Special Issue of the IEEE Transactions on Emerging Topics in Computing on Emerging Mobile and Ubiquitous Systems Part I

Over the last few years, there has been a renewed interest in the area of mobile and ubiquitous systems, like Internet of Things and mobile cloud computing. Research advances in this area promise to transform our world with systems that will far exceed those of today in terms of: effectiveness, adaptability, autonomy, energy efficiency, precision, reliability, safety, usability, scalability, stability and user-centric applicability. The special issue of TETC on Emerging Mobile and Ubiquitous Systems devoted to recent advances in addressing challenges on emerging systems, applications, networking, middleware, data management and services for mobile and ubiquitous computing. The Call for Papers was issued in late 2013, with the submission deadline set to 1 March 2014. We have received overwhelming submissions, and ultimately 11 high quality papers have been selected in the first part of this special issue.

The papers can be broadly classified according to their primary focus. Papers in the first group are on emerging techniques for ad-hoc, sensor, and vehicular networks. The paper “Quality-aware target coverage in energy harvesting sensor networks” by Xiaojiang Ren et al study the sensing coverage problem in an energy harvesting duty-cycled sensor network deployed for monitoring a set of targets for a given monitoring period. The paper “A distributed gateway selection algorithm for UAV networks” by Feng Luo et al propose a distributed gateway selection algorithm with dynamic network partition by weakening the asymmetry information phenomenon such that the partition can be adaptively adjusted to keep the whole network topology stable even though UAVs are moving rapidly. In vehicular networking, the paper “MMCD: cooperative downloading for highway VANETs” by Kaoru Ota et al propose an effective cooperative downloading algorithm for drive-thru Internet systems that minimizes the average delivery delay of each request of vehicular users while maintaining the high downloading throughput, while the other “S-Aframe: agent-based multi-layer framework with context-aware semantic service for vehicular social networks” by Xiping Hu et al present an agent based multi-layer framework with context-aware semantic service to support the development and deployment of context-aware applications for vehicular social networks. The last paper “AFDA: asynchronous flipped diversity ALOHA for emerging wireless networks with long and heterogeneous delay” by Lei Zheng et al design and evaluate a random media access control protocol for emerging wireless environments, e.g., underwater acoustic sensor networks, where the propagation delay is long, heterogeneous, and varying.

Another important topic is on mobile cloud and mobile Internet, as exemplified by the techniques proposed in the following papers. The paper “Just-in-time code offloading for wearable computing” by Zixue Cheng et al investigate the strategy of offloading a portion of computation tasks from wearable devices to local mobile devices or remote cloud with a novel just-in-time objective, i.e., maximizing the quality-of-experience acquired from the execution of delay-sensitive tasks on wearable devices. Motivated by the potentials of complementing the ubiquitous data gathering capabilities of wireless sensor network with the powerful data storage and data processing abilities of mobile cloud computing, the paper “Towards offering more useful data reliably to mobile cloud from wireless sensor network” by Chunsheng Zhu et al propose a scheme for their integration focusing on how to reliably offer data that are more useful to the mobile users from wireless sensor network to cloud. In particular, the usefulness of sensory data is achieved by considering the time and priority features of the data requested by mobile users. The paper “Characterizing user behavior in mobile Internet” by Jie Yang et al study the mobile user behavior with detailed multi-dimension analysis on data usage, mobility pattern and application usage by using the real traffic data collected from mobile Internet. Their major discovery is that both data usage and mobility pattern are closely related to the application access behavior of the users, providing the basis for designing appropriate mechanisms in resource provision and mobility management relying on different categories of applications.

Finally, the following three papers deal with security for emerging mobile and ubiquitous systems. The paper “User-habit-oriented authentication model: toward secure, user-friendly authentication for mobile devices” by Jamie Seto et al introduce a user-habit-oriented authentication model, where mobile users can integrate their own habits or hobbies with user authentication on mobile devices. They also propose a rhythm based authentication scheme, providing the first proof of concept toward secure user-habit-oriented authentication for mobile devices. Experimental results show
that the proposed scheme has high accuracy in terms of false rejection rate and is able to protect from attacks caused by credential disclosure. Another paper “A cross-layer secure communication model based on discrete fractional fourier transform” by Hong Wen et al investigate practical solutions toward the construction of unconditionally secure mobile communication systems based on discrete fractional Fourier transform via cross-layer approach. The last paper “Enabling efficient multi-keyword ranked search over encrypted cloud data through blind storage” by Hongwei Li et al exploit the searchable encryption for multi-keyword ranked search over the blind storage system by utilizing the relevance score and k-nearest neighbor techniques. Security analysis demonstrates that the scheme can achieve confidentiality of documents and index, trapdoor privacy, trapdoor unlinkability, and concealing access pattern of the search user.

In conclusion, the papers presented in this special issue demonstrate the breadth and diversity of research in the field of emerging mobile and ubiquitous systems. We wish to thank both the authors and the reviewers for their hard work in helping us assemble this special issue. We would also like to express our sincere gratitude to the Editor-in-Chief, Professor Fabrizio Lombardi, for providing this opportunity and lots of guidance throughout the process, and the editorial staff of TETC for their continuous support and professionalism.

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