Informatization Expectation with Cloud Computing in China

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1. Introduction
Cloud computing has been the most popular and promising concept in the new century with no doubt, which is the most important strategy filed to occupy for IT giants and is said to lead the 3rd IT revolution. However, it doesn’t derive from someone’s sudden whim or daydream. Success will come when conditions areripe, which is the same to Cloud Computing as a dream of IT workers all the while.

John McCarthy’s speech on 100 ceremony of MIT can be considered as a cornerstone of business pattern of Cloud Computing. He said that one day, computing should be arranged as an infrastructure just like telephone system. The foresight about future computer is not by accident to John McCarthy, which is regarded as the father of artificial intelligence. John Gage, the co-founder of SUN Microsystems, firstly proposed an idea that network is just the computer in 1983, which look like a prediction of the framework of cloud computing. The point of Bill Gates of 1989 that only 640K memory is enough for users seems to be a proper and inspiring description of cloud computing for user today.

While those great and even litter absurd ideas proposed, IT technologies were still rough and many requirements such as massive storage, Internet, hypertext protocol, and so on are unavailable or still immature. However, they couldn’t prevent those great ideas. Since Eric Emerson Schmidt firstly proposed “Cloud Computing”, the concept has become most fashionable and global commercial researches and application developments of cloud computing have been dominant in very short time. It is proposed and adopted widely because it contains all those ideas and reflect the long-run goal and idea of IT service.

2. Concept of Cloud Computing
At the beginning of computer age, expensive hardware makes the economic and centralized pattern dominant in informatization, with single host and multiple terminals. Moore’s
law witnesses a sharp decreasing cost. And then more and more distributed applications appear with hosts connected through networks. In order to low burden on hosts, some hosts turn to server which serve the other hosts named clients. Therefore, C/S application becomes popular in information systems. Web technology changed C/S to B/S because clients no longer need to install additional software to run an information system. Now, it seems to be back of the host-terminal age, the pattern with computing capacity and storage space centralized. It’s just transmigration or the negation of negation of IT development process.

It is not a new technology in essence. It derives from parallel computing, grid computing, distributed computing and virtualization. Or in other word, it is a new advanced mode of those technologies. It is a new concept after all, so there are many uncertainties in content, extension, and border like any other new concepts. Therefore, many differences and conflicts exist in definition, classification, and so on. Wikipedia defines that cloud computing is the delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a metered service over a network (typically the Internet). BAIĐU encyclopedias defines that cloud computing is a computing method based on the internet, which can provide shared information and resources of hardware and software to computer or other equipment according to need. M. Armbrust, A. Fox, R. Griffith et al 2009 said that it composes not only applications services on Internet, but also all software, hardware of data center and users use them by pay-per-use [1].

3. Characters of Cloud Computing

Obviously, definitions based on different industries, different roles and different angles differ much. People will change their viewpoint with progress of technology and deep in application. Actually, understanding of essence, contents, and characters should be the starting point of knowing what cloud computing is. As a concept deriving from and driving by enterprises, it will be the future of market. So, knowing what users’ need is to know what cloud computing would be.

Traditional parts of computer such as application, storage, and computing capacity and so on are available in cloud. Therefore terminal equipments can be more and thinner, which will turn to something like monitor, mouse and keyboard of future computer some day. And huge clouds will be the mainframe. Performance of content in the mainframe is the main index all the time, so the how much cloud computing substitute or exceed traditional mainframe is the key about if it will lead or dominant IT progresses and applications.

L. Peng concludes such character as safety and reliable as data center, convenient for use with low hardware requirement, easy to share between different devices, and provide almost infinite space and calculation capacity [16]. Main requirements of users are focused on serviceability, reliability, transparency, and portability. Why should users put their mainframes
on cloud? It must serve as local and even much better. There is a high request for network communication and clouds manage to put applications, files, calculating capacity on clouds. Personality, convenience, real-time performance, and security are naturally to be required from user and the key for market demand. It is not only cloud host with all the hardware and software to individual customers, but also cloud network and cloud server to enterprise customers, which could be a part of or the whole informatization. However, it means all resources integration on networks by mean of virtualization, grid computing, distribution, and load balancing etc to take great advantage of all resources and promote service of hardware and software constitutionally. This integration mode promotes service level and extends service scope, which therefore change the traditional IT business mode. Figure 1 shows what cloud computing could be in customers’ eyes and in cloud providers’ eyes.

