Cloud Computing-based IT Solutions For Organizations with Multiregional Branch Offices

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Abstract: One of the most significant phenomena of the new century is globalization. As business goes global, multiregional branch offices are needed and networked computing and information services must then be established for those branch offices. In this paper we investigate a cloud computing based approach to the rapid deployment of computing and information services for organizations with multiregional branch offices. We first take a look at the general process leading to the deployment of Computer and Information Technology (CIT) services for organizations, and then present some cloud computing-based solutions for organizations with multiregional branch offices, followed by discussions about their key features as well as issues and concerns surrounding the proposed IT solutions. An important contribution of this paper is a generalized view of the cloud computing-based approach, which may be used as guidance in implementing and deploying such IT solutions.

Keywords: cloud computing, globalization, information technology infrastructure

1. Introduction

In today's world, the reach of computer and information technology is vast and deep. Computer and information technology are prevalent in every corner of our society from health care and military deployments, to that of the corporate business world; using computers and information technology has become a fundamental part of daily operations for almost all organizations. Information technology drives business and communications through virtually removing borders and distance limits and making it possible for instant commerce and communication globally between organizations or internally.

The expectation that surrounds the use of computer and information systems on this global network has become one that society expects instant communications with instant gratification and results from all businesses at all times. In order to provide this type of service it is necessary to have a robust and reliable information technology infrastructure underpinning the communications and information systems. Traditionally, the information technology infrastructure that supports these systems needed for businesses with multiregional branch offices usually starts internally with a core network and data center for the originating site or head office and extends to branch offices worldwide. This traditional approach often provides more reliable and better guaranteed computing and information services. With the advances in computing and information technology, we now may have more options in providing the IT needs to businesses with branch offices worldwide. In this paper, we will explore a cloud computing based approach to the rapid deployment of computing and information technology services for businesses with offices worldwide.

2. General management process towards an IT solution for businesses

In general, any new branch office will require a data center, network core and infrastructure, telecommunications systems, 3-tier application systems, web servers, database servers and client computers, and all these elements require a high degree of information security considerations to be taken. No matter how these elements will be implemented, some general Project Management (PM) steps must be taken (PMI 2004).

In order to determine exactly what IT infrastructure and systems are needed and how to implement the IT infrastructure and determined systems for a new business expansion, the first step is defining the needs of the business. In this case a Chief Technical Architect (CTA) or the like will need to work with the functional representatives from the business and defines what will be needed to support the daily operations

of the business; from an ERP (for Enterprise Resources Planning) system and Email services to Computer Numerical Controlled (CNC) systems and Computer-Aided Design (CAD) systems, this should be determined in the project conception stages. This Initiation phase of the project allows the business to communicate the technical needs or concepts to be evolved.

The next phase of the project is Project Planning (PP), which in the project lifecycle is the next logical progression for the project. It is important in this phase to determine the full extent of the work packages or work breakdown structure (WBS), the sequencing of activities, resources required, risks and risk management plans, cost estimating and budget, change and quality control, procurement plans, plan and hold a formal project kick off meeting and define the finalized project plan (PMI 2004).

The last phase of the project is Project Execution where the work begins to occur is signified by acquiring the project team, receiving responses from any request for proposal, selection of the vendor based on proposal, execution of the work packages, perform quality assurance, and the PM distributes and controls project information and implements administrative closure procedures.

This 3-phase process of project management is applicable when using a cloud computing based IT solution to meet the computing and information technology needs of businesses with multiregional branch offices.

3. Cloud Computing based Solutions

Cloud computing is defined as "a pay-per-use model for enabling available, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Pearson 2009). In literature and practice, there are three cloud computing models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) (Fouquet 2009, Gruman 2008).

In the IaaS model, users subscribe for uses of certain components of provider's IT infrastructure. Although the subscribers don't have control of the entire cloud infrastructure, they do have control over selected portions of it, such as firewalls, operating system, deployed applications and storage.

In the PaaS model, a combination of applications, which forms a platform, is subscribed as a service by users. For example, a combination of software tools may be used as a programming and software platform.

The SaaS model can be seen as special case of PaaS, where a single application can be subscribed as a service. Such services are often accessed through a Web browser.

As for cloud, there are private cloud, public cloud and hybrid cloud based on the relationship between cloud owners and cloud users (Buyya 2008, Dikaiakos 2009).

