

Mobile Cloud Computing and Cloudlets

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Synopsis

The basic premise of *mobile cloud computing* is to overcome the limitations of mobile devices by offloading processing and storage to the abundant computational and storage resources on the cloud, and/or, to a smaller extent, those of neighbouring mobile devices in the vicinity. The latter is commonly referred to as *ad hoc mobile cloud computing* or *cloudlets*. The advantages of these approaches include reduced battery usage for the originating mobile device and faster execution of computation-intensive tasks. This area has attracted a lot of research and development interest in recent years.

However, there are still challenging issues in mobile cloud computing that need to be addressed which arise from the uncertainties in the availability and quality of the wireless connections between the user's source device and the cloud and other host devices in the neighbourhood, and the availability of computational or storage resources on potential host devices. It is common for several alternative host devices or wireless connection methods with different characteristics and costs to exist. In addition, the potential host devices are sometimes owned by other users who have different degrees of willingness for their devices to execute other users' tasks.

In order to handle the scenarios mentioned above and to achieve good performance, optimization-based, stochastic programming and Markov Decision Process (MDP) methods have been proposed to perform resource management in mobile cloud computing. Game theoretic methods may also be applied to incentivize nodes to cooperate in a systematic way. This tutorial will present how these methods can be applied in mobile cloud computing systems and discuss the achievable performance and overheads involved.

Topics

1. Background and Technologies
 - Application requirements and offloading
 - Some implementation examples
2. Requirements of Mobile Cloud Computing

- Application partitioning and VM migration
 - Wireless network configurations, intermittent connectivity
 - Infrastructure cloud vs cloudlets
3. Resource Management Methods for Mobile Cloud Computing
 - Optimization-based
 - Stochastic Programming
 - Markov Decision Process (MDP)
 4. Cooperation in Mobile Cloud Computing
 - Game theoretic formulations
 5. Conclusion and Future Directions

Biography of Presenter

Chen-Khong Tham is an Associate Professor at the Department of Electrical and Computer Engineering (ECE) of the National University of Singapore (NUS). His current research focuses on sensor network infrastructures and real-time sensor data analytics involving cyber-physical systems, wireless sensor networks, cloud computing and participatory sensing. He was an early proponent of the *SensorGrid* architecture. From 2007-10, he was on secondment at A*STAR Institute for Infocomm Research (I2R) Singapore and served as principal scientist and department head of the Networking Protocols Dept. From 2006-09, he was the programme manager of a multi-institution research programme on UWB-enabled Sentient Computing (UWB-SC) funded by A*STAR Singapore. He obtained his Ph.D. and M.A. degrees in Electrical and Information Sciences Engineering from the University of Cambridge, United Kingdom, and was an Edward Clarence Dyason Universitas21 Fellow at the University of Melbourne, Australia. He is an associate editor of the IEEE Internet of Things Journal (IoT-J) and is in the editorial board of the International Journal of Network Management. He was the general chair of the IEEE SECON 2014, IEEE AINA 2011 and IEEE APSCC 2009 conferences.