COMPARATIVE ANALYSIS OF LOW-LATENCY ON DIFFERENT BANDWIDTH AND GEOGRAPHICAL LOCATIONS WHILE USING CLOUD BASED APPLICATIONS

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ABSTRACT

Cloud computing, a approach of computing where scalable and elastic IT-related capabilities are provided as shared assorted services (IaaS, PaaS,SaaS, DaaS), metered by use, to customers using internet technologies built on top of diverse technologies like virtualisation, distributed computing, utility computing, and more recently networking, web infrastructure and software services. It represents a paradigm shift in how we think about our data, the role of our computing devices and on managing computing resources. Cloud computing comes with Zero latency so the application hosted on cloud computing will act just like desktop application. The speed of internet is main factor to avoid latency but internet speed is not same in all the geographical location. From the survey it's found out that some latency occurs in different geographical location. Even different browser gives different latency. The problem of latency or low bandwidth may be automatically solve in coming years as the speed of internet is changing day to day. If users are going to adopt cloud computing then user must think of internet speed which is available in mean time. The internet connection should be good enough to support cloud computing minimum requirement would be 1MPBS.

KEYWORDS: *Cloud computing, bandwidth, latency, web applications*

I. INTRODUCTION

Outsourcing of data center functionality and availability of desktop application online in web mode via a network connection is what we tem cloud computing [50][52][51]. Companies and SME are all under the cloud computing[49][48] many businesses has been move to cloud, moving of cloud cut down the IT cost having the security with less IT staff, having the power of scalability and elasticity of cloud computing has changes who we use the computer. The expenses have been cut down and traffic of network has increase to double times [47]. Having a big question in mind the future of cloud service will replace desktop application and we all will depend on internet [15][19]. Will the future of internet support us? A concern for many organizations is that cloud computing relies on the availability, quality and performance of their internet connection. Poor application performance causes companies to lose customers, reduce employee productivity, and reduce bottom line revenue [40][42]. Because application performance can vary significantly based on delivery environment, businesses must make certain that application performance is optimized when written for deployment on the cloud or moved from a data center to a cloud computing infrastructure [41]. Dependence on an internet connection raises some key questions:

- What happen if we lose internet connection?
- What if the net connection which we use does not support SaaS application

Moving an existing in-house application or new application to the cloud will almost surely have some trade-offs in terms of performance [43][44][45]. Most existing enterprise applications won't have been designed with the cloud in mind [54][53]. Organizations considering moving to cloud computing will certainly have to think in costs for improving the network infrastructure required to run applications in the cloud [10][59][58][57][56]. On the other side, bandwidth continues to increase and approaches such as dynamic caching, compression, pre-fetching and other related web-acceleration technologies can effect in major performance improvements for end users, often exceeding 50% [60].
The application has to design or redesign in such a way that it will support cloud computing in order to achieve maximum performance [12][60]. Latency [55] (the time taken, or delay, for a packet of data to get from one designated point to another) will undoubtedly be an issue for certain applications. CRM or stock trading applications which require near-zero latency will probably be run in-house for many years to come [25]. Latency on the Internet is extremely variable and unpredictable there may a problem when putting these applications in the cloud [61][62][63]. There are many cloud computing commentators who claim that the cloud will never be able to support these types of applications. However, vendors such as Juniper and IBM are already demonstrating extremely low latency capabilities in the cloud so it's a case of watch this space [1][39].
Any desktop application which was being hosted in local server will be hosted in cloud services [26]. The power of desktop application may not be able to support so much power resource on network [27]. Cloud is providing preconfigured infrastructure at lower cost, which generally follows the Information Technology Infrastructure Library, can manage increased peak load capacity and moreover uses the latest technology, provide consistent performance that is monitored by the service provider [37]. Dynamic allocation of the resources as and when is needed. Cloud computing reduces capital expenditure and it offers high computing at lower cost [21][38]. Upgrading your hardware/ software requirement also easy with the cloud, without disturbing the current work. Scalability and maintenance is easy in the case of cloud. Easily user can rent/lease the services offered by cloud computing vendors [2][13][14]. Latency may cause security problem while using cloud computing as the connection will be alive for long time [33]. SLA has to be taken care while adopting cloud computing by the user [34][35]. Security has to be taken in cloud storage also [36].
User will be charged as pay per usage like utility based services [31]. Overall Cloud is giving good performance at lower cost instead of making more capital investment [32]. The rest of the paper is organized as follows: Section 2 discusses about the Cloud providers. Section 3 Related work Section 4 Problem Definition and technical study, and Conclusion.

