

# MOBILE-CLOUD: A FRAMEWORK OF CLOUD COMPUTING FOR MOBILE APPLICATIONS

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## -----ABSTRACT-----

The computational and storage capabilities of today's mobile devices are rapidly catching up with those of our traditional desktop computers and servers. In fact, mobile phones with 1 GHz processors are readily available in the market today. Unfortunately, all of these processing resources are mostly under-utilized and are generally used to process local data and programs only. With the use of local wireless networks, we can enable these phones to communicate with each other without utilizing the resources of a global cellular network. This has the potential to enable collaborative data-intensive computing across a cloud of mobile devices without straining the bandwidth of global networks. To achieve these objectives, Hyrax [3] was initially developed by Marinelli as a MapReduce system [1] that is deployed on a networked collection of Android smartphones. Hyrax is based on Hadoop [4], which is a Java implementation of the MapReduce system and the Google File System [2].

**Keywords** - Mobile cloud, computational offloads, MCC (Mobile Cloud Computing), Bandwidth, m-learning-----

## I. INTRODUCTION

The mobile cloud is Internet-based data, applications and related services accessed through smartphones, laptop computers, tablets and other portable devices. Mobile cloud computing (MCC) at its simplest, refers to an infrastructure where both the data storage and data processing happen outside of the mobile device.

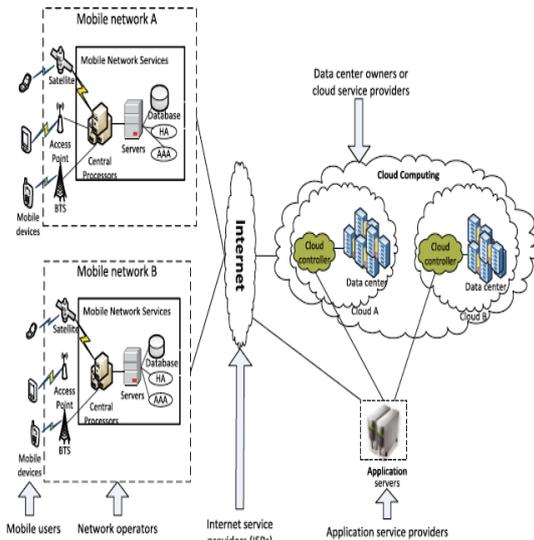
Mobile cloud applications move the computing power and data storage away from the mobile devices and into powerful and centralized computing platforms located in clouds, which are then accessed over the wireless connection based on a thin native client. While Marinelli has developed a system that is suitable for initial use to discover the resource constraints/challenges, performance and the scalability aspects of using mobile devices for collaborative data-intensive computing, that initial implementation of Hyrax was not suitable for wide-scale deployment on the mobile devices of common users. To that end, we have improved on Marinelli's implementation of Hyrax, and aim to develop a mobile multimedia share-and-search application that allows users to discover relevant multimedia content on the mobile phones of those within reasonable proximity. We also evaluate the performance of this new implementation of Hyrax and identify areas for future work, especially in improving the performance and resource consumption (especially power resources) of Hyrax. Furthermore, we also consider the risk that the use of Hyrax poses to the users of the mobile devices that run Hyrax.

Despite substantial technological advancements in recent years, Smart Mobile Devices (SMDs) are still low-potential computing devices. Therefore, Mobile Cloud Computing (MCC) can deploy computational offloading for augmenting SMDs. The contemporary Computational Offloading Frameworks (COFs) implement resource-intensive procedures for computational offloading, which involve the overhead of transmitting application binary code and deploying distributed platforms at runtime. As a result, the energy consumption costs and turnaround time for the mobile applications and the overhead of data transmission can be increased. Nevertheless, the resource-limited nature of SMDs requires lightweight techniques for leveraging the application processing services of computational clouds.

## Why Mobile Cloud Computing?

Mobile devices face many resource challenges (battery life, storage, bandwidth etc.). Cloud computing offers 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. Mobile cloud computing provides mobile users with data storage and processing services in clouds, obviating the need to have a powerful device configuration (e.g. CPU speed, memory capacity etc), as all resource-intensive computing can be performed in the cloud.

## II. ARCHITECTURE OF MCC:



- Mobile devices are connected to the mobile networks via base stations that establish and control the connections and functional interfaces between the networks and mobile devices.
- Mobile users' requests and information are transmitted to the central processors that are connected to servers providing mobile network services.
- The subscribers' requests are delivered to a cloud through the Internet. In the cloud, cloud controllers process the requests to provide mobile users with the corresponding cloud services.

### III. ADVANTAGES OF MCC

#### Extending battery lifetime

- Computation offloading migrates large computations and complex processing from resource-limited devices (i.e., mobile devices) to resourceful machines (i.e., servers in clouds).
- Remote application execution can save energy significantly.
- Many mobile applications take advantages from task migration and remote processing.

