

Advances on Cloud Computing and Technologies

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Nowadays, with the development of smart phones and wireless technology, mobile user experience (MUE) calls for a new round of innovation. As the ultimate goal of MUE, any information will appear in front of a user as soon as he/she thinks about it. MUE does not only provide broadband connection anywhere, anytime, but also support smooth media services, such as on-demand video content delivery, social media-based service, etc.

However, the limited resources of mobile devices pose a great challenge to enhance MUE. With the explosion of cloud computing, the capacity of mobile devices is improved through seemingly infinite computational and storage resources for rich media applications. Meanwhile, cloud-based video solutions are proposed to meet many technical challenges in the real world. For example, computation-intensive tasks can be transmitted to cloud, which can save a lot of mobile device power. Furthermore, cloud computing can break through the limitations of heterogeneous mobile devices in supporting rich media services.

This special issue includes 12 papers in the research area related to Mobile Cloud Media. With the development of smart phones and wireless technology and the explosion of cloud computing, the capacity of mobile devices is improved through seemingly infinite computational and storage resources for rich media applications. This special issue kicks off with an article on the mobile cloud computing framework,

namely “POEM: On Establishing A Personal On-demand Execution Environment for Mobile Cloud Applications”, co-authored by Huijun Wu, Dijiang Huang and Yan Zhu. The authors propose a mobile cloud application running system that enables mobile devices to easily discover and compose cloud resources for its applications. The proposed system introduces Provisioning Functions (PFs) as the fundamental application components in the mobile cloud, which can be composed by mobile cloud service requesters in the runtime. It utilizes the entire mobile cloud system as the mobile application running platform and the mobile cloud application development is significantly simplified.

In the second article “SmartGW: Enabling Bandwidth-Efficient Group Watching in Cloud Social TV Systems”, Z. Xue proposed a novel approach called SmartGW to support bandwidth-efficient group watching in cloud social TV systems. As a key feature of social TV, group watching allows remote peer viewers to watch TV programs together, and communicate with various communication modalities. SmartGW can minimize the operational cost to support group watching from the perspective of a social TV service provider, while still ensuring good-enough user QoE simultaneously. The article provides practical guidelines on service provisioning for cloud social TV service providers.

In the third article titled “Mining Cloud 3D Video Data for Interactive Video Services”, T. Xu et al. revealed that with an increasing number of cloud-based solutions, data security becomes a vital problem, especially for video data, because it contains sensitive private information. Also one of the main weaknesses of cloud computing lies in data security. The authors propose a media mining cloud architecture with four components, i.e., big 3D video data integration, key encryption, media mining cloud and knowledge representation, which is capable of protecting cloud video data without compromising the transportation time.

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In the article titled “Cost Adaptive VM Management for Scientific Workflow Application in Mobile Cloud”, W. Kim et al. discussed that the existing mobile cloud platforms on workflow application services did not consider the VM management for workflow processing required to assure the users Service Level Agreement (SLA). Especially, to guarantee the SLA composed of deadline and budget issued by users for workflow application services in mobile clouds, the authors proposed the two-phase algorithm with a cost adaptive VM management: the greedy based workflow co-scheduling phase and the placement phase with resource profiling scheme.

The fifth article entitled “Software Defined Mobile Cloudlet”, co-authored by L. Liao et al., proposed a Software Defined Network (SDN) based cloudlet approach to mitigate the integration complexity in current cloudlet solutions. It also analyzed the possibilities to combine SDN to Mobile Cloud Computing (MCC), and developed a proof-of-concept prototype of our proposed SDN based cloudlet approach. The functionality and performance of this prototype is evaluated through a simple test environment emulated by Mininet.

In the paper “CADRE: Cloud-Assisted Drug REcommendation Service for Online Pharmacies”, Y. Zhang et al. proposed a novel cloud-assisted drug recommendation (CADRE), which can recommend users with top-N related medicines according to symptoms. Based on clustering and collaborative recommendation algorithms, CADRE provides customers with sufficient guidelines. Furthermore, with implementation of tensor decomposition, CADRE supports validation and professional drug recommendation based on massive and sparse drug data.

The seventh article entitled “An Efficient RFID Search Protocol based on Cloud” co-authored by D. Zhang et al., analyzed the drawbacks of traditional search technology. It cannot work when the cardinality of the wanted tags is larger than covered tags. Besides, it assumes that the reader has a powerful capacity which is adequate for computation. Then the authors propose an iterative tag search protocol based on the cloud, which overcomes the defects of the traditional methods. It uses multi-rounds communication on behalf of one-round communication and requests cloud service to help do computation. The proposed scheme significantly improves the search efficiency.

In the eighth article, “A Skip-gram-based Framework to Extract Knowledge from Chinese Reviews in Cloud Environment”, F. Zhao et al. presented a novel framework to extract knowledge from Chinese review data. For Chinese reviews, a skip-gram-based model is used to train review data and generate the knowledge space. To quickly build knowledge space, the authors also propose an algorithm based on hierarchical softmax is proposed, which does not need any feature extraction and modelization. This algorithm is applicable for massive data and conveniently extended in cloud environment.

Experiments on real eBusiness dataset show the framework is practical and efficient.

The ninth article “Improving Energy Efficiency for Mobile Media Cloud via Virtual Machine Consolidation”, co-authored by Y. Dong et al., proposed energy efficient VM consolidation, which explores diverse resource demands of applications. The authors formulate the mixed linear programming problem under a general framework with an empirical power model. For homogeneous media cloud, the minimum energy consumption and the number of physical machines in operation are derived. For heterogeneous media cloud, the article reveals a lower and an upper bound of the energy consumption and the number of physical machines in operation.

In the tenth article, “CFSF: On Cloud-based Recommendation for Large-scale E-commerce”, L. Hu et al. proposed a large-scale e-commerce recommendation named CFSF, using smoothing and fusion for e-commerce provider. In CFSF, it significantly the scale of Collaborative Filtering (CF) problem in recommender systems by mapping from the entire large-scale item-user matrix to a locally reduced item-user matrix. Furthermore, CFSF achieves high levels of accuracy and scalability with smoothing and fusing strategies for the locally-reduced item-user matrix.

The eleventh article entitled “Cross-Layer Software-Defined 5G Network”, co-authored by M. Yang et al., proposed a cross-layer software-defined 5G network architecture, consisting of two software-defined programmable components, the control plane and the cloud computing pool, which enable an effective control of the mobile network from the global perspective and benefit technological innovations. The proposed architecture significantly benefits the convergence towards heterogeneous networks and enables much more controllable, programmable and evolvable mobile networks.

In the twelfth article, “Cloud-Assisted Speech and Face Recognition Framework for Health Monitoring”, M. Hossain et al., proposed a cloud-assisted speech and face recognition framework for elderly health monitoring, where handheld devices or video cameras collect speech along with face images and deliver to the cloud server for possible analysis and classification. In the framework, a patient’s state such as pain, tensed, etc. is recognized from speech and facial expression, and sent to the remote care center, healthcare professionals and providers for necessary services in order to provide seamless health monitoring.

In the end, we would like to thank all the authors who submitted their research work to this special issue. We also appreciate the contribution of many experts in the field who have participated in the review process and provided constructive suggestions to the authors to improve the contents and presentations of the articles. In particular, we would like to thank Professor Imrich Chlamtac, the Editor-in-Chief, for his support and helpful suggestions during the very delicate stages of concluding the special issue.