

A CASE STUDY ON ADOPTION AND APPLICATION OF ENTERPRISE-WIDE CLOUD COMPUTING BY AN IT SERVICE PROVIDER: LG CNS

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ABSTRACT

With continuous advancement of network technology and computing resources, most businesses and organizations persistently make investment in IT infrastructure to maximize management efficiency and to boost their competitiveness. Since the mid-2000s, cloud computing has emerged as an important topic of corporate management, because it has the potential to completely replace the existing paradigm of corporate IT by providing customers with resources of high scalability as a service. LG CNS, a system integration company, is the first company that has successfully adopted and applied cloud computing at enterprise-scale in Korea. Introducing the entire process of adoption of cloud computing in LG CNS, we present its impact and future outlook.

INTRODUCTION

With continuous advancement of network technology and high-fidelity computing resources, most of businesses and organizations using information technology persistently make investment in IT infra to maximize management efficiency and to boost competitiveness. In the same vein, cloud computing has emerged since the mid-2000s as a major trend of IT for further cost reduction, efficiency, safety and security. Cloud computing refers to a delivery of computing resources including computer use, software application, data access and management and storage as a service via networks without the knowledge of specific location of infra including in-house computing resources or other specific items.

Although cloud computing technology has emerged as an important topic in business management since the mid-2000s, the basic idea was conceived earlier when a narrow scope of network computing as a set of mainframes and dummy terminals was used. The concept of computing by leasing via networks without owning high-performance computing resources is not new in itself. However, with the rapid advance of mass data transmission technology, virtualization technology and better infra performance, high-performance computing service based on expansive network infra has become available.

LG CNS is one of the enterprises that adopted cloud computing most actively in South Korea. LG CNS is a total IT service provider considered one of the top 3 system integration company in Korea. Notably, LG CNS was the first large enterprise with more than 1,000 employees to adopt a server-based enterprise-wide cloud computing back in 2010.

Even today, when cloud computing is pervasively used in overall corporate business processes, a large-scale enterprise-wide adoption of cloud computing is rare. In 2009, Gartner foresaw that approximately 60% of enterprises would adopt enterprise-wide cloud computing by 2012 [3]. Still, such a rapid growth of cloud computing in business has not come into sight. Yet, as the electricity revolution in the past,

adoption of cloud computing is part of an inevitably massive change, and ultimately leads to a chain of auto-reactions as a catalyst accelerating the commoditization of corporate IT resources without doubt. The commoditization of IT resources will change the aspects of corporate investments in IT [2]. Accordingly, this case study is to suggest one of the best practices of adopting and applying cloud computing.

UNDERSTANDING CLOUD COMPUTING

1. What is cloud computing?

Cloud computing is one of the hottest topics in the field of IT and business management. It is often defined differently by users and technical solution providers in the market, and thus the concept is very loosely applied. To clearly define the cloud computing, it is necessary to refer to existing definitions. In 2008, a study reported that as many as 22 definitions of cloud computing were casually in use [5]. IT research and advisory firm, Gartner defined cloud computing as ‘a form of computing that uses the internet technology to provide customers with resources of high scalability as a service’ [3]. Among multiple definitions of cloud computing, one established by the NIST (National Institute of Standard and Technology) states that ‘(cloud computing is) a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction’ [4].

This study follows the most commonly used definition established by the NIST. It should be noted that the definition of cloud computing by the NIST is not a fixed concept but an evolving paradigm. Differently put, cloud computing is not technically complete but is evolving in line with emerging service models and practical application models being developed. According to the NIST’s definition, cloud computing services are largely classified into three models: SaaS (software as a service), PaaS (platform as a service) and IaaS (infrastructure as a service).

Another important criterion to classify cloud computing services is whether certain services are provided for selective businesses. A public cloud refers to a pay-as-you-go service available to anyone, whereas a private cloud is a service made for a specific company. For public cloud, cloud service providers directly manage and design the cloud infra while users use the service for a relatively low price. By contrast, private cloud is relatively more expensive as it is built for a specific company. However, private cloud has advantages in terms of security, easier control and customization for user needs.

