A Study on Recent Trends and Workload Prediction Requirements of Cloud Computing

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--ABSTRACT--

*Abstract Cloud computing has revolutionized the way the wo*Email ID: vijaypal.dhaka@gmail.com*rk is done and resources are used. This paper present study of recent development related to cloud computing. This paper is divided into two parts. In the first part the recent trends of cloud computing with respect to industry has been discussed. In the second part steps involved in the workload prediction of cloud computing is discussed. Workload prediction is becoming very crucial, as almost every organization is moving towards cloud.*

Keywords: BYOD, IaaS, PaaS, E-Business.

I. INTRODUCTION

According to Right Scale report of year 2014[I], 94 percent of organizations surveyed are running applications or experimenting with infrastructure-as-a-service of cloud and 87 percent of organizations are using public cloud.

Cloud computing popularity is result of its ability to self-host different services. According to Hfs Research [1] there are number of features of cloud services.
1. Standardization: Services provided by cloud computing can be used by large number of users without much required customization.
2. Flexible cost: In cloud based environment user has to pay for only that services that they have used. They need not to pay for entire infrastructures and services provided by cloud providers.
3. Self-service: Since cloud is based on high degree of automation user can use cloud service without much knowledge of implementation and configuration.

The cloud computing has become global. The cloud computing has cast its shadow practically over each and every aspect of business within every industry. No matter how large or small, ever organization is moving to the cloud to take advantage of cost savings and efficiency. Cloud hosting give base to the organizations with its virtual IT services as there is no installation, hardware, or maintenance costs involved. The services are managed and provided by a cloud-hosting provider working remotely or by dedicated third party. Cloud computing can benefits all type of businesses. Following are some of the advantages of cloud computing [II].

1. Cost Efficient
Desktop software cost a lot of amount to companies. Licensing fees can leads to very high cost. The cloud is available at cheaper rate, as user has to pay on usage basis.

There are lots of scalable options available. Cloud computing minimize both capital and operational cost. There is no need for setup of infrastructure as everything is available online.

2. Unlimited Storage capacity.
User needs not to worry about increasing current storage space, as there is unlimited storage space available on the cloud

3. Backups and Recovery
All data is stored and available on the cloud. Data backup and recovery is easier on physical device.

4. Software Integration
In the cloud, software integration occurs automatically. Customization and integration don't required additional efforts.

5. Easy Access to Information
One can easily access information from anywhere from cloud using internet.

6. Quick Deployment
Cloud computing helps in quick deployment. The entire system can be fully functional in fraction of seconds.

7. Manageability
Cloud computing results in simplified and enhanced IT management and maintenance because of central resource management.

Some of the limitations of cloud computing are as follow:
1. Technical Issues
There can be lot of technical issues involved with cloud computing like downtime of cloud service providers, bad internet connection, connectivity problem etc.

2. Security in the Cloud

Security issue is one of the major concern of cloud computing. In this companies are sharing their sensitive information with a third party cloud service providers. So company information can be misused easily if cloud provider is not reliable. Cloud computing data can make company vulnerable to threats and attacks. In Cloud architecture multiple users are hosted on the same server, a hacker can break into the data of other users hosted and stored on the same server.

3. Difficult migration

It is difficult for an organization to migrate their services from one vendor to other as there will lot of hosting and integrating issues involved.

4. Limited control

Cloud infrastructure is managed, owned and monitored by cloud providers so users have very limited cloud.

Though cloud computing has some of limitations yet these limitations can be overcome easily. Cloud Computing is becoming one of the favorite technology of industry. In the next session some recent trends of cloud computing with respect to industry are discussed. After that characteristic of workload prediction are discussed. Finally conclusion and future scope is presented.

II. RECENT TRENDS OF CLOUD COMPUTING

More businesses are using cloud every year. According to 2013 Future of Cloud Computing Survey among 855 IT decision makers, cloud vendors, and business users, 75% survey respondents are using the cloud in some way. Some applications of the cloud are being used more as compared to others. Business cloud services are used for social collaboration, file sharing, business productivity, and CRM marketing. The total global market for cloud computing has increased over $158 billion dollars by 2014; it is up by 126% as compared to 2011. These quickest growing cloud-computing applications are expected to handle IT services like mobile services, systems management, big data, and security [II].

According to John Grady [III], as of December 2013, about 60 percent of small-to-medium businesses use cloud services, and about 72 percent of these businesses virtualize considerable portions of their servers. This growth is expected to increase in future. Following are the recent trends of cloud computing with respect to industry [III].

1. Hybrid clouds

Hybrid clouds infrastructure combines private cloud features like security with scalable, powerful and cost-effective public cloud attributes. In this IT executives get wider choices for solutions. As hybrid models are becoming mainstream, more companies are likely to adopt this cloud deployment model.

2. BYOD

Large number of customer electronics are mobile devices, **"bring your own device"** is more suitable word in term of cloud computing. Mobile devices are used by end users to place large amount of data into cloud services for syncing, storing and streaming. Different researches must be taken in order to find a suitable way to integrate personal cloud services in a BYOD environment with tools of Mobile Device Management.

3. Platform-as-a-Service (PaaS)

PaaS solutions enable organizations to reduce costs while increasing their application development by providing more efficient development and testing methods and platforms. According to the International Data Corporation, a prominent analyst organization [III], by 2017 the PaaS market is expected to increase from $3.7 billion to $14 billion globally.

