

Overview Study of Cloud Computing and Mobile Cloud Computing

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الملخص

تعتبر الحوسبة السحابية المتنقلة مزيج بين الحوسبة السحابية والحوسبة المتنقلة بالإضافة إلى الشبكات اللاسلكية حيث توفر الهواتف الذكية موارد حسابية واسعة لمستخدمي الأجهزة المحمولة، هذا بالإضافة إلى استخدام الحوسبة السحابية لتوصيف مراكز البيانات المتاحة لعدد المستخدمين عبر شبكة الإنترنت. وبذلك أصبحت، الحوسبة السحابية المتنقلة هي السائدة اليوم ، ولها وظائف موزعة على مواقع عديدة من خوادم مركزية. ولهذا رأينا أن نقدم من خلال هذه الورقة دراسة عامة عن الحوسبة السحابية والحوسبة السحابية المتنقلة. على أن تغطي هذه الدراسة نماذج التسليم والنشر للحوسبة السحابية ، بالإضافة إلى السمات الرئيسية للحوسبة السحابية المتنقلة.

Abstract

Mobile cloud computing (MCC) is a combination of cloud computing, mobile computing, and wireless networks. However; due to their capabilities, mobiles bring rich computational resources to mobile users. On the other hand, cloud computing is used to describe data centers available to many users over the internet. Today, large clouds predominant have functions distributed over multiple locations from central servers. This paper presents an overview study of cloud computing and mobile cloud computing. The study covers delivery and deployment models of cloud computing, as well as the main features of mobile cloud computing.

Keywords: cloud computing, MCC, mobile cloud applications.

1. INTRODUCTION

New data storage, processing and display technologies have allowed mobile devices to do nearly anything that had previously been traditionally done with larger personal computers. Moreover; these devices day by day improved in their capabilities, and get dropped in their prices. In contrast, due to mobile devices portability nature, they have limited resources such as computation power, screen size and battery power when compared with personal computers. In recent times, however, the cloud applications have been gaining popularity and there are some really good reasons for the same. It is natural for a beginner or an application novice to be befuddled by the technical jargons that are thrown around, while talking about Mobile Cloud Applications and mobile Cloud Computing. Figure 1 below shows the growth of mobile cloud applications.

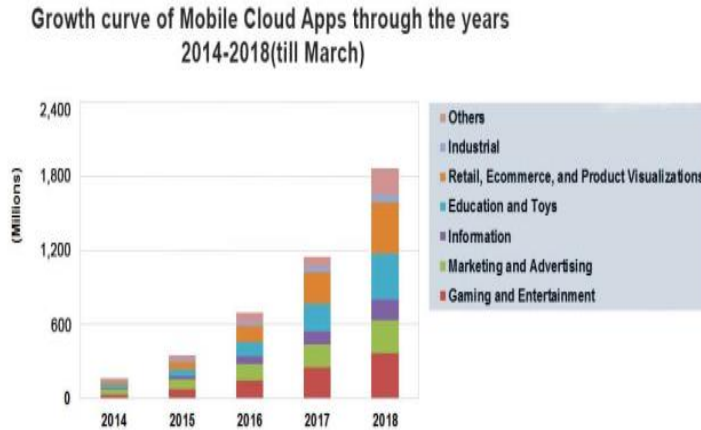


Fig. 1 The growth of mobile cloud applications

2. CLOUD COMPUTING

Cloud computing dates back to the 1950s. It is not a technology, rather it is one of the computing models, and considered as another version of internet technology. Over the years, it has evolved through many phases including grid and utility on-demand

computing. While cloud computing brings great opportunity, it can also introduce challenges for business leaders and IT departments. Inconsistent performance and security problems are the most common disadvantages that continue to affect the perceptions about cloud. It is another version of internet technology. It can provide network resources, CPU, RAM, Storage and Software resources over the web. Cloud computing is characterized with two main models i.e., the delivery models and the deployment models. Figure 2 shows these characteristics.

