Cloud Computing Drivers: Benefits, Fears, and Implementations: A GCC Study

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Abstract: - Organizations view cloud computing as a way to gain competitive advantage by improving performance, reducing cost, and providing better services. With increasing advancement in IT (hardware and software), companies are offered infinite numbers of virtual machines to use with what seem to be unlimited resources. This tempts many companies and governments to move their operations to the cloud. Developing countries align with this trend. Many companies in the Middle East and the Gulf region have started exploring and some have shifted to the cloud. With this shift come concerns and worries that slow this transition. Companies in the Gulf are no different. They are jumping on the Cloud wagon but as they do that they are facing challenges and fears. This paper dives into the concerns, worries, risks, as well as benefits and advantages IT managers and business organizations have in mind when considering or going on the cloud in the GCC region; this provides good insights into how to make cloud computing more appealing and gaining more implementation and adoption momentum in the GCC region.

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Key-Words: - Cloud Computing, cloud management, cloud risks and benefits

1 Introduction

As hardware advances increased, the concept of hardware as a service began around 2006; in 2007, stakeholders dubbed the newest advance *cloud computing* (Wang et al., 2010). Cloud computing may be a dream come true as many made attempts to separate users from computer hardware (Zissis & Lekkas, 2012); in the 1960s users envisioned time-sharing utilities; in the 1990s the commercial grid system was introduced; presently, cloud computing is an architecture that provides a separation between user and hardware. High-performance computers became a reality in the 1990s, and the concept of grid computing emerged (Zissis & Lekkas, 2012). Grid computing enables resource sharing and problem solving in a coordinated manner (Foster, 2002). (Foster, Zhao, Raicu, & Lu, 2008) considered it as a mean to provide users with “on-demand” computing power. Many researchers viewed grid computing as the beginning of cloud computing (Berman, Fox, & Hey, 2003; Foster & Kesselman, 1998; Tannenbaum & Litzkow, 1995).

The term cloud computing can be traced to the 1990s when telephone-industry specialists used it as a technical term (Hu et al., 2011). However, little consensus exists on how to define cloud computing (Foster et al., 2008). Wang et al. (2010) defined cloud computing as a set of network-enabled services that provides personalized

inexpensive computing structures and services on demand, indicating both the services provided to users over the Internet and the hardware architecture used to deliver these services. Etro (2011) defined it as a new emerging computing paradigm in which access to hardware, software, and data is available on demand over the Internet. Hu et al. (2011) defined cloud computing as an on-demand computing utility available for anyone who has access to the Internet. Foster et al. (2008) added yet another definition of cloud computing: "A large-scale distributed computing paradigm that is driven by economies of scale, in which a pool of abstracted, virtualized, dynamically-scalable, managed computing power, storage, platforms, and services are delivered on demand to external customers over the Internet" (para. 3). The National Institute of Standards and Technology defined cloud computing as an on-demand model that offers computing resources (networks, servers, storage, applications, and services) to users with little management by the provider (Fox et al., 2009).

Cloud computing transformed the way of delivering and paying for IT services. Through its unique and on-demand delivery model, companies are able to ensure IT agility, reengineer business processes, and revolutionize Business to Business (B2B) and Business to Consumer (B2C) relationships and business models. In Europe, the Centre for Economics and Business Research estimated that cloud computing could generate €763 billion ($1.05 trillion) and 2.4 million new jobs by 2015 (Zissis & Lekkas, 2012).

Regardless of the differences in the definition of cloud computing, researchers have the following factors in common:

- ☐ Cloud computing comprises various technologies including peer-to-peer computing, service-oriented architecture, grid computing, and ubiquitous computing (Kleinrock, 2005; Milenkovic et al., 2003; Zhang, 2008).
- ☐ Users can use the cloud on a pay-as-you-go architecture. Cloud computing has become a reality due to advancements in technology as well as new business models that recently emerged (Fox et al., 2009).
- ☐ Cloud computing will impact many levels in industry, changing the way people use computers (Knorr, 2009).
- ☐ Cloud computing is considered a disruptive technology that will have a large impact on the economy as a whole (Etro, 2011).

In general, the cloud computing concept is simple: the host machine runs an application known as hypervisor that simulates virtual machines, which in turn allow users to install and run their own applications (Zissis & Lekkas, 2012). Cloud computing can be categorized as public, private, or hybrid (Hu et al., 2011). The goal of this paper is to explore the extent to which cloud computing exists in the Middle East and the Gulf region. We explore the different fears and issues considered by IT managers to determine whether to use the cloud.

2 Cloud Computing Challenges

Even with all the advantages of cloud computing, some concerns about the technology still make the cloud-computing concept slow to disseminate (Younis & Kifayat, 2013). The majority of concerns related to cloud computing in the letrature were related to security, data transmission, and data storage and management.

2.1 Security

Companies and organization panic at the idea and potential effect on customers and business during IT infrastructure downtime or when getting hacked. The impact on business availability, violation of compliance requirements, and customer servicing is exponantial. In a 2010 survey (Griffiths, 2014), IDC found enterprise IT buyers were most concerned about security in cloud computing. In inspite of 4 years working to address the problem, security is still a concern. Business organizations worry about having their data flowing over networks and through organizations' devices and infrastrucurre outside of their reach.