II. CLOUD PROVIDER

A. *Infrastructure as a Service (IaaS)* provisions hardware, software, and equipments to deliver software application environments with a resource usage-based pricing model. Infrastructure can scale up and down dynamically based on application resource needs [3].

B. *Platform as a Service (PaaS)* offers a high-level integrated environment to build, test, and deploy custom applications. Generally, developers will need to accept some restrictions on the type of software they can write in exchange for built-in application scalability. An example is Google's App Engine, which enables users to build Web applications on the same scalable systems that power Google applications, Web application frameworks, Python Django (Google App Engine), Ruby on Rails (Heroku), Web hosting (Mosso), Proprietary (Azure, Force.com) [3].

C. *Software as a Service (SaaS)* User buys a Subscription to some software product, but some or all of the data and codes resides remotely. Delivers special-purpose software that is remotely accessible by consumers through the Internet with a usage-based pricing model. In this model, applications could run entirely on the network, with the user interface living on a thin client. Salesforce is an industry leader in providing online CRM (Customer Relationship management) Services. Live Mesh from Microsoft allows files and folders to be shared and synchronized across multiple devices. Identity (OAuth, OpenID), Integration (Amazon Simple Queue Service), Mapping (Google Maps, Yahoo! Maps), Payments (Amazon Flexible Payments Service, Google Checkout, PayPal), Search (Alexa, Google Custom Search, Yahoo! BOSS), Others (Amazon Mechanical Turk) Other than the listed above companies, many companies started offering cloud computing services[3].

III. RELATED WORK

Cloud computing promise to deliver desktop like application in web which is support by any internet enabled device. Web applications are now hosted in elastic cloud environments where the unit of resource allocation is a virtual machine (VM) instance. A variety of techniques can reduce the latency of communication between VMs co-located on the same server in, say, a private cloud[17] on elastic cloud systems, there will be co-located VMs of the same web application on the same physical server that can take advantage of shared-memory IPC between the VMs. It is shown that Nahanni memcached, used with VDE networking, can improve the total read-related latency for a workload by up to 45% (i.e., read latest workload) compared to standard memcached, resulting from reductions in cache read latency of up to 86%. When combined with state-of-the-art paravirtualized network mechanisms, such as vhost, Nahanni memcached can still reduce the total read-related latency by up to 29%.[5][6][8][9][11]

IV. PROBLEM DEFINITION AND TECHNICAL STUDY

Latency seems to be major problem. Latency is also depends on geography and distance from server to host. Great latency happens when the end user and internal networks system is far from the cloud environment [20][21]. End user is platform dependent and all depend on net speed, if the end user is not having high speed connection then end user has to cost more money to get the cloud speed [5] [30]. A minimum requirement to use cloud is 1mpbs. All cloud is going to cost us in high bandwidth even if they provide us the all *.aas service [31][32]. We can see the difference of cloud when we access in cyber café or GPRS connection, when I check in cyber café and try to open Google docs it took 20 sec while when it is try to open at the campus of university which provide 5.4 mbps it open in 2 sec.

Below is a technical report of some cloud provider.

