

STUDY ON THE PERFORMANCE ANALYSIS TOOLS AND TECHNIQUES OF CLOUD COMPUTING

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ABSTRACT: Cloud computing is an emerging commercial infrastructure paradigm that promises to eliminate the need for maintaining expensive computing facilities by companies and institutes alike. Cloud computing is a method or technique for enabling convenient, on demand network access to a shared pool of computing resources (such as computer networks, servers, applications, storage, and services) that can be continuously provisioned and released with minimum management efforts. In this paper we have studied some of the existing performance monitoring tools and techniques popular among variety of users.

KEYWORDS: Cloud computing, performance analysis, Load Balancing

I. INTRODUCTION

Cloud computation has been popularly recognized in the study of advanced technology as well as technical solutions for IT engineers in recent years. In other words, the scalability of this technical software programs has been available everywhere mostly in the business organizations. In fact, the term has been well associated with the servicing of the resources as well as the sharing of data visualization so that it can be able to interpret language well. On the other hand, utilization of cloud computation in the field of tech-savvy workers would be applicable as well as suitable for finding a better form of results in their businesses [1]. In terms of data storage, management or in case of networking services as well, it can be effective in managing and operating data under control.

There have been numerous ranges of cloud computing models that have been working from the past few years in the workplace environment. This involves models, which fall under the category of outside the premises of an organization [2]. Besides, there can be another form of the model, which tends to be used for commercial purposes like cloud service providers. In addition, there has been a community-based cloud model under ethical compliance so that it can be having some policy enhancements and shared within a common social community as well.

Moreover, there has been the implementation of a hybrid cloud model for the standardized application of cloud bursting for loading and balancing between clouds as well. Based on the category of cloud models, businesses of organizations could be better manipulated through the convenient option of managing data and protecting it for future security as well [3]. It has been acknowledged from the background of the study that most of the cloud service models have a high cost of implementation into work. This can be definitely of good quality and large size of space and that would be able to store maximum volume of data as well.

Complexity in cloud computing has increased with the evolution of cloud computing and with the popularity of Hybrid cloud deployment model. To facilitate the IT administrator in managing the cloud, automated cloud management tools are very useful for automating the management task in the cloud. Considering this importance we have been discussed some of the prominent cloud management tool. This work has made significant contribution by differentiating the cloud management tools considering the criteria such as open source and proprietary, cloud deployment and operating system supported etc. This will be very useful for the users in making the decision for selecting the right type of cloud management tools that are applicable for them. In this paper, it intends to focus on the study on the Performance Analysis tools and techniques of Cloud Computing. At the same time, the paper has provided a wide range of literature reviewed in the concerned area.

II. PERFORMANCE FACTORS DETERMINATION

Monitoring the cloud performance is important for both the cloud user and the cloud provider in real time and analysing the historical performance of the cloud. A large number of applications running in public cloud require huge and powerful resources. Applications known as “big data” consist of workload such as digital media collection, virtual worlds, simulation traces, data obtained from scientific instruments, and enterprise business databases are resource hungry application. Response time for these applications is very important,

lacking which leads to unpleasant experience to the user. Applications hosted on public cloud should be checked for its performance i.e. response time and processing time so that these factors are within the tolerance limit. Before provisioning the more resources, it is important that resources available are used at its optimum level to avoid further investment in these resources.

III. PERFORMANCE MONITORING APPLICATIONS

To monitor the performance in the cloud computing, a number of automated performance monitoring (APM) tools from various vendors are available which provide the monitoring in real time as well as on historical data. Majority of them enable the user to monitor the details of their cloud using wide variety of devices such as smart phones to laptop devices. Some of these tools have been defined as in table.

Sr. No.	Provider	APM Tool	Factors monitored
1.	Netinst (http://www.netinst.com/-products/observer-reporting-server/index.php)	Observe reporting system	End user page response time Transactions Processed Network error, latency & utilization
2.	Copper Egg (http://copperegg.com/revealuptime-website-monitoring/)	Reveal Uptime	URL, port, & site latency, response time, uptime, health. Worldwide real time data collection coverage, analytics, alarms. Troubleshooting, multiuser access
3.	Hyperic (http://www.hyperic.com/products/cloud-status-monitoring)	Cloud status	Monitor service availability, response time, latency, and throughput Provides real-time Reports Application availability and performance
4.	CA technologies	CA virtual assurance	Infrastructure response time, latency time Monitor the Table 1.2: Provider and factor for monitoring performance in real time Deployed as virtual appliances.
5.	Virtual instruments	Virtual wisdom	Measures the response time of individual fiber channel. SAN Latency time and load information for all fiber channel traffic.
6.	Xangati	Xangati	Infrastructure response time for each application Monitors data in real time Storage performance for only IP attached devices
7.	Akorn	Akorn	Infrastructure response time is collected from end to end. Polls the entire infrastructure once in 15 minutes (not in real time).

