Evaluating Parameters Which Affect Quality of Applications in Cloud

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Abstract: *Owing to the symbolic progress in Information Technology (IT), there is a growing awareness that Cloud Computing will soon emerge as the fifth utility. Cloud Computing is the rising model and is regarded more valuable than the conventional models of Computing.*
Cloud Computing is a collateral, effective, spread, adaptive and compliant models which refer to providing applications, resources (hardware, software, storage and services) in implicit data centers via Internet. Resources in it are dynamic and scalable. Cloud makes it possible for us to approach the information from anywhere and at any time irrespective of any physical location. Examples of Cloud Computing services are web-based email systems like Yahoo, Google, on - demand subscription services etc.
In this Research paper, we have done a literature survey on various parameters that affect the Quality of Applications deployed on Cloud. Also, we have presented a foremost measure to improve the Quality of applications on Cloud i.e. Performance and Scalability Testing of Applications.
Keywords— *National institute of Standards and Technology (NIST), Denial of Service (DoS), Testing as a Service (TaaS), Quality of Service (QoS).*

I. Introduction

A) Cloud Architecture

According to NIST, Cloud Computing provides easy, on demand network access to a shared pool of resources that can be quickly provisioned with minimum consumer management effort and service provider interaction. Cloud Computing is being adopted rapidly because its architecture focuses on shared services. The Cloud Computing architecture depicts important characteristics of Cloud, four deployment models and three service delivery models.

Five Characteristics	On demand self service Large network access Resource Sharing Scalability
Four Deployment Models	Public Cloud Private Cloud Hybrid Cloud Community Cloud
Three Service Delivery Models	IaaS Infrastructure as a Service PaaS Platform as a Service
	SaaS Software as a Service

Fig.1. Cloud Environment Architecture

B) Benefits of Cloud Computing

Following are some of the benefits of Cloud Computing:

1) Adaptability - Data can be accessed from servers outside the office and not hardwired in – house servers thus creating a more adaptable work lifestyle for organizations.

2) Reduction in Cost - Cloud Computing uses Pay- as- per use model leading to a reduction in cost of infrastructure for the management. Organizations do not need to keep their own hardware and software causing a reduced spending on technology infrastructure. This makes it easier for the new start ups to enter the market since the cost of the infrastructure is greatly reduced.

3) Virtualization - With the help of virtualization characteristic applications can be easily transferred from one location to another.

4) Multi tenancy - Many users can use the Cloud services simultaneously.

5) Scalability and Elasticity - via dynamic supply of resources to applications on request.

II.   Literature Survey

Table-1 below shows a literature review of some related papers.

Table-1: Literature Review

S.NO.	PAPER TITLE	JOURNAL AND YEAR	DESCRIPTION
1	Web Applicat ion Scalabili ty.	Software Engineering Research and Performance Engineering Services, 2004.	Scalability depends upon software architecture. If the software architecture cannot withstand more number of resources, scalability cannot be increased. Scalability isn't just a hardware issue
			In this paper 4 models of scalability applicable to web and distributed systems have been discussed.
2	Performance, Scalabili ty and Reliabili ty issues in Web applicati ons.	Emerald Insight Journal, 2005.	Main aim of this research paper is to present a complete strategy for Performance, Scalability and Reliability testing of multitier web applications.
3.	Surveyin g and analysing Security, Privacy and Trust issues in Cloud Computi ng Environ ments.	Elsevier Ltd.2011.	Security can be provided by avoiding malicious insiders, by controlling multi-instance in multi tenancy environments. Issues are how to avoid unauthorized modification. Trust issues deal with which nodes interaction should be allowed and with which it should be avoided. In this way malicious entities can be restricted from participating.
4.	Cloud Computing: Security Issues and Research Challenges.	International Journal of Computer Science and Information Technology and Security(IJC SITS), 2011.	According to them well managed Service level agreement (SLA), privacy, interoperability, reliability and Cloud standards are some of the research challenges.
5.	Cloud Testing- Issues, Challenges, Needs and Practice.	Software Engineering International Journal (SEIJ), 2011.	This paper surveys the challenges and needs of testing Cloud based software applications. Different views of Cloud based Software testing:-1) Vendor view- testing.2) User view- testing. TaaS performed either on the client side or on the

