

FROM CLOUD TO MOBILE COMPUTING

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Abstract

In recent years, with the evolution in technology, high-speed Internet transmission, the new concept for computing was formed. It is the “Cloud Computing” which is defined as a computing platform over the Internet, associated with standard protocols for providing Web services. Today, the Clouds have transformed the way businesses and consumers interact over the Internet, data storage, and software. This trend keeps growing, estimated over 90% of businesses, educational institutes, organizations, etc... already use the clouds in some capacity [1]. Cloud computing and smart phone technology also open door for a new type mobile computing

Keywords

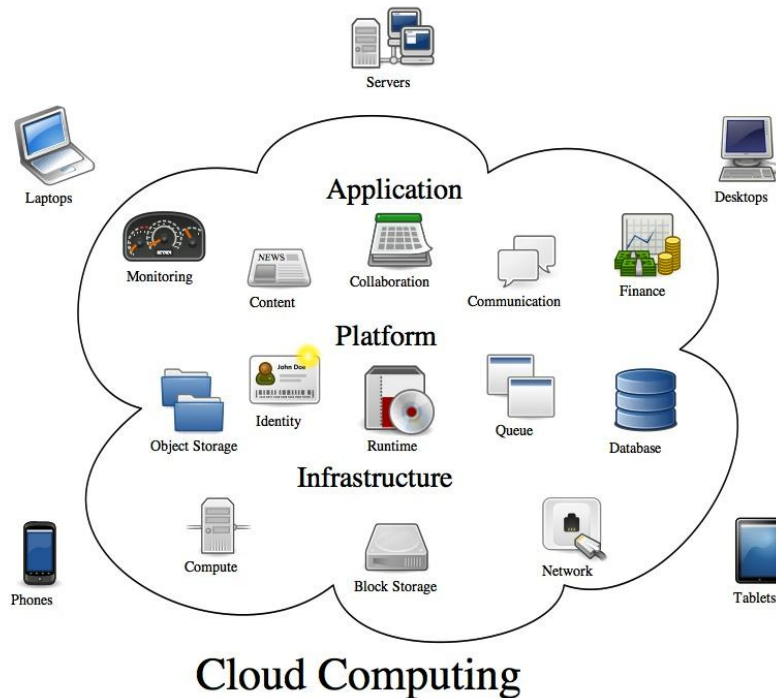
Cloud computing, Mobile computing, Internet, Web services, Android operating system, Android programming, iPhone operating system (iOS), Windows Phone OS.

I. INTRODUCTION TO CLOUD AND MOBILE COMPUTING

The most well-known company in computer industry IBM defines cloud computing as a service over the Internet and the delivery of computing resources, everything from software applications and data centers to consumers on a pay-for-use basis [2]. Depending on the services provided, clouds are divided into three categories:

- Infrastructure as a Service (IaaS), that offers data storage facility and computing resources for developers, IT firms use to deliver solutions to business customers.
- Platform as a Service (PaaS), that offers environments for IT firms to develop cloud-ready business applications.
- Software as a Service (SaaS) offers business applications to customers and businesses.

Mobile computing is defined as the interaction between human and computer, in which the computer is expected to be transported during normal usage. Mobile computing involves mobile communication, mobile hardware and mobile software that enable the transmission of voice, data, and video over the Internet [3].



II. CLOUD OPERATING SYSTEM

Cloud operating system is a simplified operating system that can run just a web browser. It provides access to variety web-based applications, allows users to do many simple tasks. Because of its simplicity, a cloud operating system is designed for PCs, Netbooks, and other mobile Internet access devices that are mainly used to browse the Internet. The users of the cloud might not be aware that the main cloud operating system is running in the background. This is the goal for any cloud operating systems.

A web browser combines with a simple, basic operating system will enable cloud computing, in which application software and data can be processed on the Internet instead on the hard drive. This concept is referred to users, customers as platform as a service (PaaS) and software as a service (SaaS).

A cloud operating system can be installed and used together with other operating systems, or as a standalone operating system by itself. This computing technology allows users to access to their own virtual desktop from anywhere around the world. The following are some examples of cloud operating systems:

- Glide OS 4.0: provides automatic file and application compatibility across devices and operating systems. Glide OS also provides Glide Sync App which helps users to synchronize files from home and work.
- Amoeba OS: is an advanced Online Operating System. Users can register for a free account and use the Amoeba applicationlike Shutterborg, Exstream, and Surf.

