

Opportunities of E - Learning Adapting Mobile and Cloud Computing Techniques

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Abstract— This study mainly focused on the application of cloud computing and mobile computing in the E-learning environment. The popularity of learning of the internet, the construction of perfect web-based learning environment has become one of the hot points on researching remote education. Cloud computing is growing rapidly, with applications in almost any area, including education. E-Learning systems usually require many hardware and software resources. There are many education institutions that cannot afford such investments, and cloud computing is the best solution. This paper presents the benefits of E-Learning based on mobile computing and learning with mobile application using cloud environment and the benefits in several sectors, especially in the area of learning. The performance and features are evaluated that can expect from the use of cloud based application on a mobile device, and the effects it will have on the device that runs.

Keywords- Cloud Computing, E-Learning, Mobile Computing, Mobile Application, Information Technology.

I. INTRODUCTION

Mobile cloud computing is the combination between cloud computing and mobile computing. Mobile computing is described as an act of portable devices usage to run standalone applications and/or accessing remote applications via wireless networks [1]. It has three major components: communication, hardware and software. The software component, are the mobile applications present in the devices like whatsapp, facebook, messenger, or any app. With respect to the hardware, we may consider mobile devices with their hardware components, such as screens, sensors, batteries, etc. And finally, the communication is related to mobile networks. Cloud computing appears for helping users to reduce their concerns about device requirements in order to run the newest software applications.

The most accepted and common definition of cloud computing is the one from National Institute of Standards and Technology (NIST) which says that “cloud computing enables 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 interaction” [2].

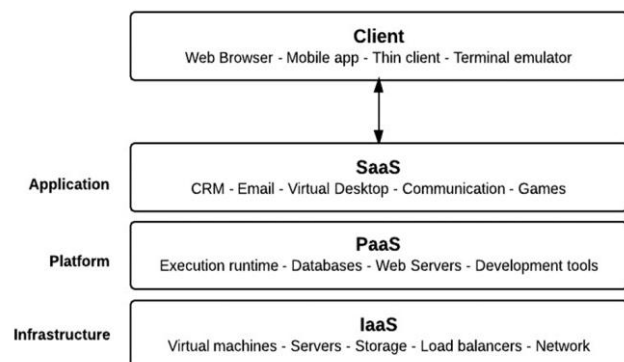


Figure : 1 Cloud computing stack

The main service models provided by the cloud computing paradigm are: platform as a service (paas), infrastructure as a service (iaas) and software as a service (saas). Mobile cloud computing is the integration of cloud computing within a mobile environment. It refers to an infrastructure where both data storage and the processing can occur outside the mobile device or can distribute between Cloud servers and mobile devices [3].

Cloud services means services made available to users on demand via the Internet from a cloud computing provider's servers as opposed to being provided from a company's own on-premises servers. There are three main services:

- A. *Software-As-A-Service (Saas)*: Only hosted applications are provisioned. By using this model the cost of hardware and the software development, maintenance and operations can be reduced.

- B. *Platform-As-A-Service (Paas)*: In this model, the customer can develop his application on the provider supported platform. By using this model the cost and full management complexity can be reduced. The customer can manage his required software components of the platform. The development environment is determined by the cloud provider. The cloud customer has control over applications and application environment settings of the platform
- C. *Infrastructure-As-A-Service (IaaS)*: The Provider hosts the consumer's virtual machines and provides networks and storage. By using this module the customer avoids purchasing and managing the hardware and software infrastructure components, and is provided with all resources virtualized through a service interface. Recently it came up another type of service in cloud computing designated Backend as a Service (BaaS), sometimes also referred as Mobile Backend as a Service (MBaaS), which is built on top of PaaS leading to a new composition of the layered stack of cloud computing [3], as shown in figure (1).
- D. *Backend As A Service (BaaS)*: The BaaS model allows developers to connect their native mobile applications to a backend cloud storage and start to enjoy some of the features they provide like push notifications and integration with social networking services [5,6]. Yet, these applications can also save their data in the cloud instead of saving it in the mobile device storage or data can even be saved in both cloud and storage. There are some platforms, for instance Google App Engine and Windows Azure, that provide custom software development kits (SDKs) and application programming interfaces (APIs) that make it easier to develop mobile applications and link them to a backend.

II. CLOUD COMPUTING DEPLOYMENT MODELS

In addition to these service models, four deployments have been added:

- A. *Public cloud*: The cloud infrastructure is made available to the general public or a large industry group and is owned by an organization selling cloud services.
- B. *Private cloud*: The cloud infrastructure is accessible for an organization only. It may be managed by the organization itself or a third party and can be internal or external.
- C. *Community cloud*: A private cloud that is shared by several customers with similar security concerns and the same data and applications sensitivity.
- D. *Hybrid cloud*: It merges more than one Cloud Computing model into a single, hybrid model; using a public cloud for hosting sites that must be published publically and containing uncritical data, and using a

private cloud for all the other sensitive data or services. This scenario is good for economic and business requirements.

III E-LEARNING BENEFITS

Many education institutions do not have the resources and infrastructure needed to run top E-Learning solution. This is why Blackboard, the biggest players in the field of E-Learning software, has now versions of the base applications that are cloud oriented. E-Learning is widely used today on different educational levels: continuous education, company trainings, academic courses, etc.

There are various E-Learning solutions from open source to commercial.