Private Cloud is usually owned and used by the same organization such as a corporation. It often refers to a proprietary computing infrastructure owned by the organization, and provides computing and information services to its employees behind the organization's firewall.

Public cloud often refers to computing and IT infrastructure that is owned by an organization but provide computing and information services to external users or subscribers. By subscribing services provided by other well established companies, new start-ups, for example, can quickly realize their computing and information technology needs without investing so much money and time to implement their own computing and IT infrastructure.

Hybrid cloud is a mixture of public cloud and private cloud. It can be useful for some well established corporations who already have their own computing and IT infrastructure, but need additional computing and IT services for expansion in new areas. By subscribing needed computing and information services available in public cloud, they can make use of the services more quickly without investing big money and lengthy time on implementing their own CIT infrastructure.

Accordingly, we derive from the above the following cloud computing based solutions for businesses with multiregional branch offices, to meet their computing and information technology needs.

3.1. Private cloud based solution to meet the IT needs of multiregional branch offices

For organizations who have well established computing and information technology infrastructure, such as some high-tech companies in the IT business, a completely private cloud based solution may be a better choice to provide computing and IT services to new branch offices in other cities or other countries. In such a case, the data centre, servers and all major computing and IT devices reside behind the firewall on the organization's enterprise network, located on site of the head office, while users in branch offices access the computing and information services through VPN or a Web browser, if a Web interface has been made available for accessing the service. Figure 1 depicts the architecture of our private cloud based solution.

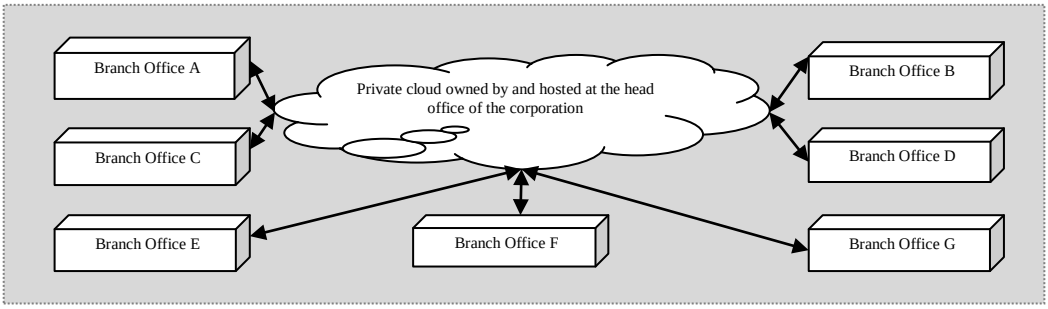

Figure 1: architecture of private cloud based solution

In private cloud based solution since everything is under control of the very same organization, this solution gives the organization the total freedom and autonomy in managing all the components of the computing and information technology infrastructure.

3.2. Federated cloud based Solution to meet the IT needs of multiregional branch offices

Federated cloud can be seen as a variant of private cloud. Same as in private cloud, in federated cloud computing and information technology infrastructure is still privately owned by the sole organization, but the equipment, servers and services are distributed among head office and branch offices. This may be necessary when different branch offices have different missions and each needs more dedicated computing and information services. For example, one branch may be working on data mining, while another branch may be more on server development. The architecture of federated cloud based solution is showed in figure 2.

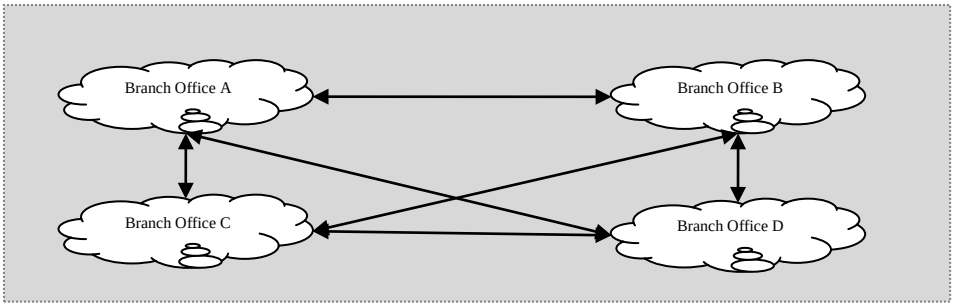

Figure 2: architecture of federated cloud based solution

3.3. Public cloud based Solution to meet the IT needs of multiregional branch offices

A public cloud based solution is for the organization to subscribe all needed computing and information technology services from providers in the public cloud. This solution is suitable for organizations that have

no resources or interest to implement their own CIT infrastructure, or small start-ups. By subscribing the needed computing and IT services readily available in the public cloud, a start-up can quick get its business going and have the creative ideas tested. If the business doesn't fly, it can easily get off the boat with less to lose. Figure 3 depicts the architecture of public cloud based solution.