			provider's side usually done by athird party.
6.	Improving Cloud Computing energy efficiency.	IEEE Asia Pacific Cloud Computing Congress 2012.	In this paper, formulations for Green loud Environments (GCE) to minimize energy consumption has been discussed.
7.	Cloud Computing Security: From Single to Multi Clouds.	45th Hawaii International Conference on System Sciences, 2012.	This paper contemplates recent research related to single Cloud and Multi Cloud Security. Three security factors that impact single clouds are Data Uprightness, Data Encroachment and Service accessibility. Multi cloud environment controls several Clouds and avoids dependency.
8.	Research Challenges and prospective business impacts of CC.	7th IEEE Conference on Intelligent Data Acquisition and Advaned Computing Systems, 2013.	In this paper, challenges e.g. migrating applications and platforms into Clouds and ensuring their security have been discussed. The Research challenges have been grouped into 4 major categories:- 1) Security 2) Resource Mgt. 3) Adoption 4) Development and Benchmarking
9.	Security Threats on Cloud Computing Vulnerabilities.	International Journal of Computer Science and Information Technology (IJCSIT), 2013.	In this Paper, Cloud Security risks and threats have been investigated. Network. Threats:- 1) Pervert use of Cloud resources E.g. Brute force attacks and DoS attacks. 2) Data Infringement- Malicious Insider and Online Cyber Theft. 3) Cloud Security Attacks like Malware Injection attack, SQL injection attack
10.	Load Balancing in Cloud Computing.	International Conference. On Recent Trends in Information, Telecommunication and Computing, ITC, 2014.	In cloud computing realm load balancing is needed to dispense the workload uniformly between all the nodes to accomplish appropriate resource utilization. Load balancing algorithms are of two types: first algorithm type is Batch mode heuristic scheduling algorithms (BMHA) and second is online mode heuristic algorithms.
11.	Quality- of- service in Cloud Computing :modeling techniques and their applications.	Journal of Internet Services and Applications, 2014.	QoS delineates the performance, reliability and availability offered by an application and by the platform or infrastructure that host it. This paper aims at discusses QoS modeling approaches applicable to Cloud Computing.
12.	Survey of Access Control Models for Cloud based real time applications.	International Conference on Innovation Information in Computing Technologies Chennai, India 2015.	In this paper, access control models to make the applications more secure have been discussed. There exists a wide range of access control models 1)IBAC- Identity Based Access Control 2)LBAC- Label Based Access Control 3)RBAC-Role Based Access Control 4) ABAC- Attribute Based Access Control.
13.	A New Quality Chart to Improve the Efficiency of Cloud Resource Management.	12th IEEE International Conference on e -Business Engineering, 2015.	This Research Paper attempts to improve the service efficiency of Cloud by putting forward different Quality approaches. An appropriate control chart is suggested to increase the Quality level of a process. In this paper Moving Range Chart and EWMA Chart (Exponentially Weighted Moving Average chart) have been discussed.
14.	Efficient and Reliable Data Recover y Technique in Cloud Computing.	Science Publishing Group 2017.	In this paper, a multi- server system using four cloud backup servers for data recovery has been discussed. It also presents a technique to recover the data by

			automatically compressing and decompressing the data before the backup of the data.
15.	Improvi ng Energy Efficiency Through VM Placement and Consolidation Techniques in Cloud Computing.	International Journal of Scientific Research in Science, Engineering and Technology, 2018.	Virtual Machine consolidation furnishes important benefits to cloud computing by providing better use of the available datacenter resources.
16.	A Study on Enhancing Data Security in Cloud Computing Environment.	International Journal of Computer Science and Mobile Applications, 2018.	In this paper data security in Cloud utilizing enhanced symmetric encryption algorithm technique has been discussed.
17.	A Study of Data Storage Security Issues in Cloud computing	International Journal of Scientific Research in Computer Science, Engineering and Information Technology, 2018.	Since the data in the Clouds is not secure, so it should be encrypted. A secure co-processor in the cloud infrastructure enables efficient encryption of data.
18.	Dynamic heterogeneous shortest Job first (DHSJF): a task scheduling approach for heterogeneous Cloud Computing systems.	International Journal of Information Technology, 2019.	In this paper, organizing independent, non communicating, variable length tasks in the concern of CPU utilization, low energy consumption and make span using dynamic heterogeneous shortest job first model has been discussed.

19.	Virtual Machine allocation to the task using an optimization method in Cloud computing environment.	International Journal of Information Technology, 2020	In this paper, Big Bang optimization method considered to be the best solution with increasing population size for Virtual Machine allocation has been discussed.
20.	Attack and Intrusion detection in Cloud Computing using an ensemble learning approach	International Journal of Information Technology, 2021	This paper discusses a constructive network based intrusion detection model utilizing an ensemble- based machine learning approach using four classifiers : boosted tree, bagged tree, subspace discriminant and RUS Booted along with a voting scheme.
21.	Investigation of Cloud Computing barriers.	Journal of Information Systems Engineering and Management, 2020.	Cloud Computing is acting as a foundation for new technologies like Internet of Things and Artificial Intelligence. Common barriers are:- Compatibility, Complexity, Confidentiality, Data Control, Data location, External support, Integrity of Provider, etc

