



Cloud Computing: An Emerging Technology In The Sultanate of Oman

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Abstract—Cloud computing has been emerged as the biggest trend in enterprise information technology (IT) with benefits set to meet the business requirements and its success. In Sultanate of Oman many organizations are approaching cloud solutions vendors with the hope of deploying a model which will cut operational costs significantly. And while such discussions are well underway, there still is a fair level of confusion regarding the actual path to the cloud. In many organizations, IT managers look to cloud computing as a means to maintain a flexible and scalable IT infrastructure that enables business agility. This paper has analysed how cloud computing technology has been beneficial to the organizations and attempted to find out whether the actual needs, requirements and expectations of organizations in Oman for cloud computing services have been met or not.

Keywords— Cloud, Security, Risk, Service, Technology

I. INTRODUCTION

Cloud computing is the ability to employ a number of computers, hardware, software, and servers to serve your computing needs remotely without actually owning or running the software and hardware.

If you've ever used BitTorrent, you have used a cloud computing service. You seek a file, and thousands of other computers around the world have copies of this file. Your BitTorrent client then downloads bits of the file from multiple computers simultaneously while also uploading bits to other people who are seeking the same file. The computers that you are connected to are your cloud. The strength of cloud computing is that it is instantly scalable; in other words, more computers can be added to or removed from the cloud at any time, without impacting the operation of the cloud. And, because of this, there are virtually unlimited processing and storage capabilities to any user that wants to use cloud computing. Because of the popularity and multitude of options that cloud computing services are offering users, cloud computing has started to be called utility computing, in the same sense that water or electricity is a metered utility. This means that while there are numerous free cloud computing services, like Hotmail, Gmail, and Yahoo! Mail, there are also a number of options that users can purchase on-demand to meet their specific needs [1]. Cloud computing has emerged as one of the prevailing IT trends today. By providing greater levels of provisioning and automation, cloud computing can help organizations become more nimble, reduce operating costs, improve application performance, and better allocate their compute resources. It enables organizations to more flexibly scale their IT infrastructure while reducing the administrative burden on IT organizations. Early cloud deployments consisted of public cloud deployments (i.e., provided by an outsourced service provider), which reduced management overhead and provided greater scalability and agility. In this situation, lines of business can "bypass" the IT organization and go straight to the cloud provider, creating an unruly and disorganized IT delivery model. To retain greater control over applications and user data, many businesses are pursuing private (on-premise) or hybrid (bursting) cloud deployments, which leverage internal shared IT resources deployed in a cloud environment. Implementing the model best suited to business needs has implications on server and storage infrastructure and datacentrenetwork design. [2].

II. UNDERSTANDING CLOUD

Cloud computing utilizes the maximum potential of networked computers, sharing data and processing power using innovative ways. Chances are you already use cloud computing in your daily life, probably without even realizing it. If you use Google, YouTube, MySpace, or other Web services, you're already part of the cloud. The general principle behind all these services is the same: using applications running on a remote server to manipulate data stored on a remote server. Plugged into the Internet, your local computer can access these remote files just like they were stored on your local hard drive.

Cloud computing allows computers to pool their resources, effectively turning the entire network into one giant computer. Now that most computers are hooked up to one giant network, the Internet, we have created a supercomputer that encircles the globe. Unfortunately, many people don't see the forest for the trees yet, and resources are distributed unevenly and inefficiently across the network as a result. A few computers may handle the bulk of the processing power and data storage while other computers run idle with near empty hard drives.