The below test is taken at www.cloudsleuth.net

City	Response Tim ▲
Singapore	0.69 sec
Mumbai	4.04 sec
Beijing	4.96 sec
Tokyo - NTT	5.09 sec
Tokyo - KDDI	5.13 sec
Sydney	7.22 sec

Fig 1. Cloud Providers/ Windows Azure(Southeast Asia-Singapore) 5.4mbps

City	Response Tim ▲
Singapore	1.13 sec
Mumbai	3.93 sec
Beijing	4.71 sec
Tokyo - NTT	5.06 sec
Tokyo - KDDI	5.21 sec
Sydney	7.15 sec

Fig 2. Cloud Providers/ Windows Azure(Southeast Asia-Singapore) From 56kbps

City	Response Tim ▲
Beijing	5.19 sec
Mumbai	12.82 sec
Sydney	13.34 sec
Tokyo - KDDI	13.45 sec
Tokyo - NTT	13.98 sec
Singapore	14.63 sec

Fig 3 Cloud Providers/ Google App Engine from 5.4 mpbs

City	Response Tim ▲
Singapore	13.80 sec
Tokyo - KDDI	14.46 sec
Tokyo - NTT	14.96 sec
Sydney	15.89 sec
Mumbai	16.46 sec
Beijing	N/A

Fig 4 Cloud Providers/ Google App Engine from 56kbps

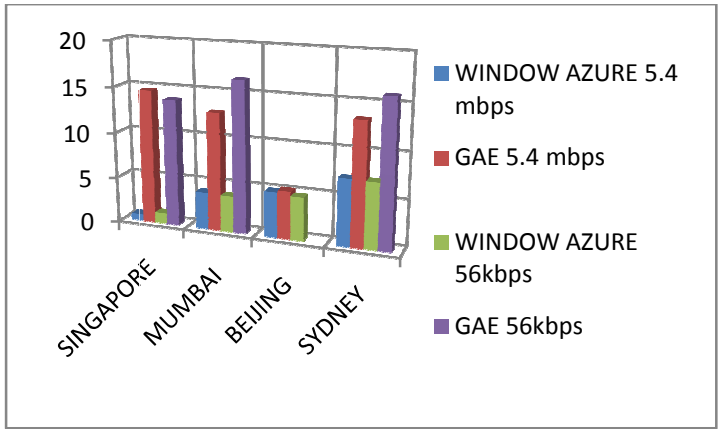

Fig 5 Graphical Represent of latency

Browser and Location Response Time Differences (seconds)*

Location	*Internet Explorer 7*	*Firefox 3.5*
New York, NY	0.467	0.872
Seattle, WA	1.225	1.428
Los Angeles, CA	0.794	1.555
Chicago, IL	0.516	0.905

Fig 6 Location Response Time Differences

URLtested: https://docs.google.com/?tab=mo&authuser=0&pli=1#home

From the above test which was conducted on www.cloudsleuth.net in two major cloud application window azure and Google app engine, I have found out that in different city the response time is slight up and down I also observe that some site browser controls the latency of the web application. The test is taken with same net connection with 5.4 mbps. Browser latency was taken on google docs because we all use google docs. If the speed on high bandwidth 5.4mpbs some latency is there then I believe that there would be a big gap with different net connection. In India the net speed connection is not always same. Even BSNL who provides broad band connection to all nation of India don't' provide same speed on different state. Speed of BSNL provided in northeast India and speed of BSNL provided at southern region is not same.

If all we depend on cloud then there would be huge gap among the user also. If the user want to utilize the cloud then he has spend more money on it. We have to take a best net connection to use cloud computing. But in recent years lots of changes has came from 2g to 3g and network service is much better than before but can cloud computing can adapt in India both rural and urban.

V. CONCLUSION

In the context of different geographic location and different web browser web application has to be design to avoid latency. Web application is design to give us like desktop application any delay in latency would be a great lose too many clients. Cloud computing expect to give us no latency but from the survey it is found that latency occurs on different geographical location. Above diagram and chart shows that difference in response time in different location with different web browser. A better algorithm is needed to prevent the latency while using the cloud computing. Cloud computing represents a powerful and proven solution for IT departments to increase elasticity and cut costs typically associated with the deployment of new platforms. However, the consideration of cloud computing should not be limited to this view and should take into consideration the entire system solution – from Cloud to end-user. Use of redundant cloud architecture, redundant data center infrastructure and an innovative route optimization technology can provide the required performance and availability of applications. Additionally, use of technologies beyond the cloud edge such as TCP acceleration and content delivery networks can further improve content delivery to end-users.

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