

Cloud Computing Architecture and Standards in E-Commerce

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Abstract

“Cloud Computing” which is a buzzword nowadays is applied to many industries at present. For instance, there has been a new trend for e-commerce companies to adopt Cloud Computing. Most organizations are attracted by Cloud computing because Cloud can save time and money for them in investing in IT infrastructure. There is no doubt that this may be the biggest benefit brought by Cloud computing, but Cloud computing also brings a number of other benefits. For e-commerce companies, Cloud Computing provides some specific benefits. For example, it is quite important for e-commerce companies to keep their customers information secure. Cloud Computing helps to improve the security performance in e-commerce by providing a safer way to store the information. This paper will present other benefits that offered to e-commerce companies by Cloud Computing. Although Cloud Computing can bring lots of opportunities for e-commerce companies, there still have some issues that should be paid attention to before moving to it. For examples, there is no unified Cloud standards yet which may cause trouble to use Cloud Computing; the quality of Cloud service cannot be guaranteed; migration effort should be considered, etc. These issues will be discussed in this paper.

Keywords - Cloud Computing, Cloud Providers, PEST Analysis, Distributed System, Resource Allocation, Virtual Machine, Hybrid Cloud.

I. INTRODUCTION

A. Definition of Cloud Computing

Although this concept has been proposed for years, there is no standard definition for it yet. Different people hold different opinions about Cloud Computing. Thus, many definitions have been suggested from various perspectives. “A Cloud is a type of parallel and distributed system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements established through negotiation between the service provider and consumers.”[1] This definition sees Cloud as a type of

system, but some other people treat Cloud as resources. Another definition defined Cloud as a large pool of easily usable and accessible virtualized resources which could be hardware, development platforms and/or services. All of these resources can be reconfigured to adjust to a variable load dynamically, allowing also for optimum resource utilization [2].

B. Cloud Architecture

In terms of Cloud Architecture, there are also multiple versions of definition. Foster proposed the four-layer architecture for Cloud in comparison to Grid (Fig 1). From bottom up, there are fabric layer, unified resource layer, platform layer and application layer. The fabric layer contains the raw hardware level resources. The unified resources layer contains abstracted/encapsulated resources so that they can be exposed to upper layer and end users as integrated resources. The platform layer provides a development and/or deployment platform by adding on a collection of specialized tools, middleware and services on the top of the unified resources. Application layer contains the applications which run in the Clouds [3].

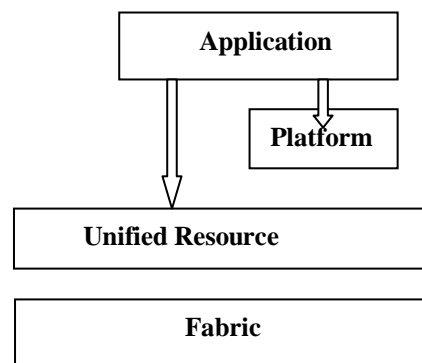


Fig 1: Four-Layer Architecture for Cloud Computing.

C. Cloud Models

There is no doubt that Cloud works for many use cases, but, not all the Cloud is the same. There are three principal ways Cloud services can be delivered: public Cloud, private Cloud and Hybrid Cloud [4].

□ Public Cloud

A Public Cloud is a service delivery model which provides massively scalable IT resources available to the general public through the Internet. It is usually based on a usage-based model. Amazon EC2, Google App Engine and Force.com are best known examples of public Cloud service providers.

□ Private Cloud

In contrast, Private Cloud represents a deployment model that offer Cloud service to the internal users within the corporate network. It is relatively secure compare with Public Cloud. But meanwhile, it brings another problem: capital to build Private Cloud.

□ Hybrid Cloud

Hybrid Cloud is a composition of public and private cloud. Organizations provide and manage some resources in-house and at the same time, have others provided externally. It allows a business to take advantages both of public cloud and private cloud. Thus, Hybrid Cloud is considered as the next wave in Cloud Computing.

II. CLOUD STANDARDS

To standardize Cloud Computing, in theory, we have to implement standardization at every level. There are several standards, including existing and under development ones, are released by different organizations, such as, Open Virtualization Format (OVF), X.509, WS* Standards and Common Assurance Maturity Model (CMM). Since both Cloud and E-commerce have security problems, standards that relevant to security seem to be more important. CSA (Cloud Security Alliance)[5] and the IEEE (Institute of Electrical and Electronics Engineers)[6] conducted a survey about the need for Cloud security standards. 93% respondents thought that security standards for Cloud are important, and 82% of them said the need is urgent.