4. Progresses of Cloud Computing

Since the concept of cloud computing was burn and practiced by Google in 2006, it has been a hot IT word internationally in very short time and introduced to business applications. Enterprises in different services or products, such as Google, Microsoft, HP, IBM, ALIBABA, RISING and so on, have made their own huge cloud plan, which provide a good growing environment and platform for cloud computing. It would land from sky soon, become the first choice of business application, and change traditional pattern of running and managing an enterprise. It mean that software and hardware on cloud can be used more efficiently, traditional and inherent physical barriers will be broke, and manufacturing and management of enterprise will be more automated and virtualized.

4.1. Abroad Progresses of Cloud Computing

Gartner, a famous international IT investigation institute, ever made great deal of investigations and researches on informatization investment with cloud computing for enterprises. It is said that 8 dollars per 10 dollars in IT investment are used in maintaining of existing system, not update; if outsourcing internal IT skeleton to cloud providers, it will save 80% cost which could turn financial cost to operation cost and save more budgets to research, sale and other kernel fields of enterprise. According to estimation of Merrill Lynch, total scale of cloud computing market will reach 95 billion in a few years, 12% of global total software market. From IDC’s data, expenditure on cloud services will be 42 billion in 2012.

Google opened the box of cloud age in 2006 and is the first practitioner in business. The framework of Google cloud computing compose three key technologies: distributed file system for massive data management, Google File System (GFS), Map/Reduce paralleling mechanism, and Big Table data management system, as well as cloud development service helping users construct their own applications. Blue Cloud of IBM is a system for small and medium enterprises distributing their calculation demands to global available network resources. Cloud hardware is managed through an open-source load allocation tool of Hadoop, which is based on Map/Reduce theory of Google. Small and medium enterprises could construct their own application with much low cost in infrastructure. Services of another giant in cloud computing, Amazon, are not related to applications, but frame services based on virtualization, such as storage, calculation, database management, and some other rentable services. Represented services are EC2 for calculation and S3 for storage. Users only pay for those basic service according to their demand and develop the other parts to construct their reliable, powerful and safety application with low cost. HP mainly pays attention to cloud services, connection among devices and software, related to its three strategies: cloud computing, networking, and software. The idea of HP is providing seamless, safe, and environment perceptible experience for the networked world. An entire cloud stack will be constructed to help customers step into the environment of mixed cloud, take great advantage of scale, reliability, and safety of current hardware, software, and services, and win great strategy value.

The government of US shows great support on cloud computing. Some officer declared that a demonstration project of cloud computing with massive cloud products or services of federal government would be constructed in or after 2010. The Japanese government started their cloud infrastructure plan, Kasumigaseki cloud, to improve efficiency and low cost of government running, which is planed to be finished in 2015. It was declared to set a special zone in Hokkaido or northeast, which would be the biggest database of Japan.
4.2. Domestic Progresses of Cloud Computing

More and more IT enterprises develop cloud computing in China as their primary task for the great potential. While visiting Beijing on 17th March 2008, CEO of Google announced they will start cloud computing plan in China formally and Tsinghua University is the first university of China to collaborate. Alisoft of Alibaba constructed the first cloud center of e-commerce in China with the co-operation of Nanjing government in Jiangsu province. On 10th May 2008, the first cloud center in China was put into operation at Science and Technology Industrial Park of Taihu metro, which is built by IBM in Wuxi. In July 2008, Rising motivates its security cloud plan, which connects users with cloud platform to form much huger Trojan virus with instant virus killing. Nseerglobal issued the first software in market in the begging of 2009, Nseer Cloud ERP System Services based on SaaS mode. UFIDA Software provides online software services for enterprise management based on future ERP business. Focus Technology provides complete online management solutions based B2B network services from CRM, MRP, to financial management.

