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Survey on Testing for Performance Issues in Private Cloud

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Abstract**: The capacity to measure a web application or website is knotted directly to understanding where the resource constraints lie and what effect the addition of various resources has on the application. Cloud computing is opening up new vistas of opportunity for testing. Testing has traditionally been viewed as a necessary evil because it required a huge, dedicated infrastructure and resources that were used sporadically. To successfully provide cloud services and sharing of resources, the cloud must be tested before came into service. Cloud testing is a form of testing in which web applications uses cloud computing environment and infrastructure to simulate real world user traffic by using cloud technologies and solutions. When you start adding new hardware/update existing hardware in a web cloud, the difficulty starts increasing which disturbs performance and hence security. performance becomes an essential and integral part, While valued cloud computing services save troubles to maintain the computational environment, there are various shortcomings such as overhead of virtual machines, possibility to share one physical machine with several virtual machines, and indeterminacy of topological portion of their own virtual machines. Multi-tenancy is one of key features of the service oriented computing especially for Software as a Service (SaaS) to influence economy of scale to bring down total cost of ownership for both service consumer and provider. This paper aims to study the technologies to build a cost-effective, secure and scalable multi-tenant infrastructure and how to improve the security and to Test its performance. This paper also identifies the potential performance blockages, summarizes corresponding optimization approaches and different Cloud-based testing techniques.

Keywords: Cloud Computing, Cloud Security, Performance evaluation, Cloud Platform, Cloud Application, Cloud Testing Techniques.

I. INTRODUCTION

Latest progress of engineering has cut down costs of computers and network, and this change gave a vast effect on high performance computing environment. Grid computing and cloud computing, which are computer environments consisted of commodity computers and commodity network devices, are clutching people's attention quickly. Grid computing and cloud computing are now recognized as a suitable source that allows users to reveal computational power as much as they need, whenever they want. Cloud computing service such as Amazon EC2 seems to bring a huge supercomputer by our side, however, is it really wise to apply the paid service as research environment for everyday activities. Virtualization technology has been developed, and it is relatively common to build a cloud computing environment as a group of virtual machines. This methodology has pros and cons. One of pros for users is that computational environment looks homogeneous; therefore, users will never be concerned with heterogeneous hardware or software environment. Cons for users are, for example, overhead of virtual machines, possibility to share one physical machine with several virtual machines, and indeterminacy of topological portion of their own virtual machines. Accounting, human resource management etc. SaaS providers usually develop or obtain SaaS applications and host them as services to serve specific needs of their clients by leveraging service oriented computing technologies[2][3]. One of the key feature of the SaaS application is Multi-tenancy. By leveraging Multitenancy, SaaS providers can relieve operations and lessen delivery cost for a big number of tenants. In a multi-tenant enabled service environment, user requests from different organizations and companies (tenants) are served simultaneously by one or more hosted application instances and databases based on a scalable, shared hardware and software infrastructure. Multi-tenant infrastructure should take care the following key aspects: 1. Resource Separation: Separate the resources allocation and usage among tenants; 2. Security: Prevent illegal resources access and potential malicious attack; 3. Customization: Support tenant-specific features or Service Level Agreement (SLA) through configurations; 4. Scalability: Scale the SaaS application's delivery infrastructure to livelihood growing number of tenants with well managed cost increase, performance and availability guarantee.Cloud- testing has the potential to offer a compelling combination of lower costs, pay-per-use and elimination of upfront capital expenditures (Cap-Ex). The benefits, however, extend beyond cost. The non-cost factors include utility-like, on-demand flexibility, freedomfrom holding assets, enhanced collaboration, greater levels of efficiency and, most importantly, reduced time-to-market for key business applications. At the same time, cloud-based testing introduces a new set of challenges, such as datasecurity and a lack of standards, especially in the public cloud model.

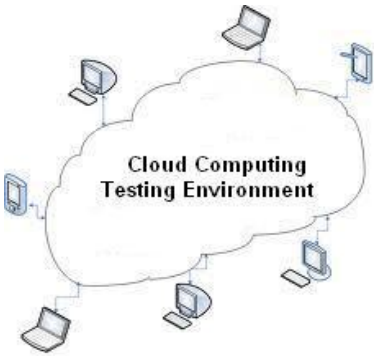

Fig 1: Cloud Testing Environment

II. CLOUD COMPUTING

Cloud computing is a model for assisting suitable, on-demand network access to a shared pool of configurable computing resources (e.g. Storage, Applications, Networks, Servers, and Services) that can be quickly provisioned and released with insignificant management effort or service provider interaction. This cloud model encourages availability and is consist of four deployment models and three service models. The "cloud" is defined as the Internet surrounding every part of our daily lives, similar to the clouds in the sky. While a common vision for cloud computing is storage space on the Internet, the cloud offers many services, infrastructure benefits and scalability which may not be possible within ordinary local-area enterprise networks. When cloud storage is used as the primary location of files and documents, a certain trust is left in the hands of the storage provider to ensure certain steps are taken to prevent data loss and maintain the reliability of the file system; aiding maximum uptime, reducing downtime and maintain the highest levels of physical protection and data security.

