Cloud Migration Benefits and Its Challenges Issue

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Abstract-*Cloud computing is one of the emerging fields in the computer world these days. Cloud computing is attracting everyone with its benefits. Now companies are shifting their focus onto cloud computing. But to be a part of cloud computing environment and to take advantages of cloud computing, legacy applications need to be migrated to cloud. Cloud migration is the process of transitioning all or part of a company's data, applications and services from onsite computers behind the firewall to the cloud or moving them from one cloud environment to another. After migrating to the cloud, the information will be available on the internet so that more people can have access to it as needed.*
Keywords-*Cloud Computing, Cloud Migration, Challenges issue*

I. Introduction

In the last few years, Information Technology (IT) has embarked on a new paradigm that is cloud computing. Cloud computing is not a new technology but it is a different computing model to deliver computer resources. More specifically cloud computing can be defined as a computing environment where computing needs by one party can be outsourced to another party and when need be arise to use the computing power or resources like database or emails, they can access them via internet. It moves computing and data away from desktop and portable PCs into large data centers. Cloud computing is evolved with lot of benefits in customer as well as business point of view. In cloud computing access to resources is provided through internet, so customer can access resources at anytime from anywhere. Also cloud computing enable companies to be a part of cloud environment and take advantages of cloud computing. Lot of companies started to be a part of cloud environment by migrating their existing systems, applications, data, and services to the cloud.

1.4 Cloud migration
Why migration?-Many organizations want to move their existing legacy application to the cloud environment because they are facing some problems in adopting new technologies, platforms, and standards. Some problems are given below.
Less agility-Significant effort is required to make changes to existing application so that these applications will be compatible with newer application.
Longer time to market-It takes longer to roll out new services and features to support business expansion.
Cost of maintenance-Over the years, it becomes expensive to maintain staff for ongoing system maintenance and routine updates.
Difficult to integrate-Integrating legacy application with newer and modern standards based applications, special tools, and services is necessary, but difficult
Difficult to upgrade-Legacy applications especially client server applications require client software to be installed on desktop computer so that user can access the applications.

II. Literature survey

Cloud computing everywhere-Cloud computing is everywhere. In fact, in 2008 Oracle CEO Larry Ellison chastised the whole issue of cloud computing, saying that the term was overused and being applied to everything in the computer world [1].
First Movers in the Cloud-Cloud computing is a growing field, and there will likely be new players in the market in the foreseeable future. For now, let's look at the names you already know: Amazon, Google, and Microsoft [1].
Amazon-Amazon was one of the first companies to offer cloud services to the public, and they are very sophisticated. Amazon offers a number of cloud services, including

• **Elastic Compute Cloud (EC2)** Offers virtual machines and extra CPU cycles for your organization.
• **Simple Storage Service (S3)** allows you to store items up to 5GB in size in Amazon's virtual storage service.
• **Simple Queue Service (SQS)** allows your machines to talk to each other using this message- passing API.

• **SimpleDB** A web service for running queries on structured data in real time. This service works in close conjunction with Amazon Simple Storage Service (Amazon S3) and Amazon Elastic Compute Cloud (Amazon EC2), collectively providing the ability to store, process, and query data sets in the cloud.

Amazon has launched two new products, Cloud Drive and Cloud Player, which allow users to tap cloud computing and store all their music and video files on a network of remote storage facilities[12].

Google-Google offers online documents and spreadsheets, and encourages developers to build features for those and other online software, using its Google App Engine.

Microsoft-Microsoft's cloud computing solution is called Windows Azure, an operating system that allows organizations to run Windows applications and store files and data using Microsoft's datacenters

III. Cloud Migration

3.1 What is cloud Migration?

Cloud migration is the process of moving data, application or other business elements from an organization's onsite computers to the cloud , or moving them from one cloud environment to another. Cloud migration sometimes involves moving data or other business elements between cloud environments, which is known as cloud-to- cloud migration

3.2 Benefits of cloud migration

Unlimited Scalability -The major benefit of cloud migration lies in the flexibility to scale up or scale down the IT infrastructure depending on the enterprise needs. This means that the enterprise do not have to worry about future needs as the IT infrastructure they need can be set up in minimal time.

Reduced cost -Cloud migration can reduce both capital expense and operating expense costs because resources are only acquired when needed and are only paid for when used. In cloud computing environment resources are managed by third party, so they are responsible for resource maintenance and upgrade.

Increased storage -Various numbers of cloud providers are available in cloud to provide storage as a service. You can store more data on the cloud than on a private network. Plus, if you need more it's easy enough to get that extra storage from cloud providers.

Automation-Your IT staff no longer needs to worry that an application is up to date because that is the job of cloud providers. And they know that they have to keep it up to date otherwise they will start losing customers.

