Cloud Computing: Network Security in E-Banking

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Abstract- Cloud computing is clearly one of today's most enticing technology areas due, at least in part, to its cost-efficiency and flexibility. However, despite the surge in activity and interest, there are significant, persistent concerns about cloud computing that are impeding momentum and will eventually compromise the vision of cloud computing as a new IT procurement model. It gives a summary of Cloud Computing and provides a good foundation for understanding.

Keywords:- Cloud Computing, Information Technology, Banking

I. INTRODUCTION

Cloud Computing," to put it simply, means "Internet Computing." The Internet is commonly visualized as clouds; hence the term "cloud computing" for computation done through the Internet. With Cloud Computing users can access database resources via the Internet from anywhere, for as long as they need, without worrying about any maintenance or management of actual resources. Accenture defines cloud computing as the dynamic provisioning of IT capabilities, whether hardware, software or services, from a third party over the network. Cloud computing has recently emerged as a major new trend in business technology based on its potential to significantly reduce information technology (IT) costs and vastly increase employee productivity for businesses both large and small. The development of a domestic cloud computing industry and to support research into the possible applications of clouds in several key industries including banking.

The best example of cloud computing is Google Apps where any application can be accessed using a browser and it can be deployed on thousands of computer through the Internet.

II. WHAT IS CLOUD COMPUTING?

The term cloud computing is broadly applied to a variety of services and IT configurations. Although a standard definition has yet to be established, in its most general form, cloud computing refers to the Cloud computing provides the facility to access shared resources and common infrastructure, offering services on demand over the network to perform operations that meet changing business needs. This architectural configuration creates a virtual computing "cloud" where users can access multiple resources at their discretion from any location they wish and at a cost based only on the resources used. Thus, a cloud is a style of computing that gives users the ability to dynamically configure computing services based on their current and future needs. Clouds can lower business expenses via reduced capital expenditures on computer hardware and software, energy usage, IT and personnel, and other related costs.

Cloud computing is TCP/IP based high development and integrations of computer technologies such as fast micro processor, huge memory, high-speed network and reliable system architecture. Without the standard inter-connect protocols and mature of assembling data center technologies, cloud computing would not become reality too. In October 2007, IBM and Google announced collaboration in cloud computing [1].

This discussion starts with the National Institute of Standards and Technology (NIST) definition:

"Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (for example, networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

III. CHARACTERISTICS OF CLOUD COMPUTING

The following is a list of characteristics of a cloud-computing environment. Not all characteristics may be present in a specific cloud solution.

• *High scalability-*

Cloud environments enable servicing of business requirements for larger audiences, through high scalability.

• *Agility-*

The cloud works in the 'distributed mode' environment. It shares resources among users and tasks, while improving efficiency and agility (responsiveness)

• *High availability and reliability-*

Availability of servers is high and more reliable as the chances of infrastructure failure are minimal Journal of Theoretical and Applied Information Technology.

• *Pay-per-use mode-*

You pay for cloud services only when you use them, either for the short term (for example, for CPU time) or for a longer duration (for example, for cloud-based storage or vault services).

• *On demand:*

Because you invoke cloud services only when you need them, they are not permanent parts of your IT infrastructure—a significant advantage for cloud use as opposed to internal IT services. With cloud services there is no need to have dedicated resources waiting to be used, as is the case with internal services.

• Resiliency:

The resiliency of a cloud service offering can completely isolate the failure of server and storage resources from cloud users. Work is migrated to a different physical resource in the cloud with or without user awareness and intervention.

• *Multi-sharing-*

Public cloud services providers often can host the cloud services for multiple users within the same infrastructure. Server and storage isolation may be physical or virtual—depending upon the specific user requirements.

The services of cloud computing are broadly divided into three categories:

• *Software as a Service (SaaS) –*

In this model, customers run finished software applications that are provided by the cloud vendor for use on the vendor's system on a subscription basis.

• *Platform as a Service (PaaS) –*

In this model, customers develop, test, and run applications on the vendor's cloud using programming languages, services, and tools supported by the vendor's platform.

• *Infrastructure as a Service (IaaS) –*

In this model, customers lease servers, storage, database services, processing capacity and/or other fundamental computing resources from the cloud vendor on which customers can load and run their own software, operating systems, applications, and programs.

Cloud computing also is divided into five layers including clients, applications, platform, infrastructure and servers. The five layers look like more reasonable and clearer than the three categories [2].

IV. BANKING ON THE CLOUD

However, cloud computing is much more than simply renting servers and storage on-demand to reduce infrastructure costs—as many believe. Furthermore, it's not simply a technology issue.