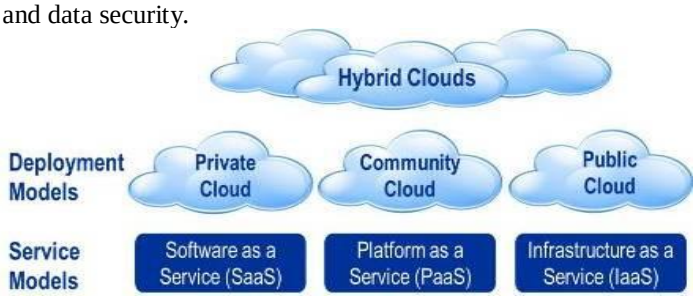

Fig 2: SPI Model & Depltoment Model

A. SPI is an acronym for the most common cloud computing service models –

*1) Software as a Service(SaaS)*The ability provided to the consumer is to use the providers applications running on a cloud infrastructure. The applications are accessible from various client devices through a thin client interface such as a web browser (e.g., web-based email).

*2) Platform as a Service(Paas)*The facility provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages and tools supported by the provider.

*3) Infrastructure as a Service.(IaaS)*The facility provided to the consumer is to provide processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, deployed applications and networking components.

B. Deployment Models are as discussed below.

1) Community Cloud: The Cloud infrastructure is shared by various organizations and supports a specific community that has shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be managed by the organizations or a third party and may exist on premise or off premise.

2) Public Cloud: The Cloud infrastructure is made available to the general public or a large industry group and is owned by an organization selling cloud services.

3) Private Cloud: The Cloud infrastructure is operated only for an organization. It may be managed by the organization or a third party and may exist on premise or off premise.

4) Hybrid Cloud: The Cloud infrastructure is a composition of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability

III. PERFORMANCE AND SECURITY IN CLOUD COMPUTING

The Cloud architecture extends to the client, where web browsers and/or software applications access cloud applications. Cloud storage architecture is loosely coupled, where metadata operations are centralized enabling the data nodes to scale into the hundreds, each independently delivering data to applications or users. Security is the challenge seen related to Cloud Computing according to our architecture. • The main security concerns include privacy in

interoperability, performance, reliability compliance and visibility under virtualization. • The Good News: Since Security is seen as such a major issue, it is getting much attention. This attention is resulting in Security-related benefits such as greater segmentation and better categorization and performance is another issue if we change the level of security in the Cloud. With increasing Business complexity, organizations are seeking innovative business models and specialized technologies to cater to customer demands. Cloud computing technologies can provide organizations competitive advantage in the market, cost reductions, higher margins, simplified maintenance and management of applications across the enterprise, greatly extended scalability, agility, high availability, automation, large data storages and reliable backup mechanisms. By using Cloud Computing environments, organizations can focus on their core business as opposed to concerning themselves about infrastructure scalability. Organizations may explore use of cloud computing initially for better performance through peak demand periods but eventually adoption could spread to other areas configuration settings.

IV. PERFORMANCE ISSUES

Everybody appears to be talking loud about Cloud Computing nowadays. But the recently reported outages at Sales force, Amazon and Google has made us think otherwise and wonder if the cloud is really ready to meet all the hype and attention its getting. No doubt, there are cost savings related to licensing, maintenance and application / server management. But does this ensure that your end users are getting the online experience you want them to have?

Many Cloud Computing providers provide custom built management consoles or control panels for managing server resources. These consoles provide customers with availability statistics and status messages in the event of significant outages that impact end users.

V. CLOUD AND TESTING

While many companies are approaching cloud computing with cautious optimism, testing appears to be one area where they are willing to be more adventurous. There are several factors that account for this openness toward testing in the cloud:

*1) Testing is a periodic activity and requires new environments to be set up for each project.*Test labs in companies typically sit idle for longer periods, consuming capital, power and space. Approximately 50% to 70% of the technology infrastructure earmarked for testing is underutilized, according to both anecdotal and published reports.