Flexibility -You have more flexibility with a cloud solution. Applications can be tested and deployed with ease. You can get application as a service from cloud service provider, and if that application is not getting the job done, you can switch to another cloud provider. When you move to a cloud solution, you have the flexibility of being able to access your company files anywhere you have access to the internet.

Better mobility -As cloud service is available through internet, users can access the cloud from anywhere with an Internet connection. This is ideal for road warriors or telecommuters or someone who needs to access the system after office hours.

3.3 Challenges in cloud migration

Although there are so many benefits of cloud migration, companies are facing some challenges and security risks during migrating to the cloud. Some of these challenges and security risks are addressed here.

Sensitive Data-All organizations whether small, medium or big run their operations at the cost of the data they store or share with their respective clients or authorized third parties. Now, when they move to cloud platform, they undergo a migration process, wherein all or a part of their data is migrated in the cloud server. However, migration has an important role to play because if this data leaks during the migration process it can cause a lot of damage to the company or organization monetarily or reputation wise. Therefore, migration of data from the existing server to the cloud server is a pain staking task and requires ample skill to handle and mange things.

Again at the time of migration you have to decide which applications and services will reside in the public cloud and which will remain on site behind the firewall or in the private cloud.

Cloud Security: Biggest Threat in the Current IT Market-The biggest issue in the current IT industry is of Internet security. Therefore, special care is taken at the time data is migrated from one server to the cloud server. As you are migrating business to the cloud, you have to move sensitive data from your computers to cloud. In this transition company has to think about the security solutions of this sensitive information.

Interoperability-One of the most pressing issues with respect to cloud computing is the current difference between the individual vendor approaches, and the implicit lack of interoperability.

In cloud computing environment interoperability is considered as one of the big challenge in cloud migration. Interoperability is concerned with the ability of systems to communicate. In the world of cloud computing, this means the ability to write code that works with more than one cloud provider simultaneously,

regardless of the differences between the providers. So if you want to be a part of cloud environment by migrating your system to cloud then it should be compatible with more than one cloud provider.

Portability-Portability is the ability to run components or systems written for one environment in another environment. So in cloud environment the software that you want to move should be portable with other cloud environment.

Adopting to cloud computing-An organization adopting cloud computing will encounter changes to the mission, authority, funding and staffing of various departments within the organization.

Cost and time it takes to move-The cost and time it takes to move an existing workload to the Cloud, again this is one of the challenge in financial point of view. Specific things to think about here are the bandwidth cost of moving significant amounts of data to the Cloud and the time taken to transfer data in the migration process.

Service Level Agreements (SLAs)- An SLA defines the interaction between a cloud service provider and a cloud service consumer. An SLA is the foundation of the consumer's trust in the provider. An SLA contains [6]:

1. A set of services the provider will deliver, along with a complete, specific definition of each
2. The responsibilities of the provider and the consumer
3. A set of metrics to determine whether the provider is delivering the service as promised

3.4 Answering the weaknesses in cloud migration

Now if cloud is so good then why are not companies using it more? As the benefits of cloud computing continues to flow, an obvious question arises that why the adoption rate isn't higher. Obviously the reasons are cloud security challenges and cloud adoption rate. Because moving from traditional IT infrastructure and adopting cloud computing technologies deals with the cost required for such a move and the security of information, data, and application that you move to the cloud. Once migrated to cloud, you do not know where your data is physically stored, what laws and regulations govern the same and most important of all, who has access to it.

Some solutions to these problems are given below.

Use encrypted file systems-Usually, whenever data is migrated from one server to the cloud server, it is done in an encrypted file format so that even if it is stolen, appears as a trash to the third parties. The only way to avoid data being snooped while travelling between the corporate network and the external application is to encrypt it. Various well-established and easy-to-implement technologies exist to do this, such as the HTTPS protocol for encrypting websites. They are providing security as a service to the third parties. So by taking support from such technologies during the cloud migration you can take special care of your important and sensitive information.

Backups where necessary-Keep offsite backups in-house or at an alternate cloud provider so that data will be available after crash. Various companies are providing storage as a service so you can make use of it to maintain backup of your migrated data.

Hiring skilled and experienced team of cloud professionals -Foremost thing that should be taken care of is to hire a skilled and experienced team of cloud professionals. This is required because sound knowledge about cloud know-how will help these professionals manage every bit of it efficiently. As you are migrating your existing business to cloud, you should have skilled and experienced team of cloud professionals with sound knowledge about new technologies and standards used in cloud computing.

Take the service from Security service providers- Various cloud providers are available in cloud environment. As they are providing security as a service, you can get service from these service providers to secure your data and information that you have migrated to cloud.