- MyGoya OS: is a free online operating system. Users can access their personal desktop from any Internet PC in the world that includes e-mail, filesharing, calendar, and instant messenger.
- Kohive OS: is an online desktop that allows users to collaborate with other. This cloud OS is good for freelancers, small business, students and groups with similar interest.
- Zimdesk OS: is your compute on the Web, the entire functionality of a PC-online. It is simple, nothing to install, only a web browser and the Internet connection are needed to access your desktop, files and frequently used applications. Users can access to their data, files anytime, anywhere in the world, and from any PC.
- Ghost OS: is one of the leader in cloud computing industry, specializing in cloud computing for the users. Ghost offers business and individual file storage and applications in the cloud to enable the security personal computing from other devices. Gosh interface is simple, easy to use, to manage files and folders. Ghost also offers full mobilesupport, users can browse through their cellular devices or USB flash drives [4].

III. CLOUD INNOVATION AND PERSPECTIVE

In the early 2000s, Scott McNally, who was the CEO of Sun Microsystems stated “We are living in the post PC’s era...” as a keynote speaker at a “Teaching and Learning” consortium in Anaheim, California. Sun Microsystems with experiences as a provider of servers, storages, networks and software took a perspective view and believed that cloud computing is the next generation of computing based on the network.

What is the different between cloud computing and previous computing models? It is using information technology as a service over a network, and is defined as services that are encapsulated with data, application software and available on the Internet. Generally speaking, efficiency is the basis for cloud computing. Applications can be built and deployed rapidly at an astonishing speed.

Cloud computing can be provided on-site using a firm data center’s own server, or by the cloud service provider that fully responsible of the infrastructure. This characteristic gives the user the illusion that the resources are unlimited, therefore cloud computing is expanding rapidly, taking over the information technology (IT) world like a storm. [5]

Today, giant companies like Google, Amazon, and Microsoft have extended their research, investigations toward cloud computing. The hottest trend in small businesses and enterprise IT industry is cloud computing. It represents a major shift in company technology infrastructure. This approach to IT relies on the network and the Internet which involves provision, dynamic, scalable, and virtual solutions.

Cloud computing can be viewed as an alternative solution for investing on company IT infrastructure and software. Similar to electrical and water utility services, cloud computing is considered as a utility for the service over the Internet, for computing and storage that the company uses. This reduces capital investments on IT, cut down the overhead of creating and maintaining company own data center [6].

III.1. TOP CLOUD COMPUTING VENDORS

Cloud computing could be the best solution to all IT problems! Data storage, file backups, hosting websites, etc... Some very big players already headed toward cloud arena. The following is a list of some giant cloud computing providers:

1. Amazon: has not only been the best in the business, but also is one of the pioneers in cloud computing. From the day Amazon started offering cloud computing services, it grew steady and delivered fantastic performance. Now, Amazon offers “White Glove” service, which provides help in routing clients to the closest possible specialist who can give the answer to a particular problem.
2. IBM: created Smart Business Test and Development Cloud is a success. IBM is well known in the world as one of the leader in the IT industry, its cloud business section alone last year earned 30 million.
3. Enki Consulting: is regarded as one of the best-managed cloud service provider in the world. Enki Consulting offers reliable and fast data centers based on unique billing model. Its unique way of managing data and content enable cheaper services to its clients and grab a good percentage of market-share.
4. Verizon: is a network provider. It started offering cloud services after acquiring a cloud service company Terremark for \$1.8 billion. And then, Verizon became the top network provider that can also offer cloud services, leaving behind rivals AT&T and Qwest.
5. Google: is the fastest growing cloud provider in the world, today. Most gaming and mobile companies are relying on Google’s cloud service. Google made a late entry into the cloud storage market by offering Google Drive in the first quarter of 2012. Google is well known to the world as the giant search engine, and with the new Google Compute Engine, it is challenging Amazon Web Service (AWS) as the leader in enterprise support.
6. Microsoft: entered the cloud computing service late and did not do very good during the early years. It came up with its Azure cloud services and acquired many companies [7]. Since the \$2 billion acquisition of SoftLayer, IBM has continued to make significant investments in building out a comprehensive cloud portfolio including \$1.2 billion to expand its global footprint to 40 data centers and \$1 billion investment to establish Bluemix, a cloud platform-as-a-service on Cloud Foundry, to help millions of developers[8].

III.2. CLOUD COMPUTING: ADVATAGES AND DISADVANTAGES

Today, cloud computing has provided computing, data processing facility for many businesses. It has many advantages over the old computing models and also there are some risks associated with cloud computing.

1. Cost: is the biggest, most important advantage. Cloud computing removes the capital cost of purchasing or leasing hardware, software on an internal system. It also save cost on operation and maintain from the pay-per-usage model.
2. Convenience: Cloud computing increases the mobility and freedom of employees and consultants. They don’t need to be located in a data center or data processing facility as long as they can access the Internet and the cloud.