In 1999, software began addressing these issues. Though cloud computing is essentially as old as networking itself, this

is when we began to see more effective management of network resources. Napster came out that year, allowing its users to share files in a way never thought of before. Napster's servers didn't store the requested files, but their locations on other user's hard drives. Thus, Napster stitched together all of its users little hard drives to form one big hard drive. Though Napster itself died in a legal hailstorm, it gave birth to our modern notion of file sharing. That same year, the Search for Extraterrestrial Intelligence (SETI) released its own groundbreaking software, SETI@home. Users of SETI@home leave their machines running and connected to the Internet when they finish their personal computing. This allows SETI's overburdened supercomputers to distribute their workload to the idling machines, utilizing their otherwise wasted processing power. SETI@home's success has lead to a number of @home applications in the last decade, allowing scientists to crunch numbers faster than any individual machine could. Again, all the little processors work together to create one big processor. If all this software came out a decade ago, why are people only starting to talk about cloud computing now? For starters, the hardware back then still wasn't nearly as powerful or affordable. Streaming video with a dial-up connection and a Pentium II isn't very effective, but these days practically anyone with a hi-speed connection can watch YouTube like its television. There's also the issue of privacy and security. Users are understandably reluctant to leave their precious data in the hands of a third party.

Today, if a company requires each employee to create an account with Google, they have access to a mail network, full office suite, and many other applications, all at no cost to the company. Instead of installing a large software bundle on each workstation, all they have to install is a web browser. As cloud computing becomes more commonplace, people will begin to trust computing utilities the way they trust electric utilities. What are you waiting for? Put your head in the cloud![3]

III. WORKING OF CLOUD

In an organization, buying computers for everyone isn't enough -- you also have to purchase software or software licenses to give employees the tools they require. Whenever you have a new hire, you have to buy more software or make sure your current software license allows another user. It's so stressful that you find it difficult to go to sleep on your huge pile of money every night.

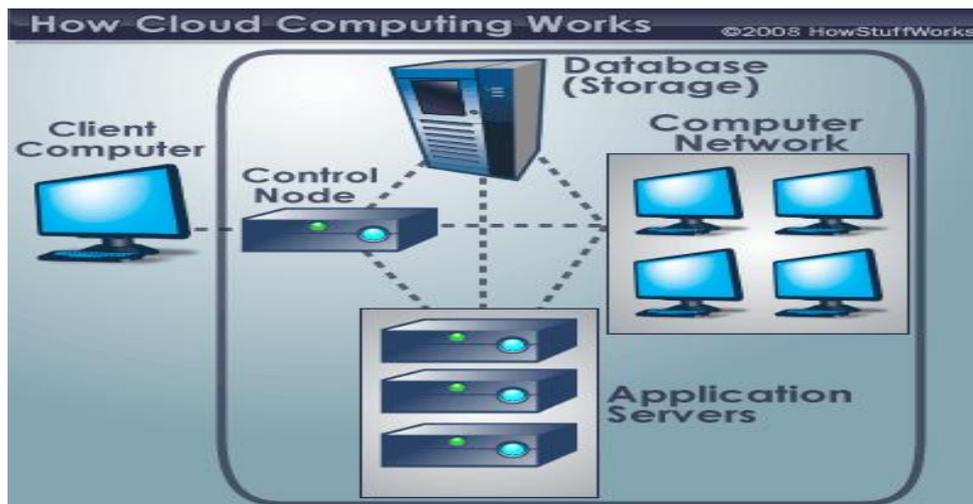


Fig 1 How Cloud Computing Works (Source: HowStuffWorks)

Soon, there may be an alternative for executives like you. Instead of installing a suite of software for each computer, you'd only have to load one application. That application would allow workers to log into a Web-based service which hosts all the programs the user would need for his or her job. Remote machines owned by another company would run everything from e-mail to word processing to complex data analysis programs. It's called cloud computing, and it could change the entire computer industry. [4]

IV. BENEFITS OF CLOUD

If used properly and to the extent necessary, working with data in the cloud can vastly benefit all types of businesses. Mentioned below are some of the advantages of this technology:

A. Cost Efficient

Cloud computing is probably the most cost efficient method to use, maintain and upgrade. Traditional desktop software costs companies a lot in terms of finance. Adding up the licensing fees for multiple users can prove to be very expensive for the establishment concerned. The cloud, on the other hand, is available at much cheaper rates and hence, can significantly lower the company's IT expenses. Besides, there are many one-time-payments, pay-as-you-go and other scalable options available, which make it very reasonable for the company in question.