3.5 Cloud Migration Strategy

In cloud migration Strategy we address the things that should be kept in mind to carry out migration process efficiently. Efficient migration process would enable organizations to ensure that the costs of migration to the Cloud do not exceed its benefits.

Look for an established vendor with a track record-A cloud vendor that is well established will have a wider breadth of knowledge and deeper insights into potential pitfalls than a smaller less- established vendor. They are also more likely to have higher security standards, a better range of services, more resources available to meet peak demand, and a better quality of support and training available for their users [5].

So if you are planning to migrate your business, you should study different aspects of migration from that vendor.

Decide what applications need cloud migration- You first need to determine what applications need to go into the cloud. For that you have to check that Is it company content? Is it the business's database? Is it the financial records? Whatever you decide, do keep in mind that not all applications are currently "cloud

compatible".

What to migrate?-It may sound obvious that cloud computing is emerging field of information technology, but not every project is cloud compatible. Such projects are not well suited for migration to the cloud. If management, customers and end users are happy with the current hosting arrangements, and if current system is cheaper than the cloud option, then there is no reason to move.

What not to migrate?-So, Cloud migrations are usually only necessary when considering large- scale hardware purchases in order to scale up existing in-house projects or enable new projects to take part in cloud. Again if you have to adopt new technologies, platforms, and standards then it is necessary to migrate your application to the cloud.

Determine the "risk of the risk" -Security of data is a key concern while considering the move to the Cloud. Anytime to make data more accessible, you also make it more vulnerable to security attacks. When putting applications and data onto a system outside data centre, customers will want to be sure that only the right people can access it and that its contents remain secure. So, you must discuss with our development and engineering team the options that you have in protecting the information that is a part of the cloud migration.

Determine the data transfer costs-Determine the bandwidth cost it takes to move an existing workload to the Cloud. As you are migrating your system to cloud, you have to move data from your existing in-house server to cloud server. So, you have to determine cost of this data transfer to decide whether to move data to cloud or not.

Make sure that you are migrating the appropriate items-Whatever you decide to move into the cloud, first ask yourself if it is information that will bring problems if the data leaked onto the Internet. The data that falls into that category should not go into a public cloud. Such data can be moved to private cloud of that organization.

Service level guarantees-The first question to ask any cloud vendor is what their availability guarantee is. A cloud vendor failing to provide the agreed service is the worst possible situation for any cloud application to be in. Particular attention should be paid to the processes in place in case of vendor collapse or takeover [5].

Once confident of the vendor's service guarantees, the next check is to look at vendor backup plans. Do they take on- or off-site backups? What is their disaster recovery plan in case of loss of a data centre? Do they guarantee to recover the the applications and data.

Check with the lawyers-The final hurdle when migrating to the cloud is almost certainly going to be a legal one. Data protection or other acts of law may prevent the placement of data in certain locations (e.g. French law prevents clinical trial data from being transferred to locations in other countries). The contract with the cloud provider must also provide suitable protection for data transmitted to it [5].

3.6 Cloud Migration Services

A 5 Step Structured Approach

Some of the practical steps adapted by the industry while migrating to the cloud are given below. Figure 3.1 [10] given below gives the overview of cloud migration steps.

Figure 3.1 A 5 Step Structured Approach in cloud migration.

1. Assessing the requirements & planning-This step involves assessments to understand issues that arise due to application level migration and then planning the project accordingly. This includes the analysis of the existing application and the collection of the data which would be input to the system, the processing required to be carried out on these data, the output data required to be produced by the system, as well as study of the behaviour of the system. This kind of in-depth assessment helps in formulation of a effective migration strategy and effective plan for cloud migration. These assessments also give a clear picture of the cost of migration as well as return on investment [10]. The key idea of assessments is to determine whether the cloud migration is financially and technically feasible [13].

2. Disintegrate dependencies -Disintegrate dependencies after initial assessments. All the micro level programs that depend on the inputs from existing enterprise legacy systems are backed up through a captive

data center. Once they are backed up and their complete architecture is mapped, the system engineers will be able to analyze the complexities involved in migrating the complete system to the cloud. This also provides a clear picture about the software components and functionalities that can be migrated to the cloud and those which are to be left out as it is [10].

3. Redesign, re-program & re-integrate - Once complexities in cloud migration are understood, the engineers will then help redesign the complete application process architecture. This involves deciding on the components that will remain in the captive data center and other components that can be migrated to the cloud. Once the decision is made about the components that are to be migrated, a substantial part of the enterprise application will be dependencies are re-programmed and re-integrated with the cloud based application environment [10].

4. Testing -Testing of the new migrated components is carried out with lot of cloud specific test cases. These test cases are written in such a manner that they replicate the day-to-day activities of the process. Errors related to the application, integration and the functionalities are captured in testing phase and they are carefully reported to make necessary changes [10].

