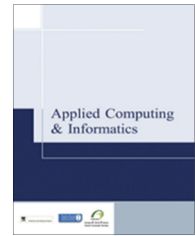




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# Mobile cloud computing for computation offloading: Issues and challenges

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## KEYWORDS

Cloud computing;  
Mobile cloud computing;  
Computational offloading;  
Algorithms;  
Partitioning

**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.

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53 **1. Introduction**

54 The main goal of CC is to allow IT departments to focus on  
55 their businesses and projects instead of just taking care of their  
56 data centers and keeping them working [2,18,20]. CC is a new  
57 concept that aims to provide computational resources as ser-  
58 vices in a quick manner, on demand, and paying as per usage.  
59 The CC paradigm is presented in three cloud delivery models:  
60 Infrastructure-as-a-Service (IaaS), Platform-as-a-Service  
61 (PaaS), and Software-as-a-Service (SaaS) as shown in Fig. 1.  
62 According to Gartner [3], CC will have in 2016 a Global Com-  
63 pounded Annual Growth Rate (CAGR) of IaaS: 41%, PaaS:  
64 26.6% and SaaS: 17.4%.

65 Recently, user preferences for computing have changed  
66 because of the latest developments and enhancements in  
67 mobile computing technologies. Several reports and studies  
68 have presented the importance of MCC and its impact on  
69 mobile clients and enterprises. For instance, and according  
70 to a recent study by ABI Research, more than 240 million busi-  
71 ness will use cloud services through mobile devices by 2015 and  
72 this will push the revenue of the MCC to \$5.2 billion [11].  
73 Moreover, the usage of smartphones has increased rapidly in  
74 various domains, including enterprise, management of infor-  
75 mation systems, gaming, e-learning, entertainment, gaming,  
76 and health care. Although the predictions that mobile devices  
77 will be dominating the future computing devices, mobile  
78 devices along with their applications are still restricted by some  
79 limitations such as the battery life, processor potential, and the  
80 memory capacity of the SMDs [31]. Nowadays, modern  
81 mobile devices have sufficient resources such as fast proces-  
82 sors, large memory, and sharp screens. However, it is still

not enough to help with computing intensive tasks such as nat- 83  
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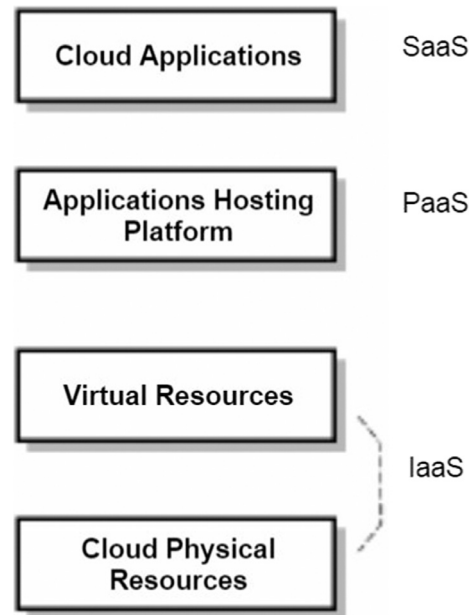


Figure 1 Cloud computing layers.

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