Cloud businesses of domestic enterprises have covered system integration, platform, services and some others through rapid development of several years. Type integration enterprises are Teamsun, Neusoft, Baosight, Huawei, etc. Teamsun can provide complete reliable solutions from integration to Operation and maintenance of hardware and software, benefiting from good cooperation with Oracle, IBM and other international companies. Neusoft mainly focus on online management services, platform and system integration, arming at future ERP. Baosight serves with solution of cloud system integration based on its abundant experience of manufactory system integration. Huawei provides basic system framework and platform services making use of its technology and equipment advantages.

Platform suppliers include 21ViaNet, MDS Cloud, Yoyosys, LangCao Information, China Software Service, Foundertech, Alibaba, etc. 21ViaNet mainly provides infrastructure services of Internet; MDS Cloud focuses on massive data storage, backup and services; Yoyosys provides basic technology platform by their bottom components and applications; LangCao provides hardware platform based on PC servers; China Software mainly serve with system integration based on Linux OS with intellectual property, database, and middleware; Foundertech provides PC servers and content services for cloud computing; And Aliyun provides open API for e-commerce to construct platforms and services individually.

Service providers include 800app, ChinaNetCenter, China Mobile, China Telecom, etc. 800app mainly provide services and solutions based on PaaS automation management platform; ChinaNetCenter focuses on cloud platform of IDC/CDN and data center agency; China Mobile provides IT infrastructure construction services to enterprises based on mobile internet; and China Telecom focus on services with current calculation capacity and SaaS applications of mobile internet and internet of things.

We can see the trend clearly through search result diagram with key word of cloud computing in EI Village, the most popular academic database.

![Figure 2. Papers related to cloud computing in EI village](image)

It is obvious that more and more scholars joined in to study and research cloud computing on one side. On the other side, it is still not mature enough and there are many problems need to discuss and solve. International conferences sponsored by IEEE will be held every year since 2009. Chinese Electronics Society set the expert committee of cloud computing on 22nd May 2009 and held the first cloud computing conference of China.
As developers of kernel technologies in Google cloud computing plan, Jeffrey Dean and Sanjay Ghemawat are pioneers of cloud computing abroad. They developed Map/Reduce and BigTable, and join the development team of Google File System (GFS). Larry Page and Sergey Brin are developers of GFS, the key technology of data management in cloud computing of Google. Doug Cutting, the creator of Hadoop, laid the solid foundation of data management in popular and real application. Thanks to hard work and great contributions of these pioneers, cloud computing became the most promising field. Literatures about cloud computing informatization are reviewed in this paper especially.

5. Researches and Progresses of Cloud Computing Informatization

According to the latest development strategy of national informatization 2006-2020, informatization is the method to take advantage of information resource, promotes information communication and knowledge sharing, improves economy quality, and impels the process of society transformation. As the new trend of IT technology or business pattern, cloud computing is an important informatization method without doubt.

Many scholars discussed the validity, feasibility of cloud computing informatization. G. Wenxue thinks that enterprises can cooperate with professional IT companies on their informatization construction through cloud computing platform and win profits [18]. Enterprise will develop more proper SaaS software for their best knowledge of themselves. H. Qing regards cloud computing as cornerstone and main technology support of information management [5]. Y. Zhendong constructs an informatization application framework in network environment for small and medium-sized enterprises with guiding of Nolan model and gives some advice on cloud computing informatization, by value analysis of serving pattern of cloud computing [20]. It is concluded that cloud computing informatization can lower their threshold of cloud computing informatization and control risks of IT investment to gain high returns. Z. Qingbin and T. Dezhu realize that cloud computing framework is a valid and economic model to provide information, simplify IT management, promote innovation and improve capacity by real-time load balancing [19]. T. Yuan proposes an automatic supply plan of IT infrastructure based on private cloud IaaS service from his related studies [6]. Traditional IT studies, such as Mullally, McKelvey et al. and Yohanes, Handoko et al. may also be related works of cloud application, which are not focus of this paper [21, 25].

