

Guest editorial

Space Communications Journal – Special issue on “Satellite Networks for Mobile Services”

In recent years we have been witnessing a tremendous growth of high speed Internet access supporting broadband applications e.g., medical imaging, distance learning, audio and video streaming around the globe. However, a reasonable high-speed Internet access does not exist for the rural dwellers as opposed to the urban area users. Such a “digital divide” gap can be easily bridged by Mobile Satellite Systems.

Even though traditionally satellite communications provide global coverage and reliability for Fixed Satellite Services (FSS) and Mobile Satellite Services (MSS), satellite systems using GEOs suffer from large propagation delays and error-prone links. Moreover, satellite networks for mobile users suffer from challenges such as low available transmission power, frequency regulations, handover and synchronization. To fully realize the integrated satellite and terrestrial networks servicing global multimedia applications with Quality of Service (QoS) guarantees, many technical challenges on radio resource management and QoS provisioning must be addressed by the researchers and system developers.

For mobile satellite systems, efficient resource management strategies considering mobility and the adaptation to channel variations using advanced modulation and coding schemes is very critical. In addition, handover management protocols have to be investigated. Several efforts are now being pursued to define new communication systems for mobile users, such as: Universal Mobile Telecommunications Systems via Satellite (S-UMTS) and the mobile extension of Digital Video Broadcasting – Second Version (DVB-S2). Many application scenarios, including aeronautics, railways and land mobile users are driving the current mobile satellite networks designs. The main focus of this special issue is to address the technical challenges such as resource management, protocol de-

signs, handover management, QoS delivery and inter-networking.

This special issue of the Space Communications journal on “Satellite Networks for Mobile Services”, brings together (i) some of the best papers of the International Workshop on Satellite and Space Communications 2006 (IWSSC’06) held in Leganés, Madrid, in September 14–15, 2006 and (ii) other invited papers from experts in the field. All these papers were reviewed by experts in the appropriate areas.

The first paper “Introduction of mobility aspects for DVB-S2/RCS broadband systems” by *Catherine Morlet, Ana Bolea Alamañac, Gennaro Gallinaro, Lars Erup, Peter Takats, Alberto Ginesi* addresses the emerging application of mobility to DVB-S2/DVB-RCS systems. This paper presents possible techniques applicable to different market segments for both the forward and the return links of the system, with associated performance and impact on the standards. A standardization activity within DVB is also presented to study and identify the adaptations required to the DVB-RCS and possibly also to the DVB-S2 standard in order to support broadband mobility.

The second paper “The development of broadband satellite interactive access system based on DVB-S2 and mobile DVB-RCS standard” by *Pansoo Kim, Dae-Ig Chang and Ho-Jin Lee* describes three different systems to provide mobile satellite services, such as MoBISAT, BcSAT and STC. The characteristics of all these systems are surveyed with a special attention to the promising train scenario.

Christian Kissling, Cristina Párraga Niebla, Núria Riera Díaz, Sandro Scalise authored the third paper “DVB-S2/RCS suitability for the provision of air traffic management services” on the planning scenario and the possibility to provide Internet connection via satellite link in order to meet QoS requirements in terms of

coverage, availability, priority and integrity. The large capacity available in Ku and Ka band allows for a cost-effective design that supports ATM services, including safety-critical applications. It has been shown that DVB-S2/RCS can be flexibly adapted and used in different network architectures.

Following, the fourth paper “Traffic management in HSDPA via GEO satellite” by *Giovanni Giambene, Samuele Giannetti, Cristina Párraga Niebla, Michal Ries, Aduwati Sali* investigates packet scheduling aspects for S-UMTS transmissions based on Satellite – High Speed Downlink Packet Access (S-HSDPA) in a geostationary bent-pipe configuration. Video traffic traces have been used to evaluate the objective video quality achieved at the application layer, considering the impact of physical medium behavior, link adaptation and scheduling techniques. In particular, different scheduling options have been compared for the forward path showing that the Proportional Fairness scheduler with Exponential Rule (PF-ER) permits to achieve the best performance for video traffic.

The provision of application traffic access to passengers on planes has been addressed in the fifth paper authored by *José Radzik, Alain Pirovano, Na Tao, Michel Bousquet*, titled: “Satellite system performance assessment for In-Flight Entertainment and Air Traffic Control”. This study has been focused on the DVB-RCS return link where challenging problems are raised for the resource allocation process. The fundamental hypothesis is the use of extremely high frequencies in Ka-band for the return link. A network-level simulation model has been developed using OPNET and some preliminary results have permitted to demonstrate the technical feasibility of such system.

The sixth paper by *Maria Koletta, Marios Poulakis, Georgios Tsalmas, Philip Constantinou*, titled: “A software tool for the prediction of the interference produced by high-speed mobile satellite systems to the fixed service” addresses an in-depth analysis of the interference produced between MSS and FSS operating in the same frequency bands and proposes a new method (implemented in a Java-based program) for the development of coordination areas around the FSS receivers, taking into account parameters such as the velocity of the mobile earth stations and their frequency of passage around specific locations.

