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Guest Editorial

Satellite Systems, Applications and Networking

Whilst satellite systems continue to be at the forefront of broadcast communication service provision, they have an increasingly important role to play in the provision of global Internet services. There has been a strong trend towards convergence of communication services in recent times, with the Internet providing the ideal platform on which to base such convergence. Even traditional circuit-switched applications (such as voice and video streaming) have been shown to work effectively over the Internet. Although the Internet is prevalent in the developed world, satellites are vital to extending this into more remote and sparsely populated regions of the world. It is therefore important that satellite technology is advanced to provide seamless interoperability with the Internet and adequate Quality of Service (QoS) support. The purpose of this special issue is to present research devoted to furthering satellite technology and networking to support the provision of both current and future applications.

The call for papers for this Special Issue has attracted fifteen submissions, originating from six European and two Asian countries, covering a wide range of topics related to satellite systems, applications and networking. Each paper was carefully evaluated through the peer-review process and we subsequently selected eight high quality research papers to be included in this Special Issue. We believe that the selected papers will provide a thorough and useful insight into the latest developments for researchers, engineers, and students interested in satellite communications.

The eight papers are divided into two categories.

Four papers consider issues surrounding the deployment of broadband networks. 'Broadband Satellite Multimedia' by Yim-Fun Hu *et al.* provides a comprehensive review of standardisation activities associated with enabling the interoperability of IP based protocols with satellite specific physical and link layer technologies. A flexible network management architecture is presented which introduces business and operational support functions to allow satellites to effectively integrate with the Internet of the Future. 'A Medium Access Control Scheme for Supporting User Mobility in DVB-RCS/S2 – General Architecture and Functionalities' by Nedo Celandroni *et al.* describes an access scheme designed to support unicast multimedia services over satellite in a mobile environment, compatible with DVB-RCS/S2. Simulation results show the relative merits of random access and contention-free access for short transfers and long-lived connections with mobile vehicles as clients and servers. 'Delivering Triple Play Services over Broadband Satellite Networks' by Gorry Fairhurst *et al.* proposes an extended DVB-RCS architecture to support advanced IP-oriented multimedia, through a QoS subsystem based upon appropriate classification and scheduling of different traffic types. Results demonstrate that triple play services can be supported with acceptable performance over a DVB-RCS system. 'Feasibility Analysis of Zero-Overhead nVOD Protocols in Satellite Channels' by Hector Cerezo-Costas *et al.* investigates the use of near Video-on-Demand protocols with error correction capability over satellite channels. The benefits of satellite systems for video distribution are explored. Alternative error correction methods are

compared in terms of their error correction performance and resource consumption at the client and server.

Four papers focus on routing and traffic control issues.

‘Routing Metrics for Store and Forward Satellite Constellations’ by Hugo Cruz Sánchez and Laurent Franck argues the case for a new approach to characterising the performance of routing computation when applied to store-and-forward networks. Beginning with a review of the classical metrics that are used to define routing performance, the authors proceed to develop a new set of routing metrics specifically designed for store-and-forward networks. Simulation of a low earth orbit satellite constellation operating in store-and-forward mode is used to analyse the performance of the proposed routing metrics. ‘QoE in Multicast Hybrid Networks: Avoiding Bandwidth Wasting with a Double Stage FEC Scheme’ by Paolo Barsocchi and Gabriele Oligeri addresses the challenge of providing quality of experience (QoE) to the end-user for video streaming applications delivered via a hybrid satellite and terrestrial wireless network. A two-stage forward error recovery scheme is shown via simulation to improve system performance and bandwidth efficiency in comparison to established techniques. ‘Linear Quadratic Control of Service Rate Allocation in a Satellite Network’ by Raffaello Secchi *et al.* develops an approach based on linear quadratic optimal control theory to allocating bandwidth to independent traffic queues sharing a limited available bandwidth at a satellite master station by making use of real-time instantaneous or delayed information on the queues’ state. A simulated geostationary satellite scenario employing Digital Video Broadcast – Return Channel via Satellite (DVB-RCS) is used to test the approach. ‘Satellite Constellation Networks for Aeronautical Communication: Traffic Modeling and Link Load Analysis’ by Anton Donner *et al.* considers the use of non-geostationary satellite constellations employing inter-satellite links (ISLs) for the provision of air traffic control and air passenger communication services. Following the modelling of multiservice traffic and aircraft movement using actual flight data, two policies for routing are analysed based on minimising handovers and the number of hops within the ISL segment, respectively.

We would like to thank Prof. Habib F. Rashvand (Editor-in-Chief) and Mr. Paul Rowley for their excellent support in preparing this Special Issue. It has been a pleasure working with them. We are very grateful to the reviewers for taking time to provide considered reviews, and would also like to thank all the authors who submitted their work for consideration in this Special Issue.

We hope readers enjoy reading the following high quality papers that address satellite systems, applications and networking.

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BIOGRAPHIES



Dr Paul D. Mitchell received his MEng and PhD degrees from the University of York, UK in 1999 and 2003 respectively. He has industrial experience from BT and QinetiQ and has been a lecturer in the Communications Research Group at the University of York since 2005. His research expertise and interests include medium access control, sensor networks, queuing theory, traffic modelling and system level simulation. He is a Senior Member of the IEEE.



Prof Ray E. Sheriff is Professor of Electronic Engineering at University of Bradford, UK. He received a BEng degree from University of Leeds, UK, in 1986. He then worked within the satellite communications industry before taking up a Lectureship in 1991 with University of Bradford, UK, where he received his PhD in 1995 and MBA in 2010, respectively. His research interests are in the fields of mobile and satellite communication networks, and technology enhanced learning. He is a Fellow of the IET.