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Towards an offloading framework based on Big Data analytics in Mobile Cloud Computing Environments

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Abstract

Mobile Cloud Computing (MCC) is the combination between cloud computing and mobile devices. The challenge for mobile devices is to provide solutions for their limited resources, and it would be possible through cloud computing by running memory intensive operations on distant servers. This paper proposes a framework for code offloading based on big data analytics in mobile cloud environments.

Keywords: Mobile Cloud Computing; Big Data; Offloading

1 Introduction

Cloud computing is a model for enabling convenient, 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 provider interaction [1]. The cloud model is composed of five essential characteristics (On-demand self-service, Broad network access, Resource pooling, Rapid elasticity, Measured service, Resource usage), three service models (SaaS: Software as a Service, IaaS: Infrastructure as a Service and PaaS: Platform as a Service), and four deployment models (private cloud, community cloud, public cloud and hybrid cloud).

Smart Mobile Devices (SMDs) are the future computing devices with high user expectations for accessing computational intensive applications.

Mobile Cloud Computing (MCC) is simply to carry your office where you go through a Smartphone connected to the Internet.

MCC aims to overcome many limitations like, computation and storage capacity, energy, shared wireless medium, by integrating cloud computing into the mobile environment to elastically utilize resources.

The amount of data stored and processed on the Internet nowadays exceeds the processing capacity of modern computer systems, which gave the birth of the term big data.

[*] Masterminded EasyChair and created the first stable version of this document

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2 Mobile Cloud Computing

Mobile Cloud Computing is a rich mobile computing technology that leverages unified elastic resources of varied clouds and network technologies toward unrestricted functionality, storage, and mobility to serve a multitude of mobile devices anywhere, anytime through the channel of Ethernet or Internet regardless of heterogeneous environments and platforms based on the pay-as-you-use principle [6].

Another definition refers MCC as the set of techniques that use cloud resources to empower mobile applications. The main goal is to provide a better experience for mobile users whose devices have limited resources and capacities like computation, storage and battery [12 and 13].

MCC is the most recent mobile computing technology that uses cloud-computing technology to achieve two main goals:

- Conserve native resources, especially battery while performing intensive application/computation.
- Augment mobiles' computing power to enable them perform tasks and run computations that could not be otherwise done. Cloud-based mobile devices can perform infinite computation using infinite elastic cloud-based resources.

With the explosive growth in mobile applications, platforms and end user demands, limitations at the mobile device (e.g.: computation and storage capacity, energy, shared wireless medium) impede further improvements in application quality of service (QoS).

Mobile cloud applications [9] are considered as the next generation of mobile applications, due to their promise of linked and elastic computational cloud functionality that enables to augment their processing capabilities on demand, power-aware decision mechanisms that allow to utilize efficiently the resources of the device and dynamic resource allocation approaches that allow to program and utilize cloud services at different levels (SaaS, IaaS, PaaS).

3 Big Data

Big data is a term utilized to refer to the increase in the volume of data that are difficult to store, process, and analyze through traditional database technologies [3].

Big data technologies describe a new generation of technologies and architectures, designed to economically extract value from very large volumes of a wide variety of data, by enabling high-velocity capture, discovery, and/or analysis [2].

This topic has appeared, as organizations must deal with petabyte-scale collections of data. In fact, in the last 2 years we have produced 90% of the total data generated in history [7].

Therefore, as mentioned in [4], Big Data technology aims to minimize hardware and processing costs and to verify the value of Big Data before committing significant company resources.

We also can define Big data in the form of architecture, inspired of [7], and which we propose in Figure 1. It is consisting of four main components namely:

- Data Sources, which include databases, sensors, mobiles, web, etc.
- Data Management, which include Distributed file system (HDFS), parallelize computing (Map Reduce), Data storage (NoSQL), Data cleaning, Data security, etc.
- Data Analytics, which refers to Data mining, Machine learning, Statistics, Network analysis, etc.
- Applications.