5. Fine tuning & Training -The application and the integrated cloud environment are then fine tuned to perfection with the help of the test data. Some of the tools that are written specifically for the cloud will not suit the production environment completely. These tools are optimized in a number of iterations to ensure that it blends with the production environment close to accuracy. All employees are then trained properly to ensure that they are comfortable using the cloud-based application and related tools. The business process would have changed completely by now and so, the managers at medium level and senior levels are trained for the new business process [10].

IV. Future of cloud migration

Organizations want to move to Cloud, but organizations want a complete migration process, offering the same services and even new services improved and provided by Cloud environments but with security level that is the same as if the system was within their own organization. When organizations decide to move to Cloud, they want to migrate their systems and the security of themselves. This is achieved with a complete migration process where aspects of security and security-related decisions are considered and different solutions proposed depending on the level of security required, the scope of the applications and the selected technological providers.

In the world of cloud computing various cloud venders are providing "security" as a service. So the companies having fear of security and privacy will quite comfortable with cloud computing and they will take part in cloud migration and they will become part of cloud computing. Some Industry Predictions are given here.

1. Cloud computing will allow everybody to be a service provider. The infrastructure to do things is no longer a limiting factor.

2. Employees will be able to use any device to access, transact and manage their work.

3. There will be a security solution in future that will force organizations to rethink how they secure their data and applications.

4. A new class of real time, personalized service providers will be in cloud market and they will develop partnerships to exploit the advantages of big data, social media and mobility.

5. In future, most people won't do their work with software running on general-purpose computers. Instead, they will work in Internet-based applications and in applications run from smartphones.

V. Conclusion

Cloud computing is emerging field in today's computer world. Now cloud computing is everywhere as it provides lot of benefits to the customers as well as companies. So companies are shifting their focus onto cloud and cloud development by migrating their existing legacy system to cloud. As the benefits of cloud computing continues to flow, an obvious question arises that why the adoption rate is not higher. The obvious reasons are cloud migration involve potential security risks and challenges. In cloud migration you are moving your sensitive data to the cloud, so you should sure about security and privacy of that data.

In current days of cloud computing, there is a need of perfect cloud provider who will provide complete migration process with less migration cost and high level security. If it happens then obviously more companies will migrate their current system to the cloud resulting higher cloud adoption rate. In future, most companies will not do their work with software running on general- purpose computers. Instead, they will work in Internet-based applications and in applications run from smart phones.

References

[1] Anthony T. Velte, Toby J. Velte, & Robert Elsenpeter.(2010), Cloud Computing: A Practical Approach. United States, TATA McGraw-Hill.

[2] Tim Mather, Subra Kumaraswamy, & Shahed Latif. (2009), Cloud Security and Privacy, Sebastopol, USA. O'Reilly Media, Inc.

[3] Tom Laszewski & Prakash Nauduri. (2012), Migrating to cloud. Waltham, USA, Elsevier.

[4] Yashpalsinh Jadeja & Kirit Modi. (2012), Cloud Computing - Concepts, Architecture and Challenges. 2012 International Conference on Computing, Electronics and Electrical Technologies [ICCEET].

[5] Richard Holland (2011), Ten Steps to Successful Cloud Migration. Eagle Genomics Ltd. White Paper.

[6] Salvatore D'Agostino, Miha Ahronovitz, & Joe Armstrong (2011), Moving to the Cloud (Version 1.0). A white paper produced by the Cloud Computing Use Cases Discussion Group

[7] Srinivasa Rao V, Nageswara Rao N K, & E Kusuma Kumari (2005 - 2009), Cloud Computing: An Overview. Journal of Theoretical and Applied Information Technology

[8] IBM.com, Grace Walker, (Dec 2010), Cloud computing fundamentals. http://www ibm.com/developerWorks.

[9] Webopedia.com, Cloud Migration, www.webopedia.com/TERM/C/cloud_migration.html

[10] Ramcoblog.com, (2010) Migrating to the cloud: A 5 Ste Structured Approach, http://www.ramcoblog.com/migrating-to- the-cloud-a-5-step-structured-approach.

[11] Cloudreviews.com, (2011), Cloud Migration: Cloud Migration Strategy in Brief, http://www.cloudreviews.com/blog/best-cloud-migration- services.

[12] Times of India, (31-03-2011), Cloud computing's the fture. http://articles.timesofindia.indiatimes.com/2011-03-31/edit-page/29365811_1_personal-computer-drive-and-cloud-player-new-products.

[13] Rashmi, Dr.Shabana Mehfuz, & Dr.G.Sahoo. (2012), A five phased approach for the cloud migration. International Journal of Emerging Technology and Advanced Engineering

[14] Techtarget.com, Search Cloud Computing, http://searchcloudcomputing.techtarget.com/definition/hybrid.