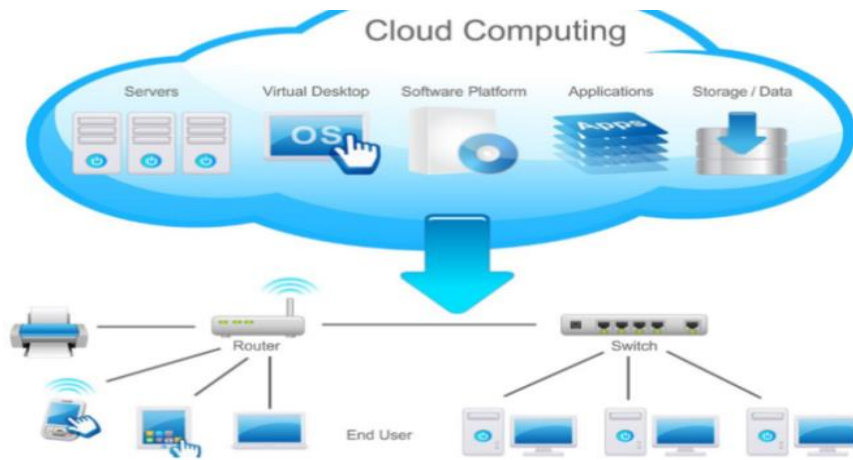


Fig. 2 Cloud computing Characteristics

2.1 DELIVERY MODELS

In cloud computing, delivery models or types are classified into three models based on service delivery.

2.1.1 Infrastructure-as-a-Service (IaaS)

In this model, the service providers allow the client to access the virtual servers in their data center. The clients are able to use virtual servers i.e., the raw hardware, in its all without the need of infrastructure maintenance [1].

When compared with the other two delivery service models, IaaS shows the most flexibility inspired from its architecture and usage in other words, the client can enjoy the flexibility as well as the

scalability without having to worry about the physical server's maintenance or hardware addition to the existing infrastructure.

Benefits of using IaaS model are:

- No Capital Investments
- Expand as You Grow
- Flexible Options
- Focus on What You Do Best
- Latest and Greatest Technology
- Get Started Immediately
- Anytime, Anywhere Access
- Tight Security Controls

2.1.2 Platform-as-a-Service (PaaS)

This model is different from IaaS in terms of software tools i.e., operating system, database, and some other necessary software tools, that are used to develop and run the software in the cloud. It does not support the client hardware maintenance too. However, the trade off with the PaaS model is that the service providers will lock down the service, and the clients will not be able to use their own developer tools [1].

Benefits of using PaaS model are:

- Innovate Faster
- Focus Resources
- Save Money
- Get the Best Technology
- Stay Up to Date
- Maximize Uptime
- Scale Easily
- Strengthen Security
- Get the Best Support

2.1.3 Software-as-a-Service (SaaS)

Similar to the previous models, the clients in this model does not have to perform any maintenance for the hardware, platform or software. The clients access and use the application software provided. However, this model provides the least flexibility in

comparison with the two other models since the clients can only use the applications and software provided by the provider. The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices such as a web browser (e.g., web-based email).

Benefits of the SaaS model include

- SaaS is a software distribution model in which a third-party provider hosts application and makes them available to customers over the Internet.
- Flexible payments
- Scalable usage
- Automatic updates
- Accessibility and persistence

2.2 DEPLOYMENT MODELS

National Institute of Standards and Technology NIST defines four cloud deployment models: public clouds, private clouds, community clouds, and hybrid clouds. A cloud deployment model is defined according to where the infrastructure for the deployment resides and who has control over that infrastructure. Deciding which deployment model, you will go with is one of the most important cloud deployment decisions you will make.

Each cloud deployment model satisfies different organizational needs, so it's important that you choose a model that will satisfy the needs of your organization. Perhaps even more important is the fact that each cloud deployment model has a different value proposition and different costs associated with it. Therefore, in many cases, your choice of a cloud deployment model may simply come down to money. In any case, to be able to make an informed decision, you need to be aware of the characteristics of each environment [2].

- **Private Cloud**

The cloud is used or operated by single organization. They are more secure and able to address privacy concern than public cloud. On the other hand; they are more expensive. Such infrastructure may be managed by the organization itself to support various user

groups, or it could be managed by a service provider that takes care of it either on-site or off-site.

- **Community Cloud**

Community Cloud supports multiple organizations sharing computing resources that are part of a community; examples include universities cooperating in certain areas of research. Members of the community are allowed to access the cloud environment. It may be managed by the organizations or a third party and may exist on premise or off premise.