2. Implications for corporate management

Cloud computing enables businesses to lease all of the computing resources including hardware and software, storing information in service provider’s data center, and paying the fees as used. Cloud computing more or less invariably ensures 5 features: broad network access, rapid elasticity in IT resource provision, measured service, on-demand service and resource pooling.

Such attributes of cloud computing drive a significant paradigm shift in corporate management and IT resource application. In the past, most companies used to own all IT resources, so they had to make considerable investment to effectively use their own IT resources. Rapid advancement and innovation in IT facilitated the obsolescence of their legacy IT resources, leading to inefficient IT investment irrespective of availability. In contrast, today’s cloud computing has emerged as an alternative to eliminate such inefficiencies in IT investment.

In addition to the benefits of corporate investment in IT resources, cloud computing has many advantages: rapid scalability, efficient configuration/arrangement of IT resources, cost reduction in

maintenance and upgrade, elastic, flexible and effective resource use, increase in collaboration capability, eco-friendly computing and higher disaster recovery capability [6]. Also, cloud computing presents a distinct utility business model. It enables rapid innovation of countless applications and business models as well as the simple plug-and-play as electricity [1]. These advantages warrant the cloud computing as a potential technology to replace the existing corporate IT paradigm. While few companies have adopted such advantageous cloud computing in Korea, LG CNS has successfully adopted a server-based cloud computing environment enterprise-wide.

LG CNS' ADOPTION OF CLOUD COMPUTING

1. LG CNS: Overview

Established in 1987, LG CNS started its business as a total IT service provider. In the early stage, the company mainly took care of IT asset management and system integration for the businesses affiliated with LG Group. In 1995, the company renamed itself LG-EDS, which successfully carried out major projects such as the national administration network for tax integration system and the Supreme Court Register Network. Since 2002, the company has been renamed LG CNS, which has carried out government/public projects such as the Government for Citizen (G4C) system, Korea Train express (KTX) integrated information system, Korea Post service system (PostNet) and Korean Intellectual Property Office (KIPO) patent-net system, as well as a range of other corporate system integration and establishment and maintenance projects for financial, manufacturing, logistics and communication companies.

Major projects carried out by LG CNS in public and financial sectors won CMM Level 5 certification, recognizing technological performance. In 2004, the company built the T-Money transportation system for Seoul and attained service innovation in the field of public transportation. Especially, the T-Money system is renowned worldwide as the best practice, contributing to LG CNS being selected as the main contractor for the automated fare collection (AFC) and bus management system (BMS) projects by the City of Bogota in Columbia in 2011.

Since its early stage, LG CNS has operated consulting business division for core competency of system integration/maintenance(SI/SM), and performed an array of other business service activities such as IT outsourcing, business process outsourcing, ERP/BI, IT infra solution and IT convergence. Considering the company started its business as an IT system integration provider, such expansive moves in service are regarded to be quite successful. Successful cases in each area of IT serve as targets of benchmarking in respect to solution sharing and resource applicability.

Currently, LG CNS is particularly focused on expanding overseas business and establishing new business models because the company's existing core competency, that is, the domestic SI/SM market has already entered the red ocean since large enterprises are faced with policies setting a limit on vendors for public projects. LG CNS runs 8 overseas corporations, performs global projects and directly obtains invoices for overseas projects while supporting affiliates as it did in the early stage. The company has persistently developed new business models since the mid-2000s, focusing on several IT convergence projects including u-City, health care, solar energy electric power generation system and digital marketing.

2. The adoption of cloud computing

LG CNS planned to adopt corporate cloud computing in August 2008. Earlier on, cloud computing technology had been considered to have great potential to influence future IT business. Claiming to be a total IT service provider, LG CNS prepared a long-term road map to develop and implement the

potential of cloud computing technology. With occasional occurrence of critical information security issues, the IT service provider found it necessary to block corporate information leakage via a new concept of IT work environment.