Many scholars discussed cloud computing informatization experiences or practices. Y Ge introduces a framework of cloud informatization with SOA for medical organizations [12]. X. Chao takes advantage of cloud computing technologies in rural informatization [7]. H. Xuemei propose a solution of coal enterprise informatization with cloud computing [8]. K. Yingshi, W. Jiyi and W. Haining suggest a solution of integrated information system of administration of coal mine Safety based on cloud computing to form a set of administrate system with 4 levels, nation, province, county, and enterprise [10]. Z. Yuan introduces cloud computing to construct informatization platform of port industry [22].

Cloud computing can help academy to share academic information, fulfill intelligent campus, and so on. C. Fengbing, W. Kaigui and W. Changze design a basic campus cloud computing system dealing with massive data [11]. They use Map/Reduce mode on Hadoop framework to cut cost and low difficulty of parallel programming. Y. Fei proposes a cloud computing solution to data center of some 211 university, including server resource virtualization, storage virtualization and cloud computing platform most importantly [13]. L. Qian integrates the resource pool of hardware in campus to allocate and balance dynamically, which improves usage of resource much [17]. She connects IT devices with physical devices to construct a real intelligent campus based on SOA, RFID, and internet of things and so on. L. Ben deploys complex experiment environment rapidly based on virtual infrastructure provided by cloud computing, which low training and management cost and expand training coverage [15]. C. Keyan applies cloud computing on online conference and file storage to provide a good platform for academic communication [24].

Telecoms operators may improve service quality, low cost, and promote construction of intelligent society by cloud computing. C. Ying constructs mobile ADC business platform based on cloud computing framework from the analysis of ADC business of china mobile, which could be a good reference of real practice [4]. Z. Haizhou proposes a basic process of management analysis according to characters of data structure and application of telecoms operators [23]. He
surveys cloud storage system suit for telecoms data analysis, discusses key technologies of parallel Ad-hoc query such as basic idea, meta-data, etc, studies parallel strategy of kernel components, and data mining algorithm realize on this platform.

There still are many other applications of cloud informatization. L. Fanmao discusses function requirements, network design, system planning, and data storage in detail of medical information system application based on cloud computing [14]. C. Honggang and X. Xia propose an information sharing system aiming at sharing problems of information in alliance of producing, studying and researching [9]. They refine reusable service entities from analysis of information interaction, design the realizing flow based on web-service, and integrate local applications and cloud services seamlessly with XML gateway programming. H. Qing discusses design ideas and methods for internet marketing platform of securities dealers based on cloud computing from view of software engineering [5]. M. Dongxia analyzes requirements of call-center management system with cloud computing in software engineering view, and fulfills a sample [3]. L. Mengjie studies resource service of enterprise cloud computing based on resource allocate and dispatch mechanism from Excalibur of Platform, and proposes some optimal suggestions to solve current limitations [2].

6. Conclusion and Expectation

There are two ways of implement cloud informatization, system integration and constructing from none. System integration is a feasible method with low cost to introduce cloud computing into enterprises, based on existing hardware, software platform, which could take great advantage of all resources in an enterprise. However, it is a method with much risk of existing software and hardware limitations, which is proportional to enterprise scale. According to the investigation report of McKinsey in 2009, cloud service is feasible to small and medium-sized enterprises but not for certain to giant enterprises unless technical, operational and financial obstacles are been overcome and essence of cloud services is been well understood. It is a good advice to managers, but not a negative judgment of cloud informatization of giant enterprises. Constructing from none could get ride of limitations of existing software and hardware and construct more long-run, optimal and global cloud service platform, but big budget and no good experience are most barriers.

In order to serve as water, electricity power and communication at last, cloud services providers should evolve like water supply enterprises, power suppliers and telecom operators to be large-scale, networked, and cross-districted. Special and professional cloud providers will appear to provide reliable, mature, and professional solution of informatization. By that time, scale effect will be more remarkable and polarization in informatization will be more obvious for the marginal cost. Giant enterprises with abundant funds and stable market position can use more budgets in cloud research and construction strategically to integrate all resources for transparent, real time, and fluent management. Cloud service will be embedded in their core competence. However, small and medium-sized enterprises have to pay more attention to production, sale, and profit to survive from brutal market competence, which could allow too much budget, devices and personnel for strategy purpose. In order to share great advantage of cloud services, they will be apt to buy cloud products from professional IT enterprises or giant enterprises to improve their management and promote their informatization process.

References