B. Title and Author Details

Title must be in 24 pt Regular font. Author name must be in 11 pt Regular font. Author affiliation must be in 10 pt Italic. Email address must be in 9 pt Courier Regular font.

C. Unlimited Storage

Storing information in the cloud gives you almost unlimited storage capacity. Hence, you no more need to worry about running out of storage space or increasing your current storage space availability.

D. Backup and Recovery

Since all your data is stored in the cloud, backing it up and restoring the same is relatively much easier than storing the same on a physical device. Furthermore, most cloud service providers are usually competent enough to handle recovery of information. Hence, this makes the entire process of backup and recovery much simpler than other traditional methods of data storage.

E. Automatic Software Integration

In the cloud, software integration is usually something that occurs automatically. This means that you do not need to take additional efforts to customize and integrate your applications as per your preferences. This aspect usually takes care of itself. Not only that, cloud computing allows you to customize your options with great ease. Hence, you can handpick just those services and software applications that you think will best suit your particular enterprise.

F. Easy Access

Once you register yourself in the cloud, you can access the information from anywhere, where there is an Internet connection. This convenient feature lets you move beyond time zone and geographic location issues.

G. Quick Deployment

Lastly and most importantly, cloud computing gives you the advantage of quick deployment. Once you opt for this method of functioning, your entire system can be fully functional in a matter of a few minutes. Of course, the amount of time taken here will depend on the exact kind of technology that you need for your business.

V. RISKS OF CLOUD

In spite of its many benefits, as mentioned above, cloud computing also has its disadvantages. Businesses, especially smaller ones, need to be aware of these cons before going in for this technology.

A. Possible Downtime

Cloud computing makes your small business dependent on the reliability of your Internet connection. When it's offline, you're offline. The most reliable cloud computing service providers also suffer server outages now and again.

B. Technical Issues

Though it is true that information and data on the cloud can be accessed anytime and from anywhere at all, there are times when this system can have some serious dysfunction. You should be aware of the fact that this technology is always prone to outages and other technical issues. Even the best cloud service providers run into this kind of trouble, in spite of keeping up high standards of maintenance. Besides, you will need a very good Internet connection to be logged onto the server at all times. You will invariably be stuck in case of network and connectivity problems.

C. Security

The other major issue while in the cloud is that of security issues. Before adopting this technology, you should know that you will be surrendering all your company's sensitive information to a third-party cloud service provider. This could potentially put your company to great risk. Hence, you need to make absolutely sure that you choose the most reliable service provider, who will keep your information totally secure.

D. Prone to Attack

Storing information in the cloud could make your company vulnerable to external hack attacks and threats. As you are well aware, nothing on the Internet is completely secure and hence, there is always the lurking possibility of stealth of sensitive data.

E. Cost

At first glance, a cloud computing application may appear to be a lot cheaper than a particular software solution installed and run in-house, but you need to be sure you're comparing apples and apples. Does the cloud application have all the features that the software does and if not, are the missing features important to you?

You also need to be sure you are doing a total cost comparison. While many cloud computer vendors present themselves as utility-based providers, claiming that you're only charged for what you use, Gartner says that this isn't true; in most cases, a company must commit to a predetermined contract independent of actual use. To be sure you're saving money; you have to look closely at the pricing plans and details for each application.

F. Inflexibility

Be careful when you're choosing a cloud computing vendor that you're not locking your business into using their proprietary applications or formats. You can't insert a document created in another application into a Google Docs spreadsheet, for instance. Also make sure that you can add and subtract cloud computing users as necessary as your business grows or contracts.