In fact, the cloud offers a host of opportunities for banks to build a more flexible, nimble and customer-centric business model that can drive profitable growth and, as a result, should be something that non-IT decision makers at bank understand and appreciate. So what does the future of cloud computing look like for banks—both in the near and long term? The pundits tend to overestimate the impact of a technology and paradigm shift in the short term and underestimate what happens in the long term. In this paper, we explore some forward-thinking uses of cloud computing in the banking sector and discuss ways we believe innovative banks will be leveraging the cloud for competitive advantage in the next five years.

Cloud computing is one of the hottest technology and business topics today, and the market for cloud services is expected to skyrocket in the next few years.

V. BUILDING A FRICTIONLESS AND FLEXIBLE ECOSYSTEM

Cloud computing's most compelling use case for banks likely will be in the way innovative services can be created. The cloud gives banks an opportunity to break apart their own value chain— be it credit approval or back-office fulfillment. A bank can re-configure its business in-real-time by dynamically sourcing from several service providers. For example, an e-invoicing company called Tradeshift allows for dynamic invoices that "pay themselves". The service constantly monitors exchange rates and then automatically sends out an order to withdraw funds or to make a purchase when the process is cheapest.

Example: Banks will be able team up with other parties (such as telcos and post offices) that can provide the "last mile" to consumers with whom the banks have no existing relationship and who can be difficult to reach. In supporting such teaming, the cloud can offer banks in the future an alternate growth strategy—i.e., a bank will be able to provide wholesale banking services outside of its core geography without having to create a presence in the new region by acquiring an established brand.

VI. CONSUMER CLOUD COMPUTING

Banks also will be able to provide a more engaging and relevant customer experience that will enable customers to more easily access and use banking products and services and, thus, help attract and retain customers. For example an application that consumers might find useful on a Smartphone and that could be supported by traditional financial services that are now made available by the cloud is "Split the Bill." This would enable consumers dining out together to easily divide the bill among each other. At its heart, such functionality is still the same basic transaction enabled by just a bit of clever logic that sits within the application, plus the required security. But it's afforded by banks' willingness to accept messages in a certain way with a certain level of security around them from a mobile device, and enables consumers to conduct their transaction completely differently (and in a way that is convenient to them). One of the cloud-based avenues in which banks can engage their customers is social media, which is growing in prominence and popularity by the month.

VII. THE RISE (AGAIN) OF ANALYTICS

Analytics has always been a differentiator for companies looking for ways to personalize interactions with customers as well as their products or services. Yet many companies still lack mature analytical capabilities, whether it's because they lack appropriate tools or have difficulty sharing, integrating and storing vast amounts of data for analysis.

Cloud computing has the potential to render such shortcomings obsolete. In fact, analytics is really tailor made for the cloud for several reasons:

• The cloud enables banks to store an enormous amount of data and put dormant data to work.

• It provides a cost-effective platform for developing analytics models, reports and driving business intelligence.

• It can enable a bank to work with historical as well real-time or transaction information from a variety of sources.

• It enables banks to churn through vast amounts of data and decipher patterns and anomalies—not only in the past, but also project into the future— much more quickly, efficiently and cost effectively Indeed, cloud computing as a virtually unlimited repository of data is a current reality.

Banking in the Clouds There are three generally agreed upon deployment models:

• *Private Cloud* –

Private cloud (also referred to as 'corporate' or 'internal' cloud) is a term used to denote a proprietary computing architecture providing hosted services on private networks. This cloud model and supporting IT infrastructure is owned by the customer and operated on the customer's business site for access by multiple-users, either employees or business units.

For most banks, the first major foray into cloud computing will be via private clouds. Indeed, in a survey of IT executives at tier-one banks. While this deployment approach provides direct control to the customer over data security and applications, this type of cloud can be cost prohibitive because of the required initial investment in computer hardware, software, and IT resources. Nevertheless, firms may still achieve cost savings by utilizing the cloud for real time collaboration and by provisioning shared resources between divisions, units, and employees.

• *Public Cloud* –

Public cloud (also referred to as 'external' cloud) describes the conventional meaning of cloud computing: scalable, dynamically provisioned, often virtualised resources available over the Internet from an off-site third-party provider, which divides up resources and bills its customers on a 'utility' basis. The servers and systems used to provide cloud services are housed on the cloud provider's owned or leased premises.

Depending on the IT infrastructure used by the vendor, these servers and systems may be spread among multiple locations. Since customers rely on the cloud vendor to provide services and IT support, this outsourcing can significantly reduce a firm's operating costs and capital expenditures. However, this type of cloud system raises potential data ownership and data security issues.