III. E-COMMERCE

A. Definition of E-commerce

The concept “e-commerce” first appeared in the late 1970’s. It was originally used to describe the process of conducting business transactions electronically using technology from EDI (Electronic Data Interchange) and EFT (Electronic Funds Transfer) [7]. Many people consider “e-commerce” and “e-business” as the same thing. In fact, this is a common misunderstanding. E-commerce, in some sense, can be regarded as part of e-business which only deals with the transactions and selling products online. It refers to

all electronically mediated transactions between organizations and any third party [8].

B. Categories of E-commerce

When talking about categories of e-commerce, there is a common opinion that shared by people in the industry. This opinion holds that, e-commerce can be broken into four major categories: business-to-business (B2B), business-to-consumer (B2C), consumer-to-business (C2B) and consumer-to-consumer (C2C).

Business-to-Business (B2B) e-commerce refers to electronic transactions between businesses.

Business-to-Consumer (B2C) companies tend to sell directly to consumers while consumer-to-business e-commerce involves people selling products and services to businesses. Amazon.com is a typical business-to-consumer company.

Consumer-to-Consumer (C2C) refers to business transactions between users, for instance, consumers selling products to other consumers via Internet[9]. eBay and Taobao provide the platform for consumer-to-consumer e-commerce.

C. Benefits of E-commerce

E-commerce has changed the way of shopping. E-commerce activity is distributed by nature. Buyers and sellers can do e-commerce at anytime from anywhere with a computer which is connected to the Internet. It is attractive to both customers and businesses, and, even to the society. The report will address these benefits for consumer, business and society respectively.

a). Benefits to Businesses

- E-commerce provides an international marketplace for businesses. With e-commerce, businesses have access to people all over the world.
- E-commerce saves operation cost for businesses because the cost of storing, processing, distributing and telecommunication has been decreased.
- The pull-type processing of e-commerce allows for products and services to be customized according to the customer’s requirements.

b). Benefits to Consumers

E-commerce offers buyers maximum convenience. E-commerce alters the relative importance of time. Customers can visit multiple vendors from around the global online, compare prices and make purchases without leaving their houses or offices at any time.

c). Benefits to society

Society can also benefit from e-commerce from the following perspectives.

- As e-commerce allowing people working at home, it enhances the quality of life for people in the society.
- People in rural areas are enabled to access and enjoy products, services and information by e-commerce.
- E-commerce facilitates the delivery of public services such as health services. It is popular to consult doctors or nurses online nowadays.

IV. CLOUD COMPUTING IN E-COMMERCE

Cloud Computing and e-commerce are two buzzwords nowadays. They are popular because both of them are cost-effective. Cloud Computing saves organizations the cost of IT infrastructure while e-commerce allows merchants to do business without renting or buying an entity shop. At present, more and more e-commerce companies moves to Cloud. Cloud provides positive opportunities for e-commerce, but before adopting it, companies should have a trade-off. This chapter will focus on investigating the intersection of Cloud Computing and e-commerce. It should be stated here, since this report aims to discuss about the relationship between Cloud Computing and e-commerce, the “customer”, “consumer”, “user”.

A. PEST analysis for E-commerce industry

PEST analysis is used to examine how political, economic, sociological and technological factors affect an organization or an industry[10]. It is a useful tool to aid environment analysis.

a). Political

- Support from government. EU encourages the developing of e-commerce.
- General office of the State Council of China has released a series of documents to accelerate the developing of e-commerce these years.

b). Economic

The rapid growth of the world economy accelerates the developing of online transaction. The increase of average income enables more and more people to access to computers and the Internet.

- The reduction of hardware and software costs.
- Cost of access to telecommunications infrastructure is reduced.

