does also exist and even plays a vital role in the online world. Trust and security are an integral part of cloud computing and essential for its adoption and growth [2]. Yaser Ghanam et al. proposed an understanding of the types of issues and chal- lenges that have been emerging over the past five years and identify gaps between the focus of the literature and what practitioners deem important [3]. Santosh Kumar and R. H. Goudar provides trendy platforms of cloud computing and the architecture. It also issues of cloud computing in detail and addressed challenges [4]. Mohsin Nazir analyzes the key research challenges present in cloud computing and offers best practices to service providers as well as enterprises hoping to leverage cloud service to improve their bottom line in this severe economic climate [5]. R. Jamina Priyadarsini and L. Arockiam proposed on this more specific to exposes the failure management models and issues in cloud environments with respect to enhancement of reliability [7]. Foram F Kherani and Prof.Jignesh Vania proposed on the model of cloud computing in load balancing and how it advanced and maintain the performance of cloud systems and also controls association of various existing static load balancers as well as predictable dynamic load balancer also [8]. Dr. Amit Agarwal and Saloni Jain discuss three algorithm we developed a new generalized priority based algorithm with limited task, future we will take more task and try to reduce the execution time as presented and we develop this algorithm to grid environment and will observe the difference of time in cloud an grid[9]. Rajarshi Roy Chowdhury discussed about security risks and issues in various aspects, such as CIAA (Confidentiality, Integrity, Availability and Authenticity) and issues related to various service delivery models such as: DoS, network security, data security and locality in SaaS models, network and host intrusion in PaaS and IaaS not only considered where data is being stored and process but also concerned the media of data transfer is being used over the Internet [10]. Maram Mohammed Falatah and Omar Abdullah Batarfi proposed an Cloud computing is a recent technology trend that help companies in providing their services in a scalable manner. Hence, used this service capabilities required many procedures in order to get better performance [11]. Jasbir

Kaur and Supriya Kinger discussion with experiments where exclusive and collaborative fault tolerance solutions are implemented in an autonomic cloud infrastructure that we prototyped. It also includes algorithm comparison between MPI and MPIL [12]. Eli WEINTRAUB and Yuval COHEN propose three possible strategis for implementation of the model in organizations. We formulate the mathematical model and illustrate its advantages compared to existing pricing practices used by cloud computing consumers [13]. Priyanka Sankhla and Sohit Agarwal propose a scheduling algorithm cloud broker between telecommunications operators and users exist. This is the basis of middleware to realize their ability to work on algorithms and ceiling [14].

III. RESEARCH ISSUES IN CLOUD COMPUTING

The main aim of cloud computing is to provide a quality Service to its consumers. The major issues in cloud computing environment are

- Scalability
- Availability
- Security
- Trust
- Scheduling
- Reliability
- Resource Utilization
- Fault Tolerance
- Cost Optimization
- Storage Optimization
- Load balancing

A. Scalability:

Cloud computing helps organization, to scale their computing resources whenever needed. This is done by either increasing or decreasing the required resources. Payment is based on the usage of resource and the organization need not pay for the unutilized resource. Scalability is the ability of the system to expand itself by adding resources, either making hardware stronger (vertical scalability/ scale up) or adding additional nodes (horizontal scalability/scale out) [11]

B. Availability:

Availability is the level to which a organization or module is operational and available when essential for utilize. In software engineering, availability is measured in terms of mean time between failures and mean time to repair. High availability typically is addressed by means of replicating servers and storage. When a job is submitter to a cloud resource, the resource is said to be unavailable in one of the following situation:

a. A part of service of the resource is denied to the user
b. The resource is shut down [7].

C. Security:

Security in cloud computing refers to the set of events, standards and processes designed to offer the information for security assertion is computing background. Cloud security addresses both physical and logical security issues across all the different service models of software, platform and infrastructure. It also emphasizes about the delivery of services through service models like public, private or hybrid delivery model. Cloud security comprises a broad range of security constraints from an end-user will always prioritize the provider's security policy. That is the user always has a concern over how and where their data is stored and who has access to that data etc. a cloud provider, on the other hand, takes care of the security issues ranging from physical security of the infrastructure to the access control mechanism and also the execution and maintenance of security policy [10].