 • *Hybrid cloud –*

This cloud model utilizes a mix of the internal and external cloud infrastructures. A hybrid system might split a project's workload over an organization's internal servers and the external servers of a cloud provider to increase computational speed and worker efficiency.

Regulatory Responses

Banking regulators are becoming increasingly aware of the benefits and dangers of cloud technology. The predominant approach has sought to address the potential risks without stifling the use of this new industry. Establishing industry standards has been a starting point for these efforts. The goal of these conferences is to establish best practices for the industry and suggest possible methods for implementing safe and practical cloud standards. Banks are also taking part in the cloud standardization process through the creation of bank-run compliance and standardization workgroups. These workgroups seek to establish cloud standards for the entire banking industry and include participation from a large number of banks and regulators from around the world. While the adoption of new technology is challenging, banks and regulators are working with the cloud industry so that the benefits of clouds can be an option for financial firms.

VIII. APPLICATIONS WHEN YOU NEED THEM

There is a compelling simplicity to a platforms-a-service and the velocity to drive innovation.

We believe that in the future, a considerable portion of a bank's applications will be candidates for migration to one or more of the cloud models.

However, core banking in a legacy sense will likely have a long shelf life due to legal, risk or regulatory compliance considerations. There will emerge a new crop of corporate and customer-facing applications that will take advantage of parallelism, new programming languages and the efficiency of the cloud's bandwidth growth potential.

Social networks are themselves a platform for application development and are a key venue for a bank to reach its customer base in different ways.

The applications built for these social platforms can be used to enhance a bank's brand, advertise banking products and services and inform and engage customers.

In short, banks will need cloud skills to help them choose among platform providers and determine the "glue" across these loosely coupled systems. At the very least, applications in the cloud will be a boon to productivity through the use of cloud data storage and Web frameworks

IX. HAVING CONFIDENCE IN CLOUD COMPUTING

For good reason, security and data privacy remain prime concerns for cloud implementers in the banking sector, according to several studies.

The fear of having their data "in the cloud" is the single greatest hurdle that banking leaders must overcome to build trust and gain the benefits from cloud computing. Indeed, especially given that the cloud is a true "multitenanted" environment, CIOs are concerned that their data could be stolen or compromised by hackers, mixed with data from their cloud providers' other customers, or released by mistake.

Many banks today have very specific challenges in areas of security and data privacy. Their existing IT estates consist of highly fragmented landscapes of security and data privacy approaches and policies taken across different functions or business lines.

This in turn carries a lot of risk and cost. Using the move to cloud computing to drive more consistency and automation in security and data privacy may actually provide a catalyst for driving greater security and reduced costs.

Banks need to adopt a very practical approach to security and data privacy in the cloud. Most banks tag data with different levels of sensitivity, from low level (published widely with no restrictions) to ultra secure (only accessible by top decision makers). In the same way, banks will need to design their cloud to have similar and appropriate security built in, through a managed combination of both private and public clouds. So, for example, low level data and access may well be suitable to go onto a public cloud infrastructure service with simple password access, whereas highly sensitive data may require dedicated servers housed in ultra secure data centers with strong authentication required for access. There will be several different levels of security in between.

There are two recent trends that will be remembered for their impact on organizations and their IT departments – the first is 'credit crunch', the second is 'cloud computing'. This White Paper is primarily focused upon the latter, cloud computing - and how to overcome the security issues raised by users accessing applications and data from beyond the traditional network perimeter – but it is worth noting that the adoption of this IT trend is and will continue to be significantly influenced by the former.

X. CONCLUSION

After so many years, Cloud Computing today is the beginning of "network based computing" over Internet in force. even an academic report [6] from UC Berkeley says "Cloud Computing is likely to have the same impact on software that foundries have had on the hardware industry." They go on to recommend that "developers would be wise to design their next generation of systems to be deployed into Cloud Computing".

As the capabilities of cloud technology continue to evolve, so do the potential applications for institutions. Given the strong adoption of cloud systems by a country (or countries) of operation. These security requirements may include specifications on data transmission, authentication, integrity, availability, location (including security of location), recoverability, consumer privacy and confidentiality. While some cloud service providers may simply be unfamiliar with the laws and regulations unique to the financial services industry, others may be unwilling to contractually guarantee the service levels that financial institutions and their customers expect.

Another key issue for banks and financial firms is the possibility that their data may be stored in cloud vendor. In this case, both governments and financial firms must determine whether the laws of the country in which the firm operates or the laws of the country in which the data is stored, govern data ownership rights, consumer privacy practices, confidentiality requirements, and other legal consequences This issue was first raised by the large auditing firms.

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