Hence, from the above discussion and table it can be inferred that response time, data processing time, throughput and uptime are important factors which plays pivotal role in cloud and hence, required to be monitored to determine the cloud performance.

IV. CLOUD PERFORMANCE AND LOAD BALANCING

In cloud computing paradigm, application and data are stored in data center of cloud provider which is located in diverse geographical locations. Presently developed countries such as USA, UK and countries from European Union are selected as preferred locations for data center by the cloud providers. These locations have been selected considering the peace and stability existing in these countries, so that any loss due to terrorist activities can be avoided. Data center locations of some of the prominent cloud providers have been depicted in table.

Table: Data Center Locations of Prominent Cloud Provider

S.N	Region	Data Center Location		
		USA	EU	Asia
1.	Amazon Web Service	East(Northern Region), US West(Northern California), Brazil	Ireland, Netherlands, Germany	Japan, China, Singapore
2.	Microsoft	Quincy, Washington, San Antonio, Texas Chicago, Illinois	Ireland, Netherlands	Singapore, Hong Kong
3.	Google	USA (Quilicura, Oklahoma, Lenoir, The Dalles, Oregon)	Finland, Belgium	Singapore Taiwan, Hong Kong

Each data center consists of a number of nodes; these nodes are in the order of hundreds. Data center offers basic on demand storage and computation over the internet. Provisions of these computational resources

are in the form of VM, which is an abstract unit of computational in cloud. These VM differs in configuration such as memory, CPU and bandwidth etc. Due to the dynamic nature of cloud environments, diversity of user's requests and time dependency of load, cloud centers must provide expected quality of service at widely varying loads (Xiong & Perros, 2009; Baker et al., 2011).

V. MAPPING OF METHODS IN DESIGNING CLOUD COMPUTATION MODEL

The mapping method of designing cloud computation model can be based on its pattern, category of the model to be used as well as on the basis of the quality functions to be implemented in the entire method of architecture. Continuous integration and delivery of application processes and techniques can be used in an effective area so that it can perform on the basis of automated systems [8]. In fact, this kind of application method has been designed on the basis of the dynamic functions of the components in the systems. It involves with a suitable method of the model below, as drawn, for example, an AWS cloud map has been supported with its registered applications and its available names as well.

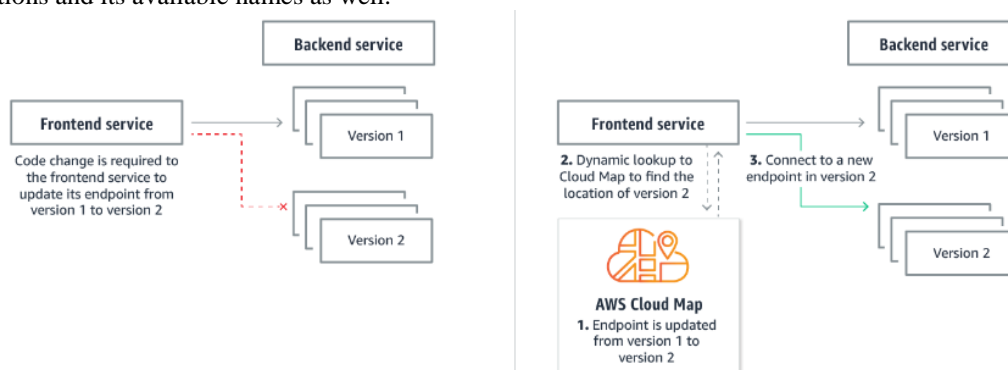


Figure 3: Mapping of methods in Design on cloud computing

(Source: Amazon Web Services, Inc, 2020)

From this mapping of design, it has been acknowledged that with the help of the mapping model, it has been identified that most of the places there have been some productive types of functional areas into it. Hence, this can well perform on the basis of front end services as well as back-ended service in alliance and coordination.

VI. EMPIRICAL STUDIES

Kaur(2020) proposed that the concept of cloud computing is now a major system in the business framework [9]. The popularity of the service has grown leaps and bound. The main reason for the popularity is the growth in the companies, the companies now are growing at a rapid rate employing thousands and providing service to millions. Thus the need of cloud computing service is at its peak, with the concept of reliability and low-cost system to run the service most companies uses them to reduce the cost of data storage, analysis and other major tasks that would require more manpower and space if done manually.

In the study of Eisa et al(2016) the organization's success depends on the perfect decision that the top managerial level tackles [10]. Thus it becomes a factor when computers are adopted into an environment if the decision-makers are innovative they can take up the adoption computer into their business system which can only enhance the capabilities.