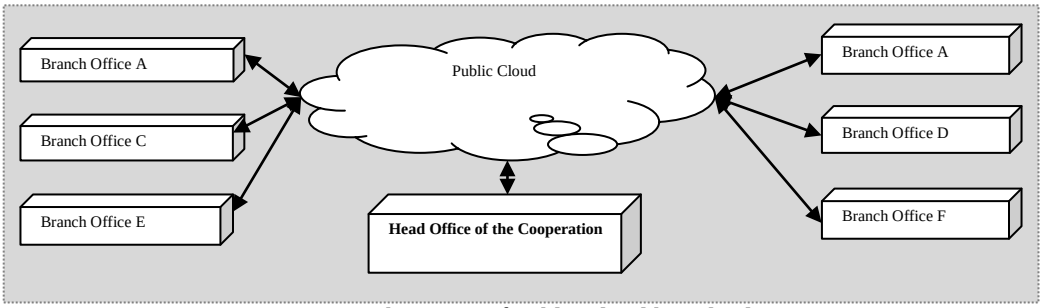

Figure 3: architecture of public cloud based solution

3.4. Hybrid cloud based Solution to meet the IT needs of multiregional branch offices

As in the common definition, hybrid cloud involves both private and public cloud. A hybrid cloud based solution may be applicable for an organization that has an established CIT infrastructure sufficient for its current needs, but doesn't want to invest big money and time to expand its current CIT infrastructure for new business. In this case, it would rather choose to get the needed CIT services from a reliable source in the public cloud. By doing this, it may be more easily turn around if the new adventure doesn't go well. The architecture of hybrid cloud based solution is shown in figure 4.

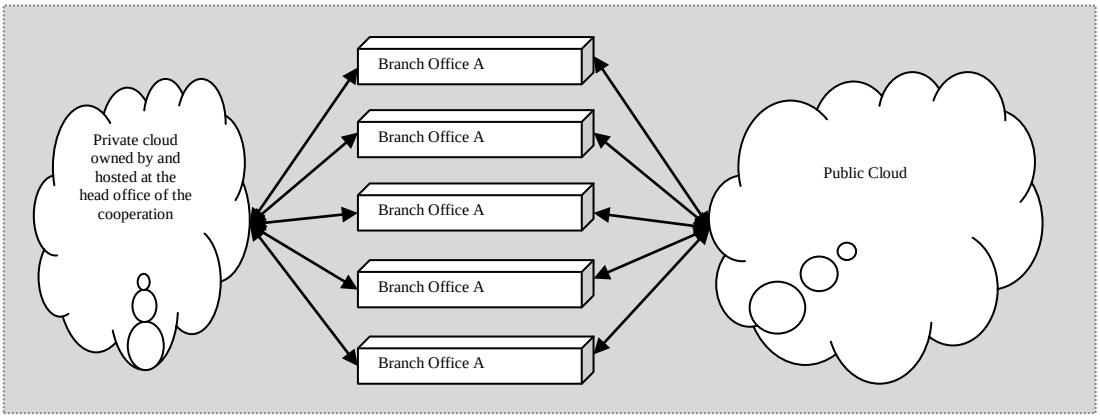

Figure 4: architecture of hybrid cloud based solution

4. Advantages and Challenges of Cloud Computing based Solution

Cloud computing based IT solution for organizations with multiregional offices brought both advantages and challenges. The advantages are as follows:

I. Cloud computing provides organizations with more agile solutions to meet their IT needs. With cloud computing, they can quickly get the IT services needed to run their business. This is especially suitable for new business with a brilliant but risky adventure. Because the new business idea is brilliant, they need to get the idea tested as soon as possible before it is stolen by competitors; because it is a risky adventure, it is very likely to fail. By subscribing CIT services available from the public cloud, they could avoid big loss in CIT infrastructure investment (Cohen 2004).