Cloud computing also has some disadvantages associated with:

1. Cloud: is “everywhere (in the clouds)” nature also a risk, the users lose control over the software application and depending provider to maintain, update and manage it. If something goes wrong, Users (programmers) do not have direct access to the software system and have to count on the provider to fix the problem.
2. Privacy: is another risk. Using cloud provider, company’s confidential, sensitive data will be stored at a third party servers. If the provider does not have adequate security system to protect data, this could be a major problem with devastating effects, also might cause legal problems.
3. Cloud closure: There is a possibility that the cloud provider will run out of money and close its door forever. The more dependency to the cloud is the more devastating accompany will get.

Business owner should be careful when making the decision to move the company IT to the cloud-based system. All the potential cost saving along with associated risks should be evaluated [9].

IV. MOBILE COMPUTING

The evolution of cloud computing and wireless communication technology introduces a new kind of computing platform. Mobile computing is the ability to use high technology in a remote, non-static environment (everywhere). This new technology relies on battery powered, portable and wireless computing, communication devices such as: smart phones, iPads, computer tablets, and personal digital assistants (PDA).

- Portability: Mobile computing system should facilitate mobility, provides sufficient processing capability in a movable environment.
- Connectivity: This depends on the quality of the network. The network is expected to be maintained at a high level with minimal lag or downtime.
- Interactivity: Mobile devices are connected with each other for communication, collaboration through active transmission of data.
- Individuality: A mobile device or a node connected to a mobile network often used by an person, that serves individual needs.

V. MOBILE OPERATING SYSTEMS

With the current technology, smart phones also use operating system, and the operating systems which run on smart phones may represent true mobile operating systems. It is a platform that developers can build applications for smart phones. Today, the users of smart phones can do a lot more than “just talk” such as checking e-mails, shopping online, pay bills, and browse the web and the Internet for information needed, and much more...

There are some popular operating systems for mobile devices such as: Apple iOS, Google Android, and Microsoft’s Windows Phone OS.

- iOS: is from Apple, iOS is a multi-touch, multi-tasking operating system for Apple line of productions such as iPhone, iPad, and iPod. Apple also delivered a special version of operating system for its new line product Apple Watch. iOS allows users to tap on the screen to access an application, to zoom in and out an image, etc... Apple iOS is strict, not to be used with a third party systems. Users will only be able to use applications from Apple, and there are millions applications available from Apple store (App Store).
- Android OS: is a mobile operating system from Google and can be installed on many different devices. Android OS is an open source operating system that allows developers to access unlock hardware to build new applications. Because of its “open source” nature, Android is now the dominant operating system platform for smart phones. Android best features include allowing users to customize multiple home-screens easily with useful widgets and apps. Android application store (Play Store) also stores millions of applications, and many of them are completely free for users to download.
- Windows Phone OS: Microsoft Corporation released its revised Windows platform for mobile devices in late 2020, after it fell behind iOS and Android. This new version of mobile operating system was redesigned, rebuilt based on user experience and called Windows Phone OS. It is easy recognized because of its tile-based interface, and these tiles can be removed or interchanged. Windows Phone OS also has aggregators that group together pictures, or music from all applications. An example of this feature is pictures from Facebook can be found on Camera pictures [10].

VI. MOBILE COMPUTING ADVANTAGES AND DISADVANTAGES

Mobile computing is the current and maybe the future of the computing technology also associated with some advantages and disadvantages

VI.1. MOBILE COMPUTING: WHY IS IT WORTH?

Because of its “everywhere” nature, we may say cloud computing is the backbone for mobile computing or “Mobile Cloud Computing” is a combination of cloud computing with mobile applications. In this latest technology, data storage, data processing occurs outside the mobile device and the results are sent back, display on the screen and/or speaker of the mobile device. GPRS, Google Mail are pioneer examples of the mobile computing. In this context the terms “Mobile Computing” and “Mobile Cloud Computing” are interchanged.

Mobile computing offers mobile device users a number of advantages:

1. Cost saving: Company users can share resources and applications without high level expenditure on hardware, software resources.
2. Efficiency: Mobile device users do not need to be highly technical in order to use the applications as computing, processing are carried out in the cloud.
3. New applications: Mobile computing is regarded as the latest technology, therefore more new applications are being developed. One example of the application that allows users to watch home security system.

Developers also have advantages from mobile computing. The largest, most important benefit for the developers is that mobile computing allows them to have access to a larger market. Applications will go through a browser, the user's mobile device operating system does not have any impact on the application, therefore the users can use any mobile device with a suitable browser can have access to the application [11].