- **Public Cloud**

Non-mission-critical tasks such as file-sharing, and e-mail service is the public cloud. It supports all users who want to make use of a computing resource, such as hardware (OS, CPU, memory, storage) or software (application server, database) on a subscription basis. The infrastructure is made available to the general public and is owned by an organization selling cloud services.

- **Hybrid cloud**

An interconnected of private and public cloud infrastructure produces Hybrid cloud. It is a composition of two or more clouds i.e., private, community, or public. This model is made used by many organizations when they need to scale up their IT infrastructure rapidly, such as when leveraging public clouds to supplement the capacity available within a private cloud. For example, if an online retailer needs more computing resources to run its web applications during the holiday season it may attain those resources via public clouds.

3. MOBILE CLOUD COMPUTING

The significant increase of mobile subscriptions is due to the rapid advance in mobile computing, wireless technology, and networking. Over the last few years, the Mobile Cloud Computing grows rapidly. One of the key factors contributing to this growth is the growing demand for enterprise mobility. They offer the advantages to users by allowing them to use infrastructure, platforms and software by cloud providers at low cost and elastically in an on-demand fashion [3]. Mobile Cloud Computing

refers to an infrastructure where both the data storage and data processing happen outside of the mobile device. Mobile cloud applications move the computing power and data storage away from the mobile devices and into powerful and centralized computing platforms located in clouds. The access is done over the wireless connection based on a thin native client. MCC is a Mobile Computing + Cloud Computing.

3.1 MCC Architecture

The operation nature of the MCC gives its entire architecture. In performing its functions, mobile devices are connected to networks via base stations. Those stations establish and control connections and functional interfaces between the networks and mobile devices. In this architecture, information and requests are transmitted to the central processors that are connected to servers providing mobile network services. Cloud controllers process the requests to provide mobile users with the corresponding cloud services. Mobile cloud computing architecture is presented in Figure 3 below.

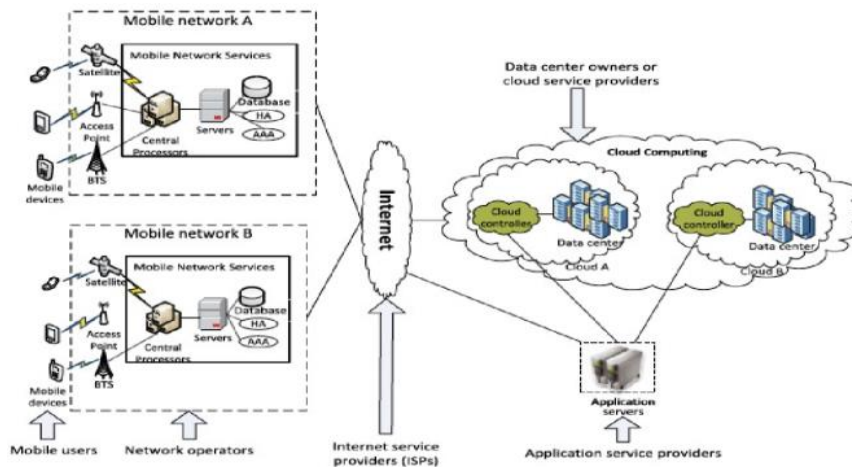


Fig. 3 Mobile Cloud Architecture

3.2 MCC Advantages

Due to its architecture, mobile cloud computing has a significance over other structures [4]. In short, MCC cause to:

- Extending battery lifetime.
- Improving data storage capacity and processing power.
- Improving reliability and availability.
- Dynamic provisioning.
- Scalability.
- Multi-tenancy.
- Ease of integration.

3.3 MCC Disadvantages

On the same way, and due to its nature and architecture, MCC has certain disadvantages i.e., its applications can't use specific devices software and hardware such as GPS, camera, and etc. They can only make use of browser notifications. In addition, Mobile cloud applications are totally cloud dependent and hence, they may suffer from connection problems. They have to deal with connection bandwidth drop problems, connection disconnected problems and etc. [5].

5. CONCLUSION

This paper presents an overview of cloud computing and mobile cloud computing. The delivery and deployment models for cloud computing are discussed in detail. MCC architecture, advantages and disadvantages are presented too. MCC issues including security, data offloading in static and dynamic environments can be done as a future work that must be considered when designing a mobile cloud in order to make sure that non-authorized users will not be able to access sensitive information and data on the cloud.

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