WORLD INTERNET USAGE AND POPULATION STATISTICS						
March 31, 2011						
World Regions	Population (2011 Est.)	Internet Users Dec. 31, 2000	Internet Users Latest Data	Penetration (% Population)	Growth 2000-2011	Users % of Table
Africa	1,037,524,058	4,514,400	118,609,620	11.4 %	2,527.4 %	5.7 %
Asia	3,879,740,877	114,304,000	922,329,554	23.8 %	706.9 %	44.0 %
Europe	816,426,346	105,096,093	476,213,935	58.3 %	353.1 %	22.7 %
Middle East	216,258,843	3,284,800	68,553,666	31.7 %	1,987.0 %	3.3 %
North America	347,394,870	108,096,800	272,066,000	78.3 %	151.7 %	13.0 %
Latin America / Carib.	597,283,165	18,068,919	215,939,400	36.2 %	1,037.4 %	10.3 %
Oceania / Australia	35,426,995	7,620,480	21,293,830	60.1 %	179.4 %	1.0 %
WORLD TOTAL	6,930,955,154	360,985,492	2,095,006,005	30.2 %	480.4 %	100.0 %

Fig 2: World Internet users and population statistics.

c). Sociological

- Online shopping is becoming a new trend as it is more convenient comparing to traditional shopping.
- The level of education and IT skills of consumers have been improved. Especially in the developing countries like China, the education of IT skills has been improved greatly in recent years.
- User’s willingness and ability to adopt new technology.

d). Technological

- The developing of telecommunications infrastructure accelerates the development of e-commerce industry.
- The rapid developing of graphical design technology enables website developers to design more attractive and user-friendly websites for customers.
- The information security technologies are developing fast.
- The advent of service oriented computing, Web services and Web 2.0 technologies.

V. Why Cloud?

Cloud computing gets more and more popular as it can be applied nearly everywhere: the libraries; the fire services; the small retailers which need secure e-commerce websites. When talking about beneficiaries of Cloud Computing, people always think of Cloud consumers. Actually, not only Cloud consumers including the organizations and end-users, but also Cloud providers can benefit from it.

A. Benefits for Cloud providers

- **Make money.** Profit is always the most attractive thing for business people. It shows a large company act as a Cloud provider could make a tidy profit when they leverage their economies of scale to offer a service.
- **Leverage existing investment.** Using existing idle IT infrastructure to provide Cloud service enable companies to have a new revenue stream. For example, Amazon and Google extended their private Clouds and offered to the public.

- **Defend a franchise.** Since many of enterprise applications begin to make use of Cloud Computing, vendors would be motivated to provide a Cloud option of their own if they already established franchise in those applications.
- **Leverage customer relationship.** Companies can get extensive customer relationship via their service offerings, including Cloud service.
- **Become a platform.** Sometimes, organizations want to provide Cloud service in order to become a platform. The indeed infrastructure provider of Facebook plug-in application is a Cloud provider called Joyent. And, Facebook's motivation was to make their application to be a new development platform.

B. Benefits for Cloud consumers

- **Pay as used.** Small companies do not need to invest in the initial IT infrastructure and maintain them if they adopt Cloud. They can simply pay as they used. In this way, companies can reduce the waste of underutilization.
- **Reduce operation cost.** Since Utility Computing uses virtual machine instead of physical machine, the work of hardware operation is shifted from Cloud consumers to Cloud providers. Organizations can reduce their operation cost in this way.

C. Benefits for end-users

End-users of Cloud service actually are the most important users. For the end-users of Cloud Computing, the incentives are similar to those motivating enterprises and organizations. They require easy-to-use interfaces, appropriately reliable and timely service delivery, information about their services, etc. With Cloud Computing, end-users can access and update information wherever they are, rather than having to run back to their offices. Moreover, Cloud Computing accomplishes a better response time than standard server and hardware in most cases.

D. Limitations of Cloud

Cloud Computing brings many opportunities for both Cloud providers and consumers, however, it has limitations. In terms of the limitations, we need to consider about different models of Cloud: Public Cloud, Private Cloud and Hybrid Cloud. The major limitations of them have been addressed earlier.

A. Benefits for Cloud consumers

Here, the Cloud consumers refer to companies and organizations that adopt Cloud Computing.

□ **Pay as used.** Small companies do not need to invest in the initial IT infrastructure and maintain them if they adopt Cloud. They can simply pay as they used. In this way, companies can reduce the waste of under utilization.

□ **Reduce operation cost.** Since Utility Computing uses virtual machine instead of physical machine, the work of hardware operation is shifted from Cloud consumers to Cloud providers. Organizations can reduce their operation cost in this way.

VI. CONCLUSION

This paper aims to investigate the relationship between Cloud Computing and Ecommerce. It looks at the background knowledge of Cloud Computing and Ecommerce first, and then a further discussion about how they related to each other is achieved. Finally, the evaluation part helps to evaluate the project. Overall, the minimum requirements are achieved to varying degrees. Some enhancements in addition to minimum requirement have been obtained as well. However, there still has big margin of improvement in future work.

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