#### 3.1 . Improving data storage capacity and processing power:

- MCC enables mobile users to store/access large data on the cloud.
- MCC helps reduce the running cost for computation intensive applications.
- Mobile applications are not constrained by storage capacity on the devices because their data now is stored on the cloud.

#### 3.2. Improving reliability and availability:

- Keeping data and application in the clouds reduces the chance of lost on the mobile devices.
- MCC can be designed as a comprehensive data security model for both service providers and users:
- Protect copyrighted digital contents in clouds.

- Provide security services such as virus scanning, malicious code detection, and authentication for mobile users.
- With data and services in the clouds, then are always (almost) available even when the users are moving.

#### Dynamic provisioning

- Dynamic on-demand provisioning of resources on a fine-grained, self-service basis
- No need for advanced reservation

#### Scalability

- Mobile applications can be performed and scaled to meet the unpredictable user demands
- Service providers can easily add and expand a service

#### Multi-tenancy

- Service providers can share the resources and costs to support a variety of applications and large no. of users.

#### Ease of Integration:

- Multiple services from different providers can be integrated easily through the cloud and the Internet to meet the users' demands.

### IV. MCC APPLICATIONS

#### Mobile Commerce:

- M-commerce allows business models for commerce using mobile devices.ex:Mobile financial, mobile advertising, mobile shopping...
- M-commerce applications face various challenges(low bandwidth, high complexity of devices, security, ...)
- Integrated with cloud can help address these issues
- Example: Combining 3G and cloud to increase data processing speed and security level.

#### Mobile Learning:

M-learning combines e-learning and mobility. Traditional m-learning has limitations on high cost of devices/network, low transmission rate, limited educational resources

- Cloud-based m-learning can solve these limitations.
- Enhanced communication quality between students and teachers
- Help learners access remote learning resources
- A natural environment for collaborative learning

#### Mobile Healthcare:

• M-healthcare is to minimize the limitations of traditional medical treatment (eg.Small storage, privacy, medical errors, ...)

- M-healthcare provides mobile users with convenient access to resources(eg. medical records)
- M-healthcare offers hospitals and healthcare organizations a variety of on-demand services on clouds

#### Examples:

- Comprehensive health monitoring services
- Intelligent emergency management system
- Health-aware mobile devices (detect pulse-rate, blood pressure, level of alcohol etc)
- Pervasive access to healthcare information

- Pervasive lifestyle incentive management (to manage healthcare expenses)

#### **Mobile Gaming**

- M-game is a high potential market generating revenues for service providers. Offloading can also save energy and increase game playing time (eg. MAUI allows fine-grained energy-aware offloading of mobile codes to a cloud)
- Rendering adaptation technique can dynamically adjust the game rendering parameters based on communication constraints and gamers' demands

#### **Assistive technologies:**

- Pedestrian crossing guide for blind and visually-impaired
- Mobile currency reader for blind and visually impaired
- Lecture transcription for hearing impaired students

#### **Other applications**

- Sharing photos/videos
- Keyword-based, voice-based, tag Based searching
- Monitoring a house, smart home systems

#### **MCC ISSUES**

- **Mobile communication issues:**
- Low bandwidth is one of the biggest issues, because the radio resource for wireless networks is much more scarce than wired networks
- Service availability of mobile users may not be able to connect to the cloud to obtain a service due to traffic congestion, network failures, and mobile signal strength problems.
- Heterogeneity is handling wireless connectivity with highly heterogeneous networks to satisfy MCC requirements that is always-on connectivity, on-demand scalability; energy efficiency is a difficult problem.

#### **MCC POPULARITY**

- According to a recent study by ABI Research, more than 240 million businesses will use cloud services through mobile devices by 2015.
- That traction will push the revenue of mobile cloud computing to \$5.2 billion.
- Mobile cloud computing is a highly promising trend for the future of mobile computing. **MCC SECURITY ISSUES**

#### **MCC SECURITY ISSUES**

- Protecting user privacy and data/application secrecy from adversaries is key to establish and maintain consumers' trust in the mobile platform, especially in MCC.
- MCC security issues have two main categories:
  - Security for mobile users
  - Securing data on clouds

#### **Security for Mobile Users:**

Mobile devices are exposed to numerous security threats like malicious codes and their vulnerability. GPS can cause privacy issues for subscribers. Security for mobile applications are Installing and running security software are the simplest ways to detect security threats. Mobile devices are resource constrained, protecting them from the threats is more difficult than that for resourceful devices.

#### **V. CONCLUSION**

This Paper focus is the way in which mobile computing can be used to enhance learning and teaching we do need to consider the wide range of mobile technologies available, from mobile phones to laptops. Mobile devices range from simple mobile phones capable of voice telephony and SMS (Short Message Service) more commonly known as text messaging; through smart phones to PDAs (Personal Digital Assistants) to laptops and tablet PCs. Within each of these categories there is an enormous range of capabilities and costs.

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