Although demands for information security may vary depending on clients' SI projects, LG CNS employees participating in projects used to store and manage important corporate information in their laptops/PCs as files. They often had to access the files outside the workplace and normally accessed the corporate development server from their portable laptops by applying for separate authorization to get onto virtual private networks. They were not able to solve information security issues even though they kept critical information from leakage by partially restricting the use of portable external storage devices.

Subsequently, as a measure to block corporate information leakage, they came up with SBC (server-based computing). VDI (virtual desktop infrastructure)-based SBC refers to a computing environment where all software and data necessary for business processes are installed in a virtual desktop space on the network server and remotely accessed for work processing. SBC users can use an array of applications and data in the present virtual desktop just as in personal PC environment as long as they can access the server via a given network.

VDI technology is sometimes compared with desktop virtualization technology. However, VDI and VM (virtual machine) concepts differ from each other in terms of installing and hosting a virtual PC environment on a network server or user's local PC. VDI-based SBC had already been used abroad by small-scale work groups or organizations valuing security. As leaders in desktop virtualization, VMware and Citrix were providing solutions, when LG CNS began to analyze ROI and IT infra change management by organizing a task force in August 2008 and conducting a pilot test prior to adopting enterprise-wide SBC. Ultimately, the project's main requirement was to provide VDI solution for the PC environment that individual employees in LG CNS were to use.

The most important aspect considered in the initial analysis was related to the performance of cloud. Also, different equipment needed compatibility, for which infra equipment underwent performance comparison testing before the selection of a solution. The performance of diverse combinations of equipment was compared with the help of corporate infra department. As such, the server, storage and network equipment constituting the cloud computing infra were decided, and finally Citrix's desktop virtualization solution was selected. The performance issue continued in the implementation process. Initially selected storage equipment did not achieve the maximum performance as expected, and this problem was not solved till the opening of cloud computing. Unexpected problems regarding equipment combination continued to arise in the implementation stage. The equipments were replaced before the final opening, and thus tuning for the new equipment was finalized.

It was December 2008 when the first corporate SBC environment was provided inside LG CNS. Prior to the final decision of adopting enterprise-wide cloud computing, 1st pilot test proceeded in the proposal room in the headquarters. LG CNS' proposal room occupied a whole floor with multiple rooms where employees made proposals for different projects. When making a proposal, confidential corporate information such as bidding price and customer information related to projects were used, which required the highest level of security. Since minimum number of employees were allowed to enter each proposal room which was cut off from the outside world, the space was considered suitable for the pilot test of SBC environment.

Once the management made a decision in April 2009, a second pilot test was performed with few organizations in charge of development and operation associated with system integration & system management. During the period of the pilot testing, security effects and technical feasibility were

analyzed. Furthermore, to establish an optimal architecture, feedbacks from actual users regarding their experiences were collected and reflected. Foremost, tuning between the solution and the infra were carried out as well.

Following these efforts, the pilot testing was successfully completed. Once the executives made a final decision, a project was formed to adopt the enterprise-wide cloud computing. About 30 people participated in this project, and developed a tight schedule for opening during the first half in 2010. The CEO notified of specific goals, necessities and adoption schedule regarding the project via email. Moreover, the CEO continued to make efforts to enhance employees' understanding of the newly adopted cloud computing work environment by posting notices and by encouraging employees to use Q&As.

At first, employees showed more or less mixed responses. A few voices of concern over security control issues were raised especially in case of carrying out projects outside the company on the grounds that customer information was held in the cloud storage. Also, some complained about having to use lower-spec netbook PCs instead of the existing laptop PCs to access the cloud for work processing. On the other hand, employees showed positive responses overall in that they would be able to carry out works wherever they could access the network.

Positive effects expected in the initial stage of adopting the corporate cloud computing included convenience, economic feasibility and security. First, regarding convenience, employees could work regardless of terminal types and places, which were expected to make smart work universal. The smart work has spread faster thanks to smartphones, increasing both mobility and ubiquity. Second, with respect to cost reduction from the perspective of economic feasibility, investment cost for IT resources for the same period before the adoption of cloud computing was expected to be lower. Third, in terms of security, SBC was expected to prevent critical corporate information from leakage and to facilitate security risk management including hacking and worm. Especially, as strengthening security had been set as the overarching goal since the planning stage for the SBC adoption, security effects were highly expected.