The students:

- Take online course
- Take exams
- Send feedback
- Send homework, projects

The trainers:

- Deal with content management
- Prepare tests
- Assess tests, homework, projects taken by students
- Send feedback
- Communicate with students (forums)

III. FRAMEWORK FOR CLOUD BASED E-LEARNING

- A. *The base layer of E-Learning cloud*: The base layer of E-Learning cloud shares IT infrastructure resources and connects the huge system pool together to provide services. Cloud Computing allows the hardware layer to run more like the internet, to make the hardware resources shared and accessed as data resources in secure and scalable way. Virtualization technology separates the physical hardware from operating system, which on one hand can make computing and storage capacity of the existing server into smaller size and re-integration, to improve the utilization and flexibility of IT resource; on the other hand can provide a common interface for large-scale cloud computing integration that enables the publication of calculation. The base layer can provide the basic hardware resources for the platform layer, and the users can also make use of it as the same as using a local device to use.
- B. *The platform layer of e-learning cloud*: With the support of the powerful hardware, platform layer carries out the tasks of data storage, computing and software development, and it can even achieve the tasks of completion of the original mass data storage, business intelligence Processing and so on which have been difficult to complete. Users can choose the devices and the number of devices according to the complexity of dealing with the content. Virtualization

technology enables the platform to show a strong level of flexibility.

C. *The application layer of E-Learning cloud:* The applications software or services provided by a school or university, the students to pay in the similar way of on-demand access, according to the amount to calculate the cost, complete the production, marketing, trading and management. E-Learning cloud environment provides user-oriented ubiquitous Adaptive hardware resources, computing environment and software services. In E-Learning cloud space, users can access to digital services transparently at any time in anywhere. The users can obtain the necessary network and computing services very naturally at any position. The information space and Physical space will be integrated because of ubiquitous computing capability. And the ubiquitous information terminals together with the embedded system equipment will be the vehicles of e-commerce in the future.

IV. E-LEARNING APPLICATION MODEL BASED ON CLOUD COMPUTING

E-Learning with the progress and application of technology, the emergence of cloud computing offers E-Learning good opportunity to develop, so we are convinced that it also can resolve the problem mentioned above properly. School or the Enterprise neither needs to worry about the construction of the environment of E-Learning software and hardware nor invest capital and human and material resources to construct the system. All those issues can be handed to service providers of E-Learning cloud, who can customize for users. In E-Learning cloud model, data storage is highly distributed, data management is highly centralized and data service is highly virtualization, all of which offer a much safer data service. Intelligent business policy-making.

E-Learning cloud Environment provides large data center in which mass data storage, high-speed computation. This architecture for the cloud platform provides a variety of user interface funs, such as Web Service interfaces, Java interfaces, C interfaces, Shell interface etc. Cloud computing platform provide resources services to teachers and students in the rental. A module is designed to which is based on the consumption billing to ensure that users only pay for the resources they have used.

V. MOBILE CLOUD COMPUTING

The Mobile Cloud Computing is defined as “Mobile Cloud Computing at its simplest, refers to an infrastructure where both the data storage and the data processing happen outside of the mobile device. Mobile cloud applications move the computing power and data storage away from mobile phones

and into the cloud, bringing applications and mobile computing to not just smart phone users but a much broader range of mobile subscribers” [6].

Mobile Cloud Computing as a new paradigm for mobile applications whereby the data processing and storage are moved from the mobile device to powerful and centralized computing platforms located in clouds. These centralized applications are then accessed over the wireless connection based on a thin native client or web browser on the mobile devices. Briefly, Mobile Cloud Computing provides mobile users with the data processing and storage services in clouds. The mobile devices do not need a powerful configuration (e.g., CPU speed and memory capacity) since all the complicated computing modules can be processed in the clouds.

From the concept of Mobile Cloud Computing, the general architecture of Mobile Cloud Computing can be shown in Figure 2. In Figure 2, mobile devices are connected to the mobile networks via base stations (e.g., base transceiver station (BTS), access point, or satellite) that establish and control the connections (air links) and functional interfaces between the networks and mobile devices.

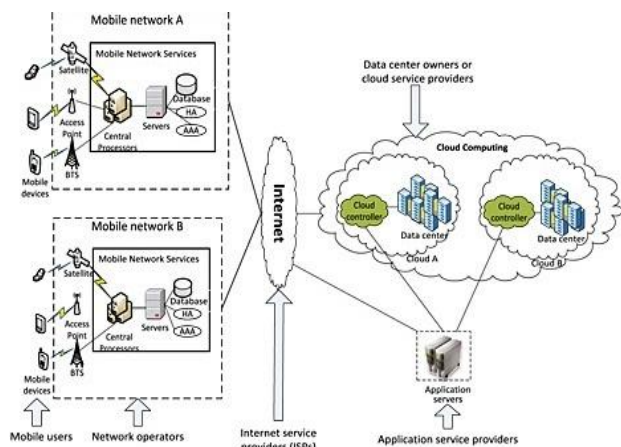


Fig. 2. Mobile Cloud Computing architecture.

VI. CONCLUSION

This paper mainly focus on the research of the application of cloud computing and mobile computing and benefits of E-learning in the in E-learning environment. It can be concluded that, we can create an E-Learning application model based on cloud computing by means of cloud computing mass data storage, high-speed computing capabilities, as well as its ideal allocation and the sharing mode of resources. This paper study presented a framework for studying the effectiveness of using mobile cloud computing application in learning. E-Learning application model based on cloud computing will not stop its pace to proceed. As the cloud computing technologies become more sophisticated and the applications of cloud computing

become increasingly widespread, E-Learning will certainly usher in a new era of cloud computing.

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