According to Arnold et al(2019) with the advancement of technical assistance, the digital market is growing relentlessly [11]. With thousands of people relying on the digital world for their daily basis work, the developers are doing their best to improve the digital world. The more accustomed people will become with the digitisation the better the job opportunity will be. Not only the organisations but every individual is one way or the other way is connected to the digital environment. From Yahoo to Google, from Facebook to WhatsApp humans, from storing picture in the phone gallery to saving them in the cloud database, humans are completely dependent on the digital markets. It is accepted that everything a person does in the digital world has to be kept, has to be kept secure. The storage is the key feature that makes the digital world popularized among the people.

Silva et al(2016) proposed that the concept of a database is not a new thing in the world [12]. With the development of the database led to the innovation of a database management system. The organization has received a lot of benefits from it. For more than 40 years the business has been using the traditional way of storing and analysing their data. The traditional way includes the usage of the data warehouse and the relational databases. The traditional databases have been designed uniquely to perform with the structured data in a large number. The structured data is different from that of semi and unstructured data. A structured data is the product of organized records with names of the fields and the relationships.

As stated by Terry(2019) the most interesting feature of cloud databases is that the companies who want to use the cloud databases need not buy any dedicated hardware for it [13]. This database has the potential to be used

by both as a user or as a provider. Unlike the traditional system, it can support more database management system. It can support NoSQL databases which include Apache Couch DB and MongoDB. PostgreSQL and MySQL of the relational databases are too can be supported in it.

According to Li(2019) it is true for any organisation management of the official matters through cloud database computing is very much effective as well as efficient [14]. It can give the company better results in a shorter time. However, there are some challenges in cloud databases. Now before directly moving towards describing the challenges in cloud databases, it is mandatory to mention the issue of why the organisations prefer to migrate their confidential and critical databases to the cloud.

Waizenegger and Lumpp, (2019) states for the last few years, it has been observed that the companies prefer to shift their databases to the clouds for maintenance [15]. There are several convenient factors behind the shifting of the databases of the companies to the cloud which are: convenience, scalability, flexibility and above all economic stability. When this conception of cloud was first adopted it was seen that the chief merit was the availability of cloud at affordable and low costs.

Van Rotterdam and Polman, (2019) evaluated that sometimes it is often seen that many cloud apps are inflexible [16]. If somehow the cloud apps are inflexible then it may cause a serious problem for the business. Additionally, some cloud computing vendors may have data format which never allows easy transfer of data to the system. As a result of all these businesses sometimes move from one accounting market to the other. Thus from ground reality, it is often seen that the transfer of databases to the cloud sometimes becomes a very painful process for a business.

Gong (2019) states in a general conception, load balancing refers to the system of division of loads or different queries to the different serves so that loads can be equally distributed among all in appropriate manners [17]. Now when such kinds of databases are done at a database level then it is called load balancing in the database. Database load balancing helps to improve the division of the workloads throughout the multiple computing resources. At the same time, it also helps to stabilize the use of the resources, maximise the throughput and so on. In short and much easier terms it can be said that database load balancing software is an application of distributing the loads over the SQL databases. For load balancing the databases, some ways are observed.

Coutinho et al (2015) proposed that cloud computing supports business organizations in leveraging both private and public companies to develop and build a cost-effective and flexible computing facility and systems [18]. Some of the benefits of cloud computing are flexible security, environmental benefits, efficiency, agility, scalability, mobility benefits, and cost-savings benefits. It can be, effectively used in service procedure than compared to hardware-based computing. The application approaches of cloud computing include shifting from the local computing to cloud computing thus providing access to the remote server to the client. There are different kinds of cloud computing services benefits that are used for various objectives such as Remote Desktop Session Host is primarily used by the developers for the implementation of the subscription-based models. The Storage as a Service is, used for renting storage, infrastructure as a Service is, used for renting the computing infrastructure and Security as a Service is, used for renting all the security services.

According to Villari et al(2016) implementation of cloud computing technology in business organizations allows them to evaluate the data concerning their business in an optimized manner [19]. It is, used in both infrastructure-based and business models. The model associated with the business delivery offers the user the experience where the software and the hardware network resources can be, leveraged optimally to offer innovative services in the servers and the Web are and allocated with the needs with the usage of the automated devices. Here the cloud then offers program administrators and the service developers to use web-based services, which takes away the complexity involved in the dynamic structure of the business. The model concerning the infrastructure methodology provides the IT business corporations to monitor the high number of virtually available resources as a single resource. It enables the companies to maximize the resources in the data center without increasing the people that was, needed to increase.

