ANALYSIS OF CLOUD COMPUTING MARKET PLAYERS

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ABSTRACT

IT managers are facing constraints on space, power, and costs. In the midst of these growing demands, a new class of solutions is emerging to transform the data-centers through cloud computing. Cloud Computing refers to the use and access of multiple server-based computational resources via a digital network. The users may access the server resources using a computer, net-book, note-pad, smart phone and so on. In cloud computing, applications are provided and managed by the cloud server and data is also stored remotely in the cloud configuration. All processing and storage is maintained by the cloud server and hence the users need not download and install applications on their own computers.

The hypothesis of the research has been to find whether there is significant difference in the ranks obtained by the two different methods of ranking. Two different methods are used in this paper to arrive at a ranking order. First, an average of rankings by major research agencies in the field of cloud computing is done. Secondly, a keyword comprising of the term cloud computing and the name of the market player is searched in major search engines like Google, Yahoo! and Bing. Number of search results has been the criteria for getting the order of market players (companies in cloud computing area) in the second method of obtaining ranks.

In the final analysis, Spearman's Rank Correlation has established to find whether there is significant relationship in the order arrived by the two different methods. A Scatter Diagram has been analysed to find the degree of association between the two orders. The result shows significant degree of correlation between the ranks obtained by the two methods. The key market players were found to be Amazon, Google Apps, Salesforce.com and VMWare.

***Keywords** Cloud, Cloud Computing, Hybrid Cloud, Cloud Backup, Public Cloud*

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INTRODUCTION

The user could do with a client device such as a computer to access a cloud system using the World Wide Web. The user will log into the cloud at a service provider. The cloud provides server-based applications and all data services to the user, with output displayed on the client device. If the user wishes to create a document using a spreadsheet, for example, the cloud provides a suitable application running on the server which displays work done by the user on the client web browser display. Memory allocated to the client system's web browser is used to make the application data appear on the client system display, but all computations and changes are recorded by the server, and final results including files created or altered are permanently stored on the cloud servers. Performance of the cloud application is dependent upon the network access, speed and reliability as well as the processing speed of the client device.

In a cloud computing system, there is a considerable workload shift. Local computers no longer have to do all the processing when it comes to running applications. It is handled by the network of computers that make up the cloud. Hardware and software demands on the user side decreases to a significant degree. The only thing the user needs to be able to run is the cloud computing system interface software, which can be as simple as a browser, and the cloud's network takes care of the rest.

Cloud computing is a general term for anything that involves carrying hosted services over the Internet. These services are largely divided into three categories: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS). The name cloud computing was stirred by the cloud symbol which is often used to represent the Internet in flowcharts and diagrams.

A cloud service has three distinct characteristics that differentiate it from traditional hosting. It is sold on demand, typically by the minute or the hour; it is elastic. The elasticity has a sense that a user can have as much or as little of a service as they want at any given time; and the service is fully managed by the provider. Extensive innovations in virtualization and distributed computing, as well as improved access to high-speed Internet and a weak economy, have accelerated interest in cloud computing.

CLOUD COMPUTING SERVICES

The cloud computing service can be private or public. A public cloud like Amazon sells services to anyone on the Internet. A private cloud is a proprietary network or a data center that supplies hosted services to a limited number of people. When a service provider uses public cloud resources to create their private cloud, the result is called a virtual private cloud. The goal of cloud computing is to provide easy, scalable access to computing resources and IT services; let it be private or public.

Infrastructure-as-a-Service like Amazon provides virtual server instance to start, stop, access and configure their virtual servers and storage. In the enterprise, cloud computing allows a company to pay for only as much capacity as is needed, and bring more online as soon as required. Because this pay-for-what-you-use model resembles the way electricity, fuel and water are consumed; it is sometimes referred to as utility computing.

Platform-as-a-service in the cloud is defined as a set of software and product development tools hosted on the provider's infrastructure provided by Salesforce.com and GoogleApps. Developers create applications on the provider's platform over the Internet. PaaS providers may use APIs, website portals or gateway software installed on the customer's computer. Developers need to know that currently, there are not standards for interoperability or data portability in the cloud. Some providers will not allow software created by their customers to be moved off the provider's platform.

In the software-as-a-service cloud model, the vendor supplies the hardware infrastructure, the software product and interacts with the user through a front-end portal. SaaS is a very broad market. Services can be anything from Web-based email to inventory control and database processing. Because the service provider hosts both the application and the data, the end user is free to use the service from anywhere.

THE CLOUD ARCHITECTURE

It is the systems architecture of the software systems involved in the delivery of cloud computing. It usually involves multiple cloud components communicating with each other

over loose coupling mechanism such as messaging queue. The two most significant components of cloud computing architecture are known as the front end and the back end. The front end is the part seen by the client which is the computer user. This includes the user's computers and applications employed to access the cloud via a user interface such as a web browser. The back end of the cloud computing architecture is the cloud itself. It comprises of different computers, servers and data storage devices.