2.2 Data Transmission

Cloud services transmit customer data across uncontrolled Internet connections that are vulnerable to monitoring and interception. To address this challenge, most cloud-based services use some form of encryption: either through the web or through a proprietary client to the server (Federal Bureau of Investigation, 2012). However, the effectiveness of the encryption may depend on the actual cryptographic algorithms and protocols. Https, which is a widely used web-based encryption protocol, requires the right web-browser and web-server configurations to be in place. Given that cloud service providers remove control of the web-server component from the client organization, especially in the software as a service-delivery model, organizations only can access web-browser settings to enforce needed encryption mechanisms. This limited access has several disadvantages that

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may lead to challenges in running some website functions and applications, forcing users and administrators to bypass encryption enforcement by using alternate web browsers or altering the browser configuration. As a result, the best approach is to set the needed server configurations as part of the cloud service, emphasizing the importance of addressing this problem with any potential cloud-service provider, regardless of the cloud-service delivery model.

2.3 Data-Storage Location

Data that are logically or physically stored by the cloud service typically resides in a shared infrastructure with multiple customers' data, stored on the same logical and physical storage media (Federal Bureau of Investigation, 2012). Hence, data stored on the cloud face the risk of modification, deletion, or unauthorized access and disclosure, either accidentally as a result of data leak across logical (customer) boundaries due to administrator error in configuration, or intentional due to malicious manipulation of the shared infrastructure. To mitigate such risk, cloud service providers encrypt data at the logical or physical storage level to limit exposure of customer's data. However, encrypted data are still prone to unauthorized deletion.

3 Research Problem

An online version of a survey will be created and sent to 60 business and IT organizations.

To look into the driving reason behind switching or not switching to the cloud, a questionnaire is developed for the purpose of this study asking questions related to

- Job sector benefits the most from the cloud?
- Services mostly used on the cloud?
- The type of cloud model used (public, private, and hybrid)?
- Factors and barriers preventing business and IT organizations from using the cloud?

3.1 Study Objectives

The objectives of this study is to explore the sector that benefits most from the cloud in the Gulf, and to explore factors and barriers preventing companies from moving fully to the cloud. Furthermore, the study will look into several factors and reasons concerning business organizations when it comes to using cloud infrastructure in relation to:

1. Complexity Funding:
2. Security: Companies and organization panic at the idea and potential effect on customers and business during IT infrastructure downtime or when getting hacked. The impact on business availability, violation of compliance requirements, and customer servicing is exponantial.
3. Data Transmission: Cloud services transmit customer data across uncontrolled Internet connections that are vulnerable to monitoring and interception. To address this challenge, most cloud-based services use some form of encryption: either through the web or through a proprietary client to the server (Federal Bureau of Investigation, 2012).
4. Data Storage Location: Data that are logically or physically stored by the cloud service typically resides in a shared infrastructure with multiple customers' data, stored on the same logical and physical storage media (Federal Bureau of Investigation, 2012). Hence, data stored on the cloud face the risk of modification, deletion, or unauthorized access and disclosure, either accidentally as a result of data leak across logical (customer) boundaries due to administrator error in configuration, or intentional due to malicious manipulation of the shared infrastructure. To mitigate such risk, cloud service providers encrypt data at the logical or physical storage level to limit exposure of customer's data. However, encrypted data are still prone to unauthorized deletion.
5. Authorization, Authentication, and Identity Management: Cloud services typically consist of a number of technical "layers" from the physical device, usually through a virtualization layer, and potentially multiple application layers (e.g., a web-interface layer, application-processing layer, database layer, etc). The identity management and access authorization functions of a cloud service may either be managed directly by the cloud provider or delegated to one or more individuals on the client side.
6. Reliability and High Availability: One strength of cloud computing is its ability to provide the illusion of having infinite resources available, giving users the feeling they can use whatever resources they need

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to accomplish their task (Fox et al., 2009). Furthermore, when signing contracts with cloud organizations, companies tend to ensure availability for their clients (Wang et al., 2010)

7. Market and Technology Maturity: Maturity is a state where technology has reached its completeness, perfection, and readiness (Simpson & Weiner, 1989). To reach maturity, a system, or even companies, need to follow a path that helps them achieve this status (Lahrmann, Marx, Winter, & Wortmann, 2011; Mettler & Rohner, 2009). For companies to measure the effect of technology on business and its maturity, they have developed different maturity models. The most often cited is Oracle's Cloud Maturity Model[1].
8. Lack of Skills: Due to advancements in technology as well as environmental limitations, developing countries are facing shortages in technology and skilled workers (Lal, 2007; Wilson, 2004). Ross (2011) pointed out that the lack of skilled employees in cloud computing and their ability to innovate on the cloud may lead companies to train and develop employees rather than seeking skilled ones in the market.

As for the benefits encouraging business and IT organizations to use cloud computing, those are related to:

1. Ease of use and self-servicing with rapid delivery
2. Highly scalable systems
3. Flexibility in expanding and decreasing IT capabilities
4. Internet/web based management of cloud environment or service
5. Reduced IT support team

Reduced IT Cost

4 Conclusion

Companies are shifting toward using cloud services—private, public, or hybrid—realizing that the shift means access to better technology at lower prices, as well as access to an infinite amount of hardware (space) or software. However, companies also realize that this service comes with concerns. The lack of understanding of how the cloud operates, the legal ramifications of data being distributed over several servers and in some cases several countries, privacy, and security concerns are on the rise. Furthermore, many companies find it difficult to find the skilled labour to deal with cloud computing. There are a lot of benefits to moving to the cloud, but there is always risk and fear by upper management that needs to be properly handled to ensure smooth and proper transition.

[1]http://www.oracle.com/technetwork/topics/entarch/oracle-wp-cloud-maturity-model-r3-0-1434934.pdf

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