As per Sen (2015) cloud computing is also used in the healthcare sector where most of the medical histories, patient charts, and medical practices are kept on the computer [20]. In the medical center, there are a large number of patients that are, required to be, managed within one time. Here cloud computing can assist in increasing the access and the categorization of the information among the professionals who might need to be connected with their patients. In the modern-day healthcare center, the servers are, linked but with the implementation of cloud computing, it will optimize the flow of information among the medical professionals. From the information taken from the cloud, it can be, later used by the medical professionals for the lab tests. Rather than accessing the computer of the hospitals, cloud computing will allow the doctors to access the data

from their remote location thus increasing the efficiency in the operation. For private doctors, cloud-computing services also increase their business profitability and competency. With the implementation of cloud computing services, the mobility option of the hospital increases, which is necessary for modern healthcare centers? They need to speed up their process through remote access so that it can facilitate either research and development department's efforts and will help in increasing the recovery rate of the patient per hospital.

According to Wang et al (2017) Malware injection attacks the hacker most of the time damage the websites and the applications that are, usually hosted in the cloud [21]. The hackers tend to find such dangers on the websites and make changes that hamper the normal functioning of the systems and the processes associated with the cloud. Here the hackers program malicious applications and use the virtual system to inject malware into the cloud computing services. Through these techniques, hackers can do data eavesdropping or data theft. The most common of injection is the SQL injection. The concept concerning the SQL injection is to alter the name of the query. Here the hackers tend to make the inappropriate validation of the databases. Moreover, here the hackers try to design the malicious program that will enable and provide the hackers with the login access to the cloud computing databases. Here the objective of the hackers is to retrieve the data information and monitor the entire web server.

Messerli et al (2017) proposed that cloud computing is usually a data-intensive computer paradigm that is dependent upon Web services across the internet [22]. It is boosted by the economies of production/scale is promoted through platforms, storage service, computing power, dynamically scalable information. Cloud computing is considered to be a varied way through which computing service can be offered. It mostly involves internet-based solutions concerning cloud computing. That proved shared resources to the users. With passing days, the internet is becoming a place where there are different security flaws due to its openness. Access control helps in accessing the resources and the services that are, made by the users of the cloud through authorization attributes, authentication, and attributes of the objects and the subjects. Here the entity if the subject that is divided into two categories such as immutable and mutable. The mutable characteristics tends to change during the operational access example, usage status, location, and others. The significant characteristics of these structures are that here every domain has the characteristics which provide the chance to filter the rights concerning the user's requests.

Varghese and Buyya, (2018) evaluated that the uncertainty linked with the regulations, laws and potential liability linked with the movement of the data through the internal networks into the cloud that can influence the decisions of the management [23]. The industries, which are, regulated, encounter concerns that might affect the specific challenges concerning cloud-computing services. The business needs to align with the decisions of the regulators to sustain the operation of the business. Most of the policy complexities concerning cloud computing include privacy, intellectual property, and access. Embracing the cloud computing technologies, need action from the government as the cloud-computing sector is still is the naive stage. The policy concerning cloud-computing will be Sheppard to the businessperson thus providing them options to offer seamless service to the customers. There is a different type of issues that interfere with the functioning of the cloud computing service. The standards are significant to ensure data interoperability and portability for unsophisticated and sophisticated users.

Puthal et al (2015) states most of the specifications are not concerning cloud computing, they are, mostly linked with information and communication technology [24]. These have been, imposed to control market competition among business corporations. The over availability of the patents in the information and communication technology developed opportunities concerning the strategic mannerisms of the reasonable and no discriminatory licensing. Having only single technology involved in the making is, regarded as valuable as all the companies have to implement this. Most of this is, overlooked, innovation and promoting competition in the online cloud community is necessary for the importance of the future market competition concerning the cloud computing services. Ubiquitous and faster broadband provides a reduction in the cost of the data storage, and good hardware systems have made the companies leverage the potential of it. When there is no market completion concerning the usage of the internet the combining the broadband services with cloud computing services tend to offer anti-competitive and dangerous to independent cloud providers. This is because here the customers have to pay for the continuity of the internet service. Here the policymaker must be attentive towards the competition that is present in the various sectors and must take into account the significance of the data transparency and data accountability.

VII. CONCLUSION

In cloud computing performance, some of the work has already been carried out. Such related work has been discussed review of literature highlight the development that took place in cloud computing performance area. From the related works it is evident that majority of them were focused in some particular area such as data center location or scheduling, virtual machine or migration of virtual machine or managing the cloud at application level. Study has focused on the issues which are directly under the control of cloud provider. None of them has considered the dependency of load balancer on broker service policies.

VIII. REFERENCES

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