II. By subscribing services from a third-party, an organization can save money on capital investment. It can also save on maintenance because the CIT infrastructure is owned and maintained by the third-party.

III. Compared to CIT infrastructure developed from scratch, cloud computing based solutions can be more reliable by subscribing well established computing and information technology services provided by trusted third-parties (Stantchev 2009).

IV. Because additional CIT services can be easily subscribed from providers in the cloud, a cloud computing based IT solution can be more scalable. It can also be more easily scale down if necessary, because unsubscribing unneeded services are usually less painful than disposing some expensive CIT equipments (Buyya 2009, Brandic 2009).

V. Generally speaking for the entire IT industry, cloud computing provide better IT solutions to utilize IT infrastructure and equipments, as these often expensive infrastructure and equipments can now be shared among more users. This also means the overall power consumption will be lower, and hence the carbon footprint will be smaller. So, it is good for the environment too (Buyya 2008).

VI. In cloud computing based solutions, because important data centers and servers are often owned and managed by big well established companies who usually have much better expertises and resources to secure their equipments and services, cloud computing based solutions are often secure in this regard (Stantchev 2009).

There are few challenges or concerns surrounding could computing based IT solutions. There challenges or concerns are:

I. The operational costs may be high. We mentioned that the capital cost can be much lower when a cloud computing based solution is chosen. However, its operational cost may be higher than running its own CIT infrastructure because it may be required to pay big money for the subscribed services. This all depends on the relationships and contract between the organization and the services provider or providers (Li 2009).

II. Reliability may be questionable if the CIT services provided in the cloud are not carefully chosen. In theory, a cloud computing based IT solution should provide reliable CIT services if the providers are carefully chosen. There are two factors that may cause the CIT services obtained from cloud computing unreliable. These factors include:

    a. Unpredictable failure of network external to the organization. Since those portions of network are not under control of the organization, it cannot really do anything to avoid such failure, or to ensure a quick recovery once such a failure has occurred.
    b. Services broken down at the service provider. It is very important to choose a reliable and trusted service provider. Even if this has been done, there is still no guarantee as things may change over time. The provider may have gone bankrupt; it might be sold to another party which is unfamiliar or even hostile to the subscriber. The original owner of the service provider may turn to be unfriendly for some reasons.

III. In a cloud computing based solution, the security of data and subscribed CIT services are in third-parties' hand. They care secure only if the third parties are doing their good job. However, even if great effort has been taken in choosing the service providers, security may still be a problem fir the following reasons (Pearson 2009, Kaufman 2009, Kandukuri 2009):

    a. They may be an oversight when evaluating the security measures implemented at the service providers;

    b. There may be new threats that the service providers are unprepared for. If the providers do not implement anti-threat measures in time and effectively, the security of the data and CIT services may be at great risk;

    c. The service providers may change their security practice or even side (due to pressure from the top, for example).

    d. Because in a cloud computing based solution, users access data and subscribed services through the Internet, security breach may occur during transmission between users and the service providers.

5. Conclusions

Cloud computing brings us both opportunities and challenges. With the advancement of computer and network technologies, more reliable and powerful computing and information technology services have become available on the Internet, and high speed reliable internet access to these services is becoming a reality for many users in the world.

Therefore, it is possible for organizations with multiregional branch offices to get the needed computing and information technology services through cloud computing.

In this paper, we presented four cloud computing based solutions: private cloud based, federated cloud based, public cloud based, and hybrid cloud based. The subtle differences between these solutions, as shown in the figures, are important because they have crucial impact to the details of implementation and even administration, including accounting and security management. For example, in the private or federated cloud computing based solutions, the accounting can be simple because there is no external body involved, but the system administration may be heavy especially in the case of federated cloud computing because of the equipments and services are distributed amongst the branch offices. This may increase the complexity of the entire system. In case of public cloud computing based solution, the organization may have less to do in security, but the accounting will have to consider the operational cost of subscribed CIT services.

We also pointed out in this paper some advantages of using cloud computing based solutions, as well as some issues. It is important for an organization to carefully study both these advantages and issues when considering a cloud computing based solution for its needs.

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