RECENT DEVELOPMENTS IN CLOUD COMPUTING

The public cloud computing market in India is estimated to touch Rs 2,434 crore by 2014 according to CyberMedia Research's India. The survey showed that penetration amongst Indian enterprises was 4% in 2010 which is expected to rise to 6.8% for all large and mid-size enterprises in the country by next year. In United States, Forrester Research Inc. estimated 46 million Americans used cloud computing services last year, with about 10 million of them using paid services. By 2016, the market research firm expects usage to skyrocket more than 400% to 196 million people, 97 million of which will be willing to pay. By 2016, people will be routinely juggling a smart-phone, tablet, and at least one PC, plus a growing range of entertainment, home automation and embedded automobile systems. The forecast is particularly good news for Apple Inc. which says iPhone, iPad and iPod would be one of only three players capable of providing a full personal cloud ecosystem. Web search firm Google Inc. and Microsoft Corp., the world's largest software company, comprise the other two firms deemed by Forrester to be capable of riding the rising cloud wave.

THE CLOUD MARKET PLAYERS

Some of the prominent market players in the cloud market space are; Amazon, Apple, Cisco, Equinix, GoGrid, Google Apps, Hosting.com, HP, IBM, Joyent, Microsoft Azure, Rackspace, RightScale, rPath, Salesforce.com, VMWare and Zuora. Below are discussed some of the market players in the are of cloud computing.

Amazon Elastic Compute Cloud (Amazon EC2)

Amazon EC2's simple web service interface allows you to obtain and configure capacity with minimal friction. It provides you with complete control of your computing resources and lets you run on Amazon's proven computing environment. Amazon EC2 reduces the time required to obtain and boot new server instances to minutes, allowing you to quickly scale capacity, both up and down, as your computing requirements change. Amazon EC2 changes the economics of computing by allowing you to pay only for capacity that you actually use. Amazon EC2 provides developers the tools to build failure resilient applications and isolate themselves from common failure scenarios.

Google Apps

Gmail for business has 25 GB storage, less spam and a 99.9% uptime SLA and enhanced email security. Google Calendar covers agenda management, scheduling, shared online calendars and mobile calendar sync. Google Docs includes documents, spreadsheets, drawings and presentations and working online without attachments. Google Groups helps user-created groups providing mailing lists, easy content sharing and searchable archives. Google Sites is for the security, coding-free web pages for intranets and team managed sites. Lastly, Google Video is private, secure and provides hosted video sharing.

Microsoft's Windows Azure

Windows Azure™ platform appliance is a turnkey cloud platform that customers can deploy in their own datacenter, across hundreds to thousands of servers. The Windows Azure platform appliance consists of Windows Azure, SQL Azure and a Microsoft-specified configuration of network, storage and server hardware. This hardware will be delivered by a variety of partners.
The appliance is designed for service providers, large enterprises and governments and provides a proven cloud platform that delivers breakthrough datacenter efficiency through innovative power, cooling and automation technologies.

Salesforce.com

The company provides leading cloud platform for business apps. General features being 100% cloud and does not require any hardware or software, run apps on any platform or device and adds collaboration features to every app. The business apps are HR apps, inventory apps, iPhone,

iPad, Android, and BlackBerry apps. The company platform can be used to build apps and websites.

VMWare

VMware's tailored approach delivers flexibility and security while protecting your existing investments, by enabling efficiency through utilization and automation resource; agility with control and freedom of choice. At its core, VMware Horizon App Manager includes an identity as a service hub that securely extends a user's existing identity in systems such as Microsoft Active Directory or other directory options, into third-party public cloud applications like Box.net, BroadVision, Google, Salesforce.com, WebEx,   Workday and   others.   This dramatically simplifies the management of multiple access credentials, a necessity brought about by the growing number of cloud applications now found in a typical enterprise.

RackSpace

Its Cloud Server service includes Linux & Windows Servers with Dynamic Scaling. The Cloud Files provide Unlimited, On-demand Storage, Scalable Online Storage, Easy to Access via File Manager or API, Serve Content at Blazing Speeds with CDN, Powered by Akamai and by OpenStack. The Cloud Load Balancer Service of RackSpace provides Dedicated (static) IP Address, Supports Multiple Protocols, Advanced Load Balancing Algorithms, Simple Configuration and Access via Online Control Panel and Open API.

DATA COLLECTION AND ANALYSIS

The below table represents the compilation for the six major players discussed above in the cloud space. A detailing is given in the annexure about the methodology used to arrive at this ranking. A table compiles the various sources from which a ranking has been adopted. Further, averaging is done to arrive at a final ranking preference.

Table 1: Ranking as per different Web Sources

Sr. No.	Company / Source	Rank
1	Amazon	01

2	Google Apps	**02**
3	Salesforce.com	**03**
4	Microsoft Azure	**04**
5	Rackspace	**05**
6	VMWare	**06**

Source: As compiled from different web sources

(Details are attached in the annexure)

Another method used for ranking the players in this research has been as per the number of searches obtained in the major search engines. The search engines selected for the purpose has been Google, Yahoo and Bing. Following table shows the compilation of the same.