*2) Applications are increasingly becoming dynamic, complex, distributed and component-based, creating a multiplicity of new challenges for testing teams.*For instance, mobile and Web applications must be tested for multiple operating systemsand updates, multiple browser platforms and versions, different types of hardware and a large number of concurrent users to understand their performance in real-time. The conventional approach of manually creating in-house testing environments that fully mirror these complexities and multiplicities consumes huge capital and resources.

*"**Testing in the cloud leverages the cloud computing infrastructure, reducing the unit cost of computing, while increasing testing effectiveness."***

Fig: Purpose of Testing in Cloud

VI. CLOUD COMPUTING TESTING TECHNIQUES

Various types of testing required for a cloud setup which mainly categorize into three techniques: Functional, Non-Functional and Ability testing Techniques.

1) Functional Testing Techniques: System Testing, Integration Testing, User Acceptance Testing.

2) Non-Functional Testing Techniques: Availability Testing, Security Testing, Scalability & Performance Testing, Load & Stress Testing, Latency Testing.

*3) Ability Testing Techniques:*Multi-tenancy Testing, Compatibility and Interoperability Testing, Disaster Recovery Testing.

VII. CHALLENGES IN CLOUD TESTING

There are various issues and challenges in cloud testing and cloud based software. Here we examine them from the following three areas.

1) On-demand test environment construction: Step by step instructions to set up a testing environment deliberately (or naturally) for on-interest testing services in a cloud? Engineers additionally discovered that there is an absence of cost-effective solutions for them to effectively influence their cloud based applications (or SaaS) in a cloud with the current test tool.

*2) Scalability and performance testing:*Although many published papers talk about system performancetesting and scalability evaluation in the previous decades, thevast majority of address issues and results in web-based software systems or conventional distributed software. As indicatedby our literature survey on this subject, most existing papers concentrate on frameworks for parallel and distributed systems and scalability evaluation metrics. Since these system are situated up with preconfigured system assets infrastructures and resources, execution testing and are normally directed in a static and prefixed system environment (for example, a test lab.), so the current evaluation measurements, framework and results did not consider special characteristics in cloud testing, for example, cost-models Testing security, SLA-based requirements, scalable testing environments, dynamic scalability and measurement in clouds.

*3) Testing security and measurement in clouds:*Security testing has becoming a hot exploration subject withnumerous open questions in software programming testing group.Since security turns into a major concern inside clouds and security services become an essential part in cloud technology and modern Software as a Service (SaaS), engineers must arrangement the issues and challenges in quality assurance and security validation for Software as a Service (SaaS) and clouds.

VIII. RELATED WORKS

In the hosted applications of the early 90s [1][5], companies only moved their hardware and applications from their premises to the data centers, and paid a premium to have their applications hosted. This was a typical single-tenancy scenario without any hardware or software sharing across customers of the service provider. To achieve more benefits from improving the sharing efficiency, some hosting service providers gradually started to leverage virtualization technologies [14][15][16] on machine, operation system etc levels, but each tenant still owns dedicate application instance and database in these hosting models. In recent years, a native multi-tenant model, as exemplified in SaaS [6][7][8][9][10], achieves great successes. In this model, a single instance of application or a single database can both serve multiple tenants. For the multi-tenant data tier, Fred &Gianpaolo studied the similar topics [11]. They evaluate patterns on aspect of multi-tenant data customization, and provide a performance report based on SQL Server. Our work differentiates in at least two ways. First, this paper touches more perspectives and corresponding design patterns of multi-tenant data model, such as the isolation, security and scalability patterns. Secondly, this paper conducted a wider scope of performance of private Cloud and Cloud Testing Techniques.

IX. CONCLUSION

In this paper, we explore many Key Aspect of multi-tenant infrastructure like :isolation, security, customization and scalability. We can also evaluate performance of these patterns through a series of experiments, and summarize a set of valuable conclusion and best practices on how to design an effective multi-tenant data model. This work can help the service provider and multi-tenancy application developer.The hands-on experiences will help us to handle more research topics on performance optimization and scalability aspects in data tier, such as tenant behavior awareness load balancing in distributed database cluster environment. Another goal of our research is to explore Cloud –Testing technologies to Test Cloud Performance. We believe that a new kind of DBMS with native multi-tenancy design will emerge to support both SaaS applications developers and service providers. For those deploying software out in the Cloud, scalability is a major issue. 1. The system must also coordinate information coming from multiple sources fast, not all of which are under the control, of the same organization 2. The need to marshal resources in such a way that a program continues running smoothly even as the number of users grows. 3. It‟s not just that servers must respond to hundreds or thousands of requests per second. With these equations there is a possibility that the security can be broke, but the performance will be increased according to our scenario when the number of users are increased. In future we want to design a protocol which will be more secure and the performance of the cloud will increase.

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