G. Lack of Support

Customer service for Web apps leaves a lot to be desired -- All too many cloud-based apps make it difficult to get customer service promptly – or at all. Sending an email and hoping for a response within 48 hours is not an acceptable way for most of us to run a business". [5], [6]

VI. CLOUD IN OMAN

According to Said Akar, regional director of EMC for the South Gulf region, Oman is heading in the right direction. There is adoption of cloud services, including public-cloud services, is at an advanced level in Oman. However, much more are definitely needs to be done like in other countries in the region. On the service-provider side, there is service providers in Oman now prepared for the launch of public-cloud services. From the end-user side, the idea of adopting and moving on to cloud services is also at an advanced level here. Organisations are gearing up to move into cloud services. Once public-cloud services are launched, we expect to see the faster adoption of cloud services by small and medium enterprises (SMEs). Large enterprises will invest more and more to build their own privateloud services and they will also employ some services within public clouds. We are working closely with service providers that are planning to launch public- cloud services in Oman [7]. According Samer Abu Latif of Microsoft Gulf regional manager, "The infrastructure in Oman is adequate for us to launch cloud services. We have run our tests with key clients and we have done our own assessment for the provisioning of public cloud services in all Gulf countries and I am very pleased with the outcome." The cloud computing services will chiefly benefit 'struggling' SMEs, which will not have to invest large sums in ICT hardware and software but subscribe to services they need.

He said, "I see the biggest opportunity for Oman around cloud computing in the area of enabling SMEs. "The SMEs have been struggling. You will see us targeting SMEs more with offerings that can best fit their needs." [8]

According to Said Akar, regional director of EMC, they believe that they would be able to capture 45-50 per cent market share in cloud services in Oman, but they have some way to go in investing more in resources and educating the customers in Oman. EMC is part of some of the government initiatives in Oman. Having the knowledge and experience, EMC has already been involved in government e-services initiatives in other countries in the region. EMC is bringing this expertise to Oman and working closely with some of the important government initiatives. EMC is already part of some and we are gearing up to participate in others.

The government initiatives are very important and crucial because the government is the one which provides initiatives and makes them happen for the public. EMC is working with some customers to provide cloud services across the schools, ministries and other government entities in Oman and the region [7].

George DeBono, General Manager, Middle East & Africa at Red Hat says that one of the reasons behind this bewilderment is the sheer number of offerings available under the broad cloud umbrella. The wide array of cloud strategies and enabling technologies that have been made available in the past 12 to 36 months offer varying levels of performance in factors such as access, dynamic allocation, scalability, application hosting and management. It is no wonder then that IT managers are completely overwhelmed by the cloud clutter [9]. According to the research firm Gartner, the public cloud computing services market is expected to grow 19.6 per cent to reach \$109 billion globally this year on the back of infrastructure segment, which is fastest growing area at 45.4 percent. "The public cloud services market is forecast to grow 19.6 per cent in 2012 to total \$109 billion worldwide. Infrastructure as a service (IaaS) is the fastest-growing segment of the public cloud services market and is expected to grow 45.4 per cent in 2012".10]

VII. CLOUD – AN EMERGING TECHNOLOGY IN OMAN

The author has done a study in 2010 in Sultanate of Oman to find out the security risk precautions taken by the organizations using cloud computing technologies. The survey conducted in 35 organizations in Oman has given alarming figure that only 37% were taken care of the risk precautions and one third of the organizations were not even aware about the cloud computing technology. [11]

The author has done the study with the same organizations during August-September 2012 and the findings from the survey result are very encouraging and it clearly shows that cloud computing is an emerging technology in the Sultanate of Oman.

As shown below in the table, awareness of cloud computing technology has been shown excellent improvement from 33% to 90%. Similarly the organizations using cloud technologies have also been increased from 33% to 65%. This shows the growth rate of 200% in two years. Therefore, cloud computing has become the emerging technology in the Sultanate of Oman.

TABLE I
CLOUD – COMPARISON BETWEEN 2010 AND 2012

Summary Questions	In 2010	In 2012
Organizations having the awareness of Cloud computing technology	33%	90%
Organizations using Cloud computing technology	33%	65%
Precautions taken completely to prevent security risks among the organizations using Cloud	37%	85%
Precautions taken partially to prevent security risks among the organizations using Cloud	63%	15%

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