D. Trust:

The major concerns in cloud computing are trust and security. Trust is one of the most critical obstacles for the adoption and growth of cloud computing. Trust and security go hand in hand - one might even go as far as saying one induces the other. Therefore, in this section we will not only refer to the framework with the four characteristics of trust we have just laid out in the preceding chapter, but go beyond this and include security as an object of study, which interacts bilateral with trust. Trust and security are an integral part of cloud computing and essential for its adoption and growth [2].

E. Scheduling:

Cloud computing in scheduling is a large amount significant task in cloud computing atmosphere. In this paper we have analyzed various scheduling algorithm which efficiently schedules the computational tasks in cloud environment. We have created FCFS, Round robin scheduling Algorithm and new proposed Scheduling algorithm is (GPA) generalized priority algorithm. Priority is an important issue of job scheduling in cloud environments. The experiment is conducted for varying number of Virtual Machines and workload traces. The experiment conducted is compared with FCFS and Round Robin. The result shows that the proposed algorithm is more efficient than FCFS and Round Robin algorithm [9].

F. Reliability:

Some of cloud computing key requirements for information security are availability and reliability. For all types of potential failures there are mechanisms in place that help to reduce the availability- and reliability risks to a minimum level. Reliability for large cloud computing datacenters and present a detailed analysis of failure characteristics, as well as a preliminary analysis on failure predictors. In ongoing work they are working on models for server reliability, including replacing hard disk drives (HDD) with solid state drives (SDD) for better reliability [2].

G. Resource Utilization:

Considerable energy in the saving of a cloud computing data center not including sacrificing SLA are an admirable economic motivation for data center would also make a significant contribution to greater environmental sustainability and operators. It has been estimated that the cost of powering and cooling accounts for 53% of the total operational expenditure of data centers. The purpose is not only to the scratch down energy charge in data centers, but also to meet environmental standards and regulations of government. Designing energy-efficient data centers has recently received considerable attention [14].

H. Fault Tolerance:

Fault tolerance refers to correct and continuous operation even in the presence of faulty components. In processing on computing nodes is done distantly, mainly of the cloud applications in real time. So there are more chances of errors. So there is an increased requirement for fault tolerance to achieve reliability for the real time computing on cloud infrastructure. The main fault tolerance issues in cloud computing are detection and recovery [12].

I. Cost Optimization:

Cost optimization is optimized in the complete mathematical model. In the simple model the optimization is not maximal since selection of services is performed on a subgroup of all providers' services. In the hierarchical model optimization is low due to selection on the basis of providers' bundle's price, but not based on services' prices [13].

J. Storage Optimization:

Cloud Storage provides users with storage space and makes user friendly and timely acquire data, which is foundation of all kinds of cloud applications. When the researches on cloud storage in optimize aiming at development of data access performance over cloud and there is impairment of profound studies. In this environment, consumers are billed as per they used. Generally it is called as "Pay-as-you-go". Storage management system automatically analyses user's requirements and locate and transform data, which greatly facilitate the users. But, high demands are proposed for cloud management system itself [4].

K. Load balancing:

Load balancing is the process of improving the performance of the system by shifting of workload among the processors. Machine in workload means the overall processing time it requires to perform all the responsibilities assigned to the particular machine. Balancing the load of virtual machines uniformly means that anyone of the available machine is not idle or partially loaded while others are heavily loaded. Cloud computing in load balancing is most significant factors to improvement the working of the cloud service provider in performance. The goal of load balancing is to increase client satisfaction and maximize resource utilization and substantially increase the performance of the cloud system and minimizing the response time and reducing the number of job rejection thereby reducing the energy consumed and the carbon emission rate [8].

IV. CONCLUTION

In this paper provides a concise review on cloud computing, service delivery models, cloud architecture, its types, state-of-the-art and the research issues in cloud computing. The study shows that failure instances directly affect the system reliability. Thus a failure free environment is to be achieved. By maximizing the fault tolerance and minimizing the failure incident increased reliability is possible. Efficient utilization of resource helps to achieve high performance. Thus the study illustrates that effective resource utilization can be achieved with the help of optimization technique like PSO. Also evolutionary algorithms can be proposed to optimize resource scheduling.

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