Editorial

Al-Sakib Khan Pathan*

International Islamic University Malaysia,
Kuala Lumpur 53100, Malaysia
Email: sakib@iium.edu.my
Email: sakib.pathan@gmail.com
*Corresponding author

Muhammad Mostafa Monowar

King Abdulaziz University,
Jeddah 21589, Saudi Arabia
Email: hemal.cu@gmail.com
Email: monowar@ieee.org

Hani Alzaid

King Abdulaziz City for Science and Technology,
Riyadh 11442, Saudi Arabia
Email: hmalzaid@kacst.edu.sa
Email: hani@wsn-security.info

Mohammad Asadul Hoque

East Tennessee State University,
Johnson City, TN 37614, USA
Email: hoquem@etsu.edu
Email: asad1752@gmail.com

Biographical notes: Al-Sakib Khan Pathan received his PhD in Computer Engineering from Kyung Hee University, South Korea in 2009. He received his BSc in Computer Science and Information Technology from Islamic University of Technology (IUT), Bangladesh in 2003. He is currently an Assistant Professor at Computer Science Department in International Islamic University Malaysia, Malaysia. His research interest includes wireless sensor networks, network security, and e-services technologies. He has served as a Chair, organising committee member, and TPC member in numerous international conferences/workshops. He is also serving as an editor of several renowned journals. He is a senior member of IEEE.

Muhammad Mostafa Monowar is an Assistant Professor at the Department of Information Technology, Faculty of Computing and Information Technology, King Abdulaziz University, Saudi Arabia. He received his PhD in Computer Engineering from Kyung Hee University, South Korea in 2011 and BSc in Computer Science and Information Technology from Islamic University of Technology (IUT), Bangladesh in 2003. His primary research interests are wireless networks, especially routing protocols, MAC mechanisms, IP and transport layer issues, cross-layer design, QoS provisioning and energy efficiency of ad hoc, sensor, body sensor and mesh networks. He is active with various editorial and PC roles in journals and conferences.

Hani Alzaid is an Assistant Research Professor at the Center for Cybersecurity, King Abdulaziz City for Science and Technology (KACST), Saudi Arabia. He received his PhD from Queensland University of Technology (QUT), Australia, in 2010, and Master degree in Computer Science and Engineering from University of New South Wales (UNSW), Australia in 2005. He received his Bachelors degree in Computer Engineering from King Saud University, Saudi Arabia in 2000. His broader research interests are in WSNs and IoT Security. He has served as TPC member in several international conferences/workshops. He is serving as a Chairman for the consultancy committee at the Saudi Computer Society.

Mohammad Asadul Hoque received his PhD and MS in Computer Science from the University of Alabama in 2012 and 2010, respectively. His received his BS in Computer Science and Engineering from Bangladesh University of Engineering and Technology (BUET), Bangladesh in 2006. His research interests include high performance computing, parallel and distributed computing, wireless network, vehicular ad hoc network (VANET), and computer architecture. He is active in various editorial boards of journals and in programme committees of international conferences and workshops. He is a member of IEEE.

Various networking technologies and terms have been coined in the last couple of decades. The dynamism in networking technologies and applications has paved the way for work on multitudes of research areas. While some areas can be broken into more sub-areas and topics, there is a trend among researchers to think about combining different technologies. The term *hybrid* is commonly used for such case. So, what is the basic difference between the two terms: *hybrid* and *converged*? Often people talk about combining the physical structure, or various device platforms, or benefits, or services, or features of different technologies to get a hybrid system. However, the term *network convergence* or more specifically *converged network* goes beyond the notion of network hybridisation or hybrid network. In the field of telecommunication, network convergence refers to the provision of telephone, video and data communication services within a single network. So, while *hybrid* simply refers to combining apparently disjoint technologies/services, *convergence* refers to the appropriate mixing and smooth functionality of the joint system. That is why a converged network demands one pipe to deliver all forms of communication services. There is little doubt that the process of network convergence is primarily driven by the development of technology and demand. One of the primary goals of such integration is to deliver better services and lower prices to consumers. Instead of paying for each service or technology separately, users may be able to access a wider range of services and choose among more service providers, which would put the users as the main beneficiaries as well as ensuring the provider's profit. In fact, convergence allows service providers to adopt new business models, offer innovative services, present special offers, and enter new markets.