After a long period of projects, in February 2010, the enterprise-wide SBC was first launched to the employees in the headquarters. By the end of 2010, the SBC work environment became available to employees stationed in client companies and those in suppliers. LG CNS invested approximately 15-billion Won to adopt the corporate cloud computing, 700-plus servers, 1.4-Petabyte large-scale storage, network equipment and software. The infra supporting the SBC was installed in the IT center. The number of employees who switched to the SBC environment was about 10,000 including those working for suppliers.

SINCE THE ADOPTION OF CLOUD COMPUTING

Initially, employees' responses to the enterprise-wide cloud computing were affirmative. As in most of organizations, some resisted the change. Others felt uncomfortable about privacy information being kept in the corporate cloud storage with the possibility of leakage or surveillance as well as switching to a new PC environment. Still others complained about the lower-spec netbooks replacing the high-performance laptops. To deal with those issues as part of the SBC adoption project, specific guidelines and options for the terminals provided for individuals were presented.

In early days of the enterprise-wide adoption, some unexpected problems arose. For example, simultaneous updates of software installed in each SBC personal environment caused overloads on the server and network, leading to connection problems such as slow-down or SBC access failure. LG CNS failed to consider such overloads. Soon, the project team solved the problem through appointment

scheduling management and architecture optimization. Also, as personal PC environment was operated on the server, problems arose on internet banking web sites where installation of independent security tools was required. Some applications were not installable or encountered errors. The project team posted FAQs and solved such problems with swift responses and improvements.

Cloud computing proved effective over time. First, prior to SBC adoption, enterprise-wide monitoring over information leakage had been uncertain, but no information leakage has occurred within SBC. In addition, no interference occurred between the data stored in local PC and the data in the cloud storage, enabling independent management. Second, user convenience was greatly improved. Consistent and stable work environment became available to highly mobile employees using diverse devices including smartphones. As the SBC was applied to suppliers as well, the efficiency of collaboration increased by sharing the same work environment. Third, as for economic profitability, about 29-percent cost reduction was reported in comparison to the existing practices. Still, enabling centralized control/management over IT resources that were formerly distributed led LG CNS management to optimize distribution of resources. Foremost, efficient power control in its IT center, where the cloud infra was installed was conducive with the global trend of eco-friendly green IT.

Since the adoption of corporate SBC, LG CNS became confident of cloud computing service based on its experience and decided to run relevant businesses. In February 2011, the company released an enterprise public cloud service and supported LG Group's affiliates and other companies with their adoption of cloud computing. In addition to the current data centers, the company plans to build another cloud data center. In July 2012, the company released a personal cloud PC service for the first time in Korea and has been running a beta service.

CONCLUSION

LG CNS was the first large enterprise with more than 1,000 employees to adopt a server-based enterprise-wide cloud computing. Likewise, Citrix never carried out an enterprise-wide application of its desktop virtualization technology as the core solution for SBC for such a large-scale business. Nevertheless, as the project proved successful with seamless operation up until now, this case has become a good reference, exerting great influence on SBC adoption by other IT and financial institutions.

The effects of LG CNS' corporate cloud computing were beyond expectations. Yet, cases of enterprise-wide adoption of cloud computing as in LG CNS are far from increasing. This is attributable to the possibility that investments in cloud computing may not lead to an immediate cost reduction and that changes in work environment lack assurance of successful implementation. Some LG CNS' clients are anxious about critical corporate information being held in external cloud storage. Most of all, clients need to see evidence of return on investment.

Nonetheless, cloud computing is a significant IT trend in this age. The virtual PC environment of cloud service is likely to replace current personal PC environment from a long-term point of view. Certainly, not all PCs including laptops are likely to be replaced. Still, growing interest in cloud computing and increasing numbers of users over the past few years shed light on future prospects. In that respect, LG CNS' adoption of cloud computing will remain a good reference case as a stepping stone for foreseeing and preparing for future IT environment.

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REFERENCES

Complete list of references are available upon request.