A New Solution for Multimedia Data Distribution Optimization in Mobile Cloud Computing

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Abstract: The convergence of mobile computing and cloud computing has brought to users a new choice of both mobility and power: mobile cloud computing. This new paradigm, however, still suffers lots of performance issues due to the inherent problems of thin client devices (such as smart phones, tablets, etc.), especially those related to multimedia data distribution which requires intensive computation and high bandwidth. Although recent studies have tried to solve this problem, yet most are not sufficient. In this paper, we propose a framework which inserts of thick clients (laptop or desktop computers) into existing mobile cloud paradigm. The resulting framework relies on the collaboration of thin clients and thick clients to optimize the distribution of multimedia data between cloud network and mobile thin clients with attention paid to user mobility. With an example, followed by the detailed architecture of the proposed system and its performance evaluation tests, we could prove the effectiveness and benefits of our work.

Keywords: offloading, thin-thick client, multimedia data, mobile cloud;

1. Introduction
The past few years have witnessed an explosive growth of handheld devices like smartphones and tablets and changes in how people access to computers or the Internet. Instead of staying loyal to personal computers (PCs) or laptops (thick clients), users can alternatively utilize these smaller, lighter devices for their personal or business activities. According to the market analysis of Gartner Inc. in [1], sale of smartphones and tablets has already surpassed PC sale during the last two years, and soon the former will replace the latter as users’ preference in choosing their device for Internet access, which is a long-term change in user’s behavior [2]. In a world where mobile devices (thin clients) have become more dominating than ever before, computing services are also undergone massive innovation so as to adapt with the mobile environment. Meanwhile, mobile users can choose to upload their data and tasks to the Internet for further processing, with the aid of cloud computing (CC) platform [14]. The recognized combination of these two above emerging trends is known as mobile cloud computing (MCC) [3].

Different from fixed computing situations, MCC faces various challenges related to limitation in hardware capabilities, costly cloud access, or user mobility, which might severely degrade the Quality-of-Service (QoS) [4, 5]. A lot of solutions have been discussed, their performances are not satisfied. In [6], for example, the authors present a guideline for a framework to create virtual MCC providers by using nearby thin clients to receive multimedia data from Internet, yet their limited capacities and bandwidth connection still are great obstacle for cloud access. Another way is to reply on thick clients, which normally have more generous hardware capacities and better network connections, to improve thin clients’ service.

With that in mind, we introduce in this paper a new architecture that collaborates thin clients and thick clients in order to optimize data distribution, especially for multimedia application, between cloud provider and cloud customers, so that expected QoS requirements can be met. We place our main concern on how data from cloud network can be efficiently and effectively transferred to individual customers, with attention paid particularly to their mobility. Extensive simulation work shows that our approach can improve data distribution efficiency and has better performance than other existing ones.

The remaining of our paper is divided into following sections: Section 2 presents related studies with unsolved problems. Section 3 exemplifies our work with a typical circumstance where the proposed idea can bring significant improvements. Section 4 details the architecture and philosophy of our system, which is going to be evaluated in section 5. The last section concludes the paper and gives hints on future work.

2. Related work
Research literature has seen efforts in trying to solve the above mentioned problems. In [15],