III. Performance Analysis Of Applications In Cloud Environment

After performing an extensive literature survey we have recognized the
following open matters in Cloud Computing that need to be addressed:
1)Scalability and Performance Enhancement of Cloud Applications.
2)Storage Security.
3)Data Confidentiality- desired recipient is only getting the data.
4)Application Security.
5)Enhancing Quality of Applications in Cloud. Current
Research focuses on Evaluation of these metrics for collateral and spread systems. Since these

systems - collateral and spread are set up with prearranged system resources and infrastructures, Performance Testing and Scalability Evaluation, Enhancing Quality of Applications in Cloud are usually conducted in pre-established system environment such as test lab. So the existing evaluation metrics, structures and solutions did not consider the special features in Cloud Testing such as dynamic scalability, scalable testing environments, Service Level Agreements and cost models.
Hence, the above mentioned research challenges motivated us to develop structures and solutions considering the dynamic features of Cloud Computing.

IV. Results

The Quality of applications deployed on Cloud is affected by various parameters like security of applications, performance, reliability and availability offered by an application and by the platform or infrastructure that hosts it. Quality of applications in Cloud can be enhanced by enhancing the security of applications in Cloud, by balancing the Load of applications in Cloud, by improving energy efficiency of applications in Cloud, by employing efficient and reliable data recovery techniques in Cloud, by measuring the performance and scalability of applications and developing ways to improve the performance and scalability of applications.

Result Discussion:-

In this research paper, we propose a structure to show case the parameters that highly affect the Quality of applications in Cloud. The positive outcome of Cloud deployment is based on working on integrated performance engineering and scalability management techniques. Performance evaluation is important for Cloud users and providers. There are two different techniques to evaluate performance:
i) Evaluation based on parameters
ii) Evaluation done using simulation

Performance can be evaluated using a number of parameters- These are balancing the number of requests, effort & turnout, workload, rate of transactions, return time, time of allocation and release of resources, different scheduling algorithms, effectiveness, productivity, number of i/o operations in network and average waiting time.
Scalability- measure of an application system's ability to provide cost effectively- increased turnout, return time, support more users when hardware resources are added. Scalability can be measured with the help of two metrics- Speed up and Scale up.
Speed up- is the time reduced in order to execute a fixed workload when the number of resources such as processors or disks are added.
Speed up =TT(1)/TT(p)
TT (1): time taken by one processor to do some work
TT (p): time taken by p processors to perform the same amount of work

Scale up- amount of work that increases in a fixed time as a result of adding resources. We can scale up the number of transactions or scale up the number of users.
Scale up, C = Wmax (p)/ Wmax (1) Wmax (p): maximum work done with p processors Wmax (1): maximum work done with 1 processor
Scalability can also be upgraded by checking the efficiency of the application or the system to tolerate peak loads and the effect of these peak loads on the Performance of the system.
Using the above factors, we present metrics to measure Quality of applications in Cloud environment.

Evaluation Model and Metrics
A Radar chart also known as a web chart, irregular polygon. It is a graphical method of displaying multidimensional data in the form of two-dimensional chart with variables represented on axes from the same point.
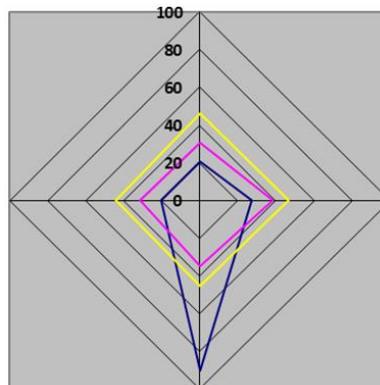Blue- Cloud 1
Pink- Cloud 2
Yellow- Cloud 3

Fig. 2: 2D Web Chart

1. Storage security (+ x axis)
2. Performance and Scalability (-y axis)
3. Optimizing Energy Efficiency (-x axis)
4. Data Back- up and Recovery Techniques (+y axis)

From the above mentioned Radar Chart, it is clear that Performance and Scalability parameter is playing the most crucial role in affecting the Quality of applications all the three Clouds: Pink, Blue and Yellow.

V.   Conclusion

We, therefore, conclude that Performance and Scalability are the most crucial factors in determining the Quality of Applications in Cloud. Performance of any application can be evaluated using Load Testing and Stress Testing.

Load testing is the process of placing normal and peak demand on a system or device and measuring its feedback. It is implemented to tap a system's behaviour under both the above mentioned conditions. It helps to diagnose the maximum performing capacity of an application and take a decision which element is causing degradation.

Stress Testing is a thorough testing used to estimate the strength of a given system. Stress testing is done above normal operating capacity to a breaking point in order to observe the results. Stress can include extremes of work load, type of task, memory use, thermal load (heat), clock speed or voltages. Memory and CPU are stress tested in this way. By improving the Performance and Scalability of applications deployed on Cloud, Quality of applications can be highly improved.

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