Table 2: Ranking as per number of search results

in popular Search Engines

Sr. No.	Company	Rank
1	Amazon	**01**
2	Google Apps	**02**
3	Salesforce.com	**05**
4	Microsoft Azure	**04**
5	Rackspace	**06**
6	VMWare	**03**

Source: As compiled by using different search engines

(Details are attached in the annexure)

RESULTS AND DISCUSSIONS

The ranks obtained from both the above methods have been further correlated to check the degree of agreement between the two sources of information.

Table 3: Correlation Analysis				
Sr. No.	**Company**	**Rank 1**	**Rank 2**	
1	Amazon	01	01	Rank 1 Rank 2
2	Google Apps	02	02	Rank 1: 1.000
3	Salesforce.com	03	05	Rank 2: .600 1.000
4	Microsoft Azure	04	04	6 sample size
5	Rackspace	05	06	± .811 critical value .05 (two-tail)
6	VMWare	06	03	± .917 critical value .01 (two-tail)

From the above table it can be seen that Amazon, Google Apps and Microsoft's Windows Azure show 100 % correlation. Next, Rackspace has been closely related by the two ranks followed by Salesforce.com and lastly VMWare. Ofcourse, the above analysis is restricted to the degree of association between the two methods of ranking.

The Spearman's Rank Correlation which is based on ranks or the order of the observations is calculated. The Spearman's Correlation is found to be 0.6 which is significant and shows a moderate degree of correlation between the two ranks. Also, from the above table it can be seen that Amazon and Google Apps are popular amongst the established players while Salesforce.com and VMWare leading the pack of emerging players in the field of Cloud Computing. A scatter has also been drawn to find out the visual picture of the degree of association between the two orders or ranks obtained by the two methods discussed above.
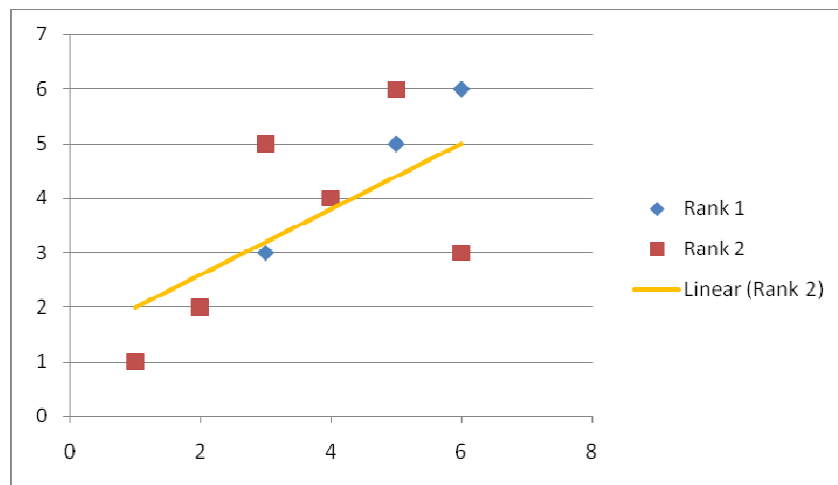
Further, the beginning of the cloud computing concept is witnessing extensive attention from the users on one hand and businessmen on the other. This is fuelled by the strong belief that the arrival of cloud computing will allow a large number of MSME's to adopt the same enterprise-class software and technology solutions, which were earlier the select-domain of large enterprises. This, in turn is expected to allow the market for software solutions to open up as large investments in IT infrastructure can be converted into smaller payments. Many characteristics of the technology industry at large will be affected by the change from personal-computing to personal-cloud. Whereas it is far too early to say which company will emerge as the champion of this new industry once its structure is complete, one thing is sure that there will be a lot of wealth to be made all along the road.

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Annexure

Tables showing the method of arriving at the ranks in the research.

Table 4: Ranking as per different Web Sources

Sr. No.	Company / Source	Cloud Horizon	Raydepena	ReadWrite	StockPicker	ProcureInsights	Quora	Forrester	CCTech	CloudsofChange	Google	AusWeb	Combine	Social Biz	Total	Rank
1	Amazon	1	1	6	3	1	1	4	1	4	1	1	1	3	28	1
2	Google Apps	2	2	1	3	2	3	3	4	1	3	3	3	1	31	2
3	Salesforce.com	5	3	4	1	5	5	1	3	2	3	4	2	2	40	3
4	Microsoft Azure	3	6	3	3	3	4	2	5	3	3	2	6	4	47	4
5	Rackspace	4	3	5	3	4	2	4	2	5	2	5	4	6	49	5
6	VMWare	5	5	2	2	6	6	4	6	6	3	6	5	5	61	6

Source: As compiled from different web sources

Table 5: Ranking as per number of search results in popular Search Engines

Sr. No.	Company	Google	Yahoo!	Bing	Total	Rank
1	Amazon	1	3	1	05	1
2	Google Apps	2	1	2	05	2
3	Salesforce.com	5	5	5	15	5
4	Microsoft Azure	4	4	4	12	4
5	Rackspace	6	6	6	18	6
6	VMWare	3	2	3	08	3

Source: As compiled by using different search engines

Spearman's Correlation has been calculated using:

$$r = 1 - [(6 \cdot d^2) / n\,(n^2 - 1)]$$

Where,

n = number of observations and

d = difference between the two corresponding observations