4. Big data

Many organizations believe that merging big data with cloud computing than to choose one over the other is very much beneficial. The emergence of big data analytics as a service will offer organizations an easily achievable and scalable tool for competing with global market.

5. Graphics intensive applications

Running graphics intensive application requires substantial hardware infrastructure as investment. However, cloud computing has changed this reality. There are a large number of cloud-based graphics technologies from prominent graphics companies, including NVIDIA and AMD that allow end users to run high-end graphic intensive applications with help of web browser based on HTML5.

6. Identity protection

Security is a major concern with cloud computing. As more and more businesses are moving information and data into cloud servers, this aspect is becoming more important. Researches are going on for finding identity management solutions based on new cloud based security systems.

7. Web-powered apps

As scalability and efficiency are among the main benefits of cloud computing, it is needed to start with development of cloud-based applications that are compatible with multiple platforms.
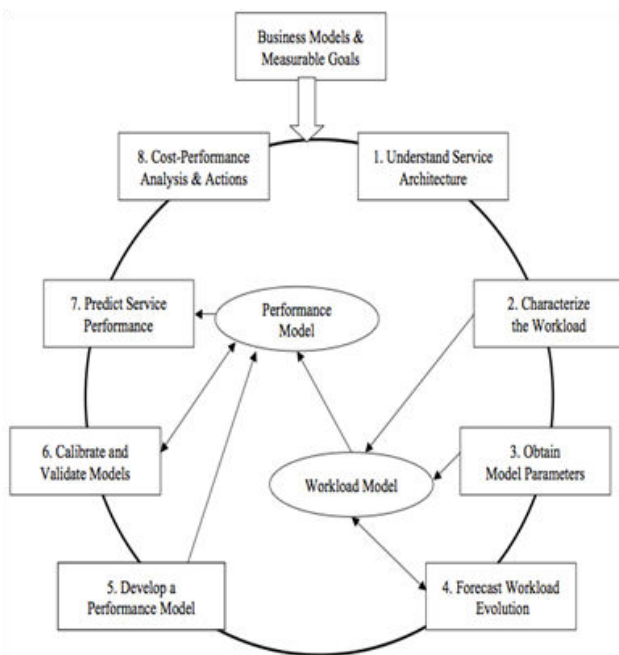
III. WORKLOAD PREDICTION

Workload with respect to cloud computing is an extent to which cloud consumers put their systems, resources and information on the cloud. As for example, a desktop workload supports a large number of users logging to desktop interactive sessions. Different applications on cloud have different characteristics and metrics [IV]. These applications and their requirements are discussed in table 1 below.

Table 1: Applications and service parameters required.

S. NO	Type of application on cloud	Example	Service parameters of cloud required
1.	Web sites	Social networking, informational etc.	High bandwidth, large storage.
2.	Scientific applications	Numerical analysis, Bioinformatics etc.	High computing capability.
3.	Business software	ERP, data warehouse, SAS, Kenexa (hiring)	Customer support, availability.
4.	Performance testing	Large workload is simulated to test the performance.	High computing capability
5.	Development and testing	Rational Software Architect, Microsoft Visual Studio etc.	Flexibility, understandability and rich set of infrastructure services.
6.	Mobile services	Mobile applications	High availability required.
7.	E-commerce	Shopping	Variable computing load, example during holiday times
8.	Highly Graphics intensive applications.	Virtualization and animation software.	High Network bandwidth, latency and data backup
9.	Core finance services	Banking and insurance	Security and high availability
10.	Storage and backup	High data storage and backup	Large amount reliable storage.

There are number of steps which are to be followed for workload prediction. Figure 1 presents basic steps that are to be monitored when workload prediction is done. Almedia [2] discusses these steps for e-business websites. In this paper these steps are presented as generalized steps for workload prediction of cloud services.

Figure 1: workload prediction steps [2]

Basic steps required for workload prediction [3] are summarized as follow:
1. Understanding the environment. In this step system requirements, website configuration, connectivity, types of servers, types of software, underlying architecture details are surveyed.
2. Workload characterization. Different types of workload are categorized. Different parameters like high availability, computing capacity, customer behavior pattern is taken into in this step.
3. Identifying parameters for workload model. Different parameters for workload model depend on type of applications. For example in web services parameters can be; log of transactions, server downloads time, peak traffic etc.
4. Forecasting workload model. Forecasted model is based on past data available. Different tools like Matlab, S-plus, and MS-Excel can be used for this purpose.
5. Validation of workload model. In this result of the model is evaluated to check for acceptable range of errors.
6. Prediction of future scenarios. Prediction is a key for workload determination. On the basis of result of workload model results of future scenarios are predicted. Performances and resources required in future can be guessed using this model.
7. Analyzing the results. All the results are analyzed and cost effective company policies can be generated. Future scenarios obtained can be used to obtain expected workload, the site cost, and the quality of service perceived by customers in order to optimize cost benefit ratio.

Above discussed steps can be used for workload prediction and capacity planning of different applications working on the cloud. Review work on workload prediction of cloud services can be found in [4].

IV. CONCLUSION AND FUTURE SCOPE
Almost every company uses cloud-computing technology. Work can be done for merging cloud with other technologies like big data. Workload prediction is very important for cloud as almost every business is using cloud. Different tools can be done for workload prediction. If cloud workload is forecasted accurately cost benefit ratio can be optimized for almost every organization. Workload prediction needs to be application specific. Different applications have different requirements. Analysis and planning can be based on forecasting of workload.

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