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Mobile cloud computing for computation offloading: Issues and challenges

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Abstract Despite the evolution and enhancements that mobile devices have experienced, they are still considered as limited computing devices. Today, users become more demanding and expect to execute computational intensive applications on their smartphone devices. Therefore, Mobile Cloud Computing (MCC) integrates mobile computing and Cloud Computing (CC) in order to extend capabilities of mobile devices using offloading techniques. Computation offloading tackles limitations of Smart Mobile Devices (SMDs) such as limited battery lifetime, limited processing capabilities, and limited storage capacity by offloading the execution and workload to other rich systems with better performance and resources. This paper presents the current offloading frameworks, computation offloading techniques, and analyzes them along with their main critical issues. In addition, it explores different important parameters based on which the frameworks are implemented such as offloading method and level of partitioning. Finally, it summarizes the issues in offloading frameworks in the MCC domain that requires further research.

Contents

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1. Introduction

The main goal of CC is to allow IT departments to focus on their businesses and projects instead of just taking care of their data centers and keeping them working [2,18,20]. CC is a new concept that aims to provide computational resources as services in a quick manner, on demand, and paying as per usage. The CC paradigm is presented in three cloud delivery models: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS) as shown in Fig. 1. According to Gartner [3], CC will have in 2016 a Global Compounded Annual Growth Rate (CAGR) of IaaS: 41%, PaaS: 26.6% and SaaS: 17.4%.

Recently, user preferences for computing have changed because of the latest developments and enhancements in mobile computing technologies. Several reports and studies have presented the importance of MCC and its impact on mobile clients and enterprises. For instance, and according to a recent study by ABI Research, more than 240 million business will use cloud services through mobile devices by 2015 and this will push the revenue of the MCC to $5.2 billion [11]. Moreover, the usage of smartphones has increased rapidly in various domains, including enterprise, management of information systems, gaming, e-learning, entertainment, gaming, and health care. Although the predictions that mobile devices will be dominating the future computing devices, mobile devices along with their applications are still restricted by some limitations such as the battery life, processor potential, and the memory capacity of the SMDs [31]. Nowadays, modern mobile devices have sufficient resources such as fast processors, large memory, and sharp screens. However, it is still not enough to help with computing intensive tasks such as natural language processing, image recognition, and decision-making. Mobile devices provide less computational power comparing to server computers or regular desktops and computation-intensive tasks put heavy loads on battery power.

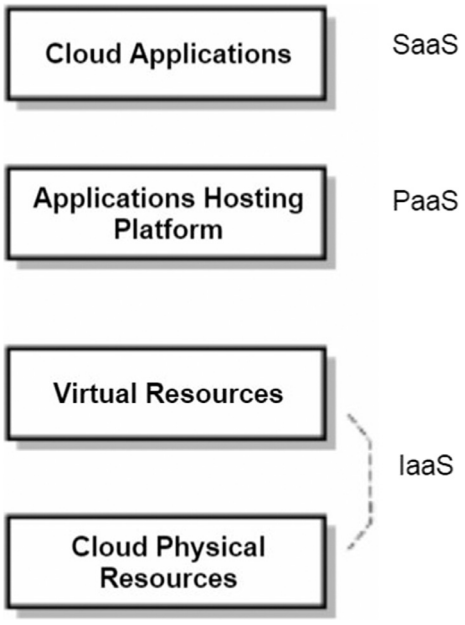

Figure 1 Cloud computing layers.