



Novel Technique of Mobile to Cloud Offloading of Tasks by Optimal Partition Approach

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Abstract— Compared to desktop devices, mobile devices have limited resources such as limited processing power, memory, and battery capacity. One such solution is mobile cloud computing (MCC), which uses cloud infrastructure to increase the capabilities of mobile devices. This paper focuses on a related, emerging technology called computation offloading (CO), where the emphasis is on dynamically offloading computation from applications running on mobile devices to outside surrogates such as cloud infrastructure.

Keywords— Mobile Cloud Computing, Computation Offloading, Virtual Machine, Virtualization, Application Partitioning.

I. INTRODUCTION

Battery is one of the main concerns for mobile devices. Many solutions have been proposed to increase the CPU performance and to manage the disk in an efficient way to reduce power consumption. However, these solutions require changes in the structure of mobile devices, or they require a new hardware that results in an increase of cost and may not be feasible for all mobile devices.

Computation offloading technique is proposed with the objective to migrate the large computations and complex processing from resource-limited devices (i.e., mobile devices) to the servers in clouds. This avoids taking a long application execution time on mobile devices which results in large amount of power consumption.[7]

Offloading Computations To Save Energy:

If the calculations are too large for the mobile system, which is resource constrained; as an alternative, computation is performed someplace else, thereby extending the mobile system's battery life time. The cloud computing is different from the existing model of implementation of virtualization. Cloud retailer thus provides computing cycles, and client can use these cycles to decrease the amounts of computation on mobile systems and keep energy. Thus, cloud computing can keep energy for mobile clients throughout *computation offloading*. Virtualization, a essential characteristic in cloud computing, lets appliances from different customers run on dissimilar virtual machines, thereby providing division and protection. When computations are heavy and bandwidth is also high, offloading can be done. [8] Offloading can be beneficial only when large amount of computations C are needed with relatively small amount of Communications D in following figure.

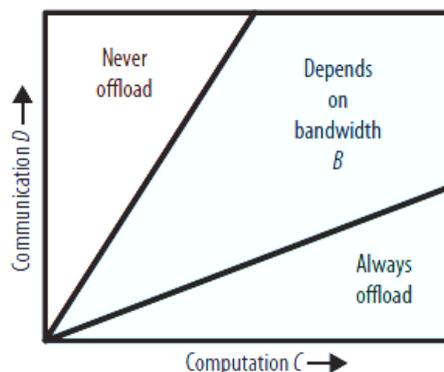


Fig.1. Offloading is beneficial when large amounts of computation C are needed with relatively small amounts of communication D .

II. RELATED WORK

Li.Z, Wang.C, Xu.R[1] presented an offloading scheme based on profiling information about computation time and data sharing at the level of procedure calls. A cost graph is constructed and a branch-and-bound algorithm is applied to minimize the total energy consumption of computation and the total data communication cost. Wang.C, Li.Z [2] presented a computation offloading scheme on mobile devices and proposes a polynomial time algorithm to find an

optimal program partition. Both the static information and the run-time information were used. A heuristic algorithm is applied into the clusters to find the optimal partition to minimize the execution cost of the program. Miettinen.A, Nurminen .J[3] This paper considered energy efficiency problem. The reason behind this is that mobile devices are energy constrained and they lack sufficient resources. Detailed analysis is made with respect to critical factors that affect the energy efficiency of the mobiles connected to a network. Kumar.K, Lu.Y[4] suggests a program partitioning based on estimation of energy consumption before execution.Optimal program partitioning for offloading is dynamically calculated based on the trade-off between the communication and computation costs at run time.B. Chun, S. Ihm [6] CloneCloud brings the power of Cloud Computing to your smartphones. History based profiling is used. But real Network and device conditions cannot be generalized.Pre-calculated partitions cannot cover all the offloading scenarios.Calheiros.R, R.Ranjan [8]propose CloudSim: an extensible simulation toolkit that enables modeling and simulation of Cloud computing systems and application provisioning environments. The CloudSim toolkit supports both system and behavior modeling of Cloud system components such as data centers, virtual machines (VMs) and resource provisioning policies. Roopali, Kumari.R [9]presented the challenges with offloading such as latency rate which mainly depends on factors like code to be offloaded, distance between smart phone device and the remote server, network bandwidth, heterogeneous environments and results of computations.X. Feng, D. Fangwei [13] Phone2Cloud, a computation offloading-based system is devised for energy saving on smartphones in the context of mobile cloud computing. The objective is to improve energy efficiency of smartphones and at the same time, enhance the application's performance through reducing its execution time. This system is a semi-automatic offloading system.

III. PROPOSED WORK

In this paper we propose a technique for making the applications running on smartphones autonomous enough, to offload their computation intensive, non-interactive parts automatically from the Smartphone to cloud via internet after analyzing the cost of offloading over the cost of running the application on the phone. The offloading decision is fully automatic by adaptive partition of task using EM(Exceptional Maximization) algorithm and analysis the response time, energy, cost and delay. The performance of an offloaded task is judged based on the goals set by the user.

IV. RESEARCH METHODOLOGY

As the application and features of smartphones are increasing day by day, thus the demand for processing and memory is increasing. These phones are battery powered which is of limited capacity as compared to plug in devices. So it becomes very important to enhance the user's experience of using smartphones.

Android:

In this thesis, we mainly focus on Android operating system. Android operating system is based on Linux kernel. Android offers an open platform and users can customize their operating system. It is applied on smartphones, tablets, smart TVs and cameras.

Features of Android:

- User Friendly Interface
- Multitasking
- Media support
- Connectivity

CloudSim: (A Cloud Simulation Framework)

CloudSim is an open source software used for modeling and simulation of cloud computing infrastructures and services. CloudSim model of Cloud Computing architecture consists of three layers the system layer, the core middleware, and the user-level middleware. These three layers corresponding to three top layers of cloud computing architecture Iaas, Paas and SaaS respectively.

It enables users to:

- a) Test their application in controlled and repeatable environment
- b) Find the system bottlenecks without the need of real clouds
- c) Try different configurations for developing adaptive provisioning techniques

V. CONCLUSION

Mobile Cloud Offloading is considered a promising approach to enhance the capabilities of resource constrained mobile devices. A mobile device can save a significant amount of battery energy by offloading computational intensive part of the application which requires less communication to the rest of the application, to the cloud, and thus provide more responsive user experience.

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