Another definition of network convergence or simply *convergence* could be given as a broad term used to describe emerging telecommunications technologies, and network architecture used to migrate multiple communications services into a single network. It means the future networks are also included in this concept. In some literature, a formal definition of a converged network is given like: a cross national perspective, as integration and digitalisation. Integration, here, is defined as "a process of transformation measure by the degree to which diverse media such as phone, data broadcast and information technology infrastructures are combined into a single seamless all purpose network architecture platform". Digitalisation is not so much defined by its physical infrastructure, but by the content or the medium. Sometimes by digitalisation we mean "breaking down signals into bytes consisting of ones and zeros"; as simple as that!

To address the issue and understand it from practical perspectives, we may observe that many recent initiatives such as next generation networks (NGN) and IP multimedia subsystems (IMS) have been undertaken to provide a seamless architecture for various access technologies, which harmonise with the objectives set by network convergence. Besides other innovative approaches, by integrating different technologies – service delivery platforms (SDP) and IMS, for example – easy service delivery, execution and management are now possible. Other issues, such as point-to-point and broadcasting communications, data and multimedia oriented services, mobile and cellular systems, fast fibre and mobility, remain challenging tasks and, to say the least, the end-to-end picture is still unclear.

On the other hand, there are efforts, such as 6LoWPAN [IPv6 over low power wireless personal area network (WPAN)] and ubiquitous sensor networks (USN), that try to connect resource-constrained sensor networks to the internet to provide a ubiquitous environment, and are supporting the concept of the internet of things (IoT) in some way. This leads to a highly distributed network of devices communicating with human beings as well as with other devices. With such convergence processes, with the increase of heterogeneity, it becomes very difficult to ensure proper interactions among devices in a unified manner. Lots of challenges come forward and there are too many yet to get satisfactory solutions.

Given the status quo, it can be said that even though the recent advances in network convergence offer new realities, there are several research challenges and issues that need to be addressed. For example, the heterogeneity of networks imposes difficulties and challenges in ensuring network security, quality of service (QoS) provisioning, route optimisation, and so on. Applications relying on underlying mechanisms could perform well or satisfactorily when the underlying mechanisms can meet the expected standard levels of their operations.

Our primary focus of this special issue was to get papers from a wide range of topics including; next generation networks, IMS and related technologies, integration of IMS and SDP, internet protocol television (IPTV) architectures and standards, security issues in future networks, IPTV/IMS management, QoS and quality of experience (QoE) provisioning, triple-play (3P) and quadruple-play (4P) service provisioning, accounting and billing, regulatory issues, streaming services over wired/wireless access networks, 6LoWPAN architectures

and standards, mobility issues in 6LoWPAN, route optimisation, and other related topics. By QoE, we mean the quality of user experience, which is a subjective measure of a customer's experiences with a service (web browsing, phone call, TV broadcast, call to a call centre, etc.). It is related to but differs from QoS, which attempts to objectively measure the service delivered by the vendor; QoS measurement is most of the time not related to customers directly, but to media/multimedia technology (e.g., customers do not complain in technical terms such as 'the jitter is too high' or 'latency is not satisfactory'!).

It is understood that now-a-days wireless networks have become an integral part of our daily technical life. Though the impact of wireless networking was more or less assessed since the advent of basic wireless technologies, today's vast and dynamic features of various wireless applications might not have had been accurately envisaged. Today, the types of wireless network range from cellular networks to ad hoc networks, infrastructure-based networks to infrastructure-less networks, short range networks to large range direct communication wireless networks, static wireless networks to mobile networks, and so on. Hence, some works have addressed the wireless networking issues or the issues that can also be applied in wireless networks as parts of the solutions to the convergence concepts.

From the perspective of the objective of this special issue, we have become largely successful in getting papers from all spheres of network convergence from all over the globe. Among all submitted papers, we have been able to finally include only a limited number of papers, each of which went through a rigorous review process. Some of the high quality papers have been selected from the 5th International Conference on Internet and Distributed Computing Systems (IDCS 2012) and the 6th International Conference on Network and System Security (NSS 2012). The authors were required to address the reviewers' comments received from the conferences as well as the comments in the second phase of the review for being considered for this special issue.

As we know, a special issue preparation takes lots of efforts both from the editors and the contributing authors. There are others also involved in the entire process starting from the Editor-in-Chief of the journal to the journal staffs who helped us at each step by providing guidelines and tackling technical issues related to the submission system or journal policy. We thank all of them heartily. There are also many referees of the submitted papers who we would like to thank for their invaluable service. We want to acknowledge the tremendous interests of the authors in this special issue. Finally, we would like to express the highest gratitude to the Almighty who has given us time in this transient life to accomplish this long, challenging task.