VI.2. LIMITATIONS

Like other technologies before, mobile computing contributes some benefits and also some limitations.

- Range / bandwidth: Mobile Internet access is somewhat slower than direct cable connections, even with 3G, 4G and the proposed 5G networks. These networks are only available within the range of the commercial cell phone towers.
- Security: This one is the biggest challenge. Security is a major concern for mobile computing. Users of mobile computing should be careful, hackers can easily attack the Virtual Private Network (VPN) through a huge number of networks interconnected. All cell phones are preferred targets of attacks from wireless telecommunication (WIFI).
- Power consumption: Mobile computing devices rely entirely on battery power, when power outlets or portable chargers are not available.
- Transmission interferences: Transmission of data over a network or the Internet can be effected by weather, terrain, and the range from the nearest signal point. Signal reception when using mobile devices in a tunnel, in some buildings, and rural areas is often poor.
- Potential health problems. People using mobile device like a cell phone when driving often distracted, and more likely involved in traffic accidents. Cell phone also interferes with sensitive medical devices and the question of mobile phone radiation and health has been raised. [12]

VII. CONCLUSION

It is very clear that cloud and mobile computing technology affect our lives, the way we do business, the way we do things on a daily basis. In cloud computing, resource computing is off-loaded to the cloud that could save the cost for any data processing centers.

Applications for mobile devices have exploded in recent years due to the increasing popularity of smart phones and tablet devices such as iPad. The growth in data centers has also elevated in cloud computing industry.

Amazon built Amazon Web Service(AWS) is one example of a giant company in cloud industry. AWS spans 53 availability zones within 18 geographic regions and 1 local region around the world. Amazon announced plans for 12 more availability zones and four more regions in Bahrain, Hong Kong Saudi Arabia Republic, Sweden, and a second AWS GovCloud (Government Cloud) region in the US [13].

How cloud and mobile computing affect business? The answer is that Google penetrates every layer of business. As of 2016, Google has nine data centers across North and South America, four in Europe and two in Asia and these numbers are increasing. Beside the most widespread Search Engine, Google offers many products and data storage such as Google Drive, Google Wallet which is a mobile application for wireless payment, and a lot more [14].

References:

- [1] <https://www.theamegroup.com/cloud-computing-advantages-disadvantages/> Downloaded 02/20/18 9:36pm
- [2] <http://www.ibm.com/cloud-computing/what-is-cloud-computing.html> downloaded 7/3/16 12:44pm
- [3] https://en.wikipedia.org/wiki/Mobile_computing downloaded 02/21/18 1:16pm
- [4] <http://www.tripwiremagazine.com/12-excellent-cloud-computing-operating-systems/>
Downloaded 03/03/18 6:15pm
- [5] “Introduction to Cloud Computing Architecture”, Sun Microsystems, White Paper, 1st Edition, June 2009, pp. 1-2
- [6] <http://www.esds.co.in/blog/basics-cloud-computing/> downloaded 11/07/11 19:35pm
- [7] https://www.lifewire.com/top-cloud-computing-vendors-3473553?utm_term=cloud+computing+ibm&utm_content=p1-main-1-title&utm_medium=sem&utm_source=msn_s&utm_campaign=adid-1a6cd79f-38e4-4f12-86e4-bd590a7863f5-0-ab_msb_ocode-6018&ad=semD&an=msn_s&am=broad&q=cloud+computing+ibm&o=6018&qsrc=999&l=sem&askid=1a6cd79f-38e4-4f12-86e4-bd590a7863f5-0-ab_msb downloaded 02/23/18 2:04pm
- [8] <https://www-03.ibm.com/press/us/en/pressrelease/45196.wss> downloaded 2/23/18 5:03pm
- [9] <https://www.theamegroup.com/cloud-computing-advantages-disadvantages/> downloaded 2/23/18 2:30pm
- [10] <https://www.uswitch.com/mobiles/guides/mobile-operating-systems/> Downloaded 03/03/18 7:37pm
- [11] <https://altabel.wordpress.com/2011/06/06/mobile-cloud-computing-why-is-it-worth-using/>
downloaded 12/4/16 6:24pm
- [12] https://en.wikipedia.org/wiki/Mobile_computing downloaded 02/21/18 1:16pm
- [13] <https://aws.amazon.com/about-aws/global-infrastructure/> downloaded 03/04/18 3:48pm.
- [14] https://en.wikipedia.org/wiki/Google#cite_note-151 downloaded 03/04/18 4:43pm