In closing, we would like to thank all the authors for their excellent contributions. We also thank the reviewers for their valuable comments and suggestions in refining the quality of the papers. We appreciate Professor Michel Bousquet for his support and Mrs. Dan-

guole Bagdanaviciene for her help in the publication process. Finally, we hope that the readership will find these papers interesting.

S.L. Kota biography



Sastri Kota (skota@harris.com): Dr. Kota received his B.S. Physics from Andhra University, B.S.E.E. from BITS, Pilani, M.S.E.E. from Indian Institute of Technology (IIT), India. He received the Electrical Engineer’s Degree from Northeastern University, Boston, USA and PhD in Electrical and Information Engineering from University of Oulu, Finland. Since 2003 he has been a Senior Scientist in Harris Corporation involved with Corporate Technologies and Standards with special emphasis on Wireless and Mobile Ad Hoc Networks, satellite communication networks and Standardization. He is an Adjunct Professor in the Telecommunications Laboratory of University of Oulu. His research interests include wireless and mobile information networks, satellite IP networks, QoS and traffic management, broadband satellite access, and ATM networks. Over the years, he held technical and management positions and contributed to military and commercial communication systems at Loral Skynet, Lockheed Martin, SRI International, The MITRE Corp and Xerox Corp. He has been very active in telecommunications and networking standards development. Currently he is the US chair for ITU-R, Working Party 4B and International Rapporteur for Ka-Band Fixed Satellite Systems. He was the chair for Wireless ATM Working Group and has been an ATM Forum Ambassador. He was the recipient of the ATM Forum Spotlight award and Golden Quill award from Harris Corporation for his contributions to Broadband Satellite Communications and Assured Communications.

Dr. Kota is the principal author of the book *Broadband Satellite Communications for Internet Access* published by Kluwer Academic Publishers, and is the

co-editor of book “Emerging Location Aware Broadband Wireless Ad Hoc Networks” by Springer, and has contributed book chapters to Encyclopedia of Telecommunications, John Wiley & Sons, High Performance TCP/IP Networking, Prentice Hall and Modeling and Simulation Environment for Terrestrial and Satellite Networks, Kluwer Academic Publishers. He has published and presented over 120 technical papers in book chapters, journals, and conference proceedings. He served as a guest editor for IEEE Communications Magazine, Special Issues on *Cross-Layer Protocol Engineering for Wireless Mobile Networks*, *Satellite ATM architectures*, *Broadband Satellite Network Performance*, and International Journal of Satellite Communications and Networking, Special Issue on *Satellite IP QoS*. He currently serves on the editorial boards of International Journal of Satellite Communications and Networking (Wiley Interscience), and International Journal of Space Communications (IOS Press). He is an Industry Advisory Board member of Rochester Institute of Technology and CRUISE Project.

Dr. Kota has been a keynote speaker, invited speaker and panelist at various International Conferences. He is the Unclassified Technical program Chair for MILCOM 2007. He also served as Tutorial chair and Asst. Technical chair of MILCOM 2004, 1997, 1990; symposium chair, co-chair of satellite Communications symposium of GLOBECOM 2000, 2002 and invited session chair of PIMRC 2004, 2005 and 2006. He was the co-chair of Wireless Communications and networking symposium of GLOBECOM 2006 and Technical chair of ISWPC 2007. He has been a member of technical program committees of several IEEE, AIAA, SPIE and ACM conferences and workshops. He is a senior member of IEEE, Associate Fellow of AIAA and member of ACM.

G. Giambene biography



Giovanni Giambene (giambene@unisi.it) was born in Florence, Italy, in 1966. He received the Dr. Ing. degree in Electronics from the University of Florence, Italy, in 1993 and the PhD degree in Telecommunications and Informatics from the University of Florence, Italy, in 1997. From 1994 to 1997, he was with the Electronic Engineering Department of the University of Florence, Italy. He was Technical External Secretary of the European Community COST 227 Action, entitled “Integrated Space/Terrestrial Mobile Networks”. He also contributed to the Resource Management activity of the Working Group 3000 within the RACE Project, called “Satellite Integration in the Future Mobile Network” (SAINT, RACE 2117). From 1997 to 1998, he was with OTE of the Marconi Group, Florence, Italy, where he was involved in a GSM development program. In the same period he also contributed to the COST 252 Action (“Evolution of Satellite Personal Communications from Second to Future Generation Systems”) research activities by studying the performance of *Packet Reservation Multiple Access* (PRMA) protocols suitable for supporting voice and data transmissions in low earth orbit mobile satellite systems. In 1999 he joined the Information Engineering Department of the University of Siena, Italy, first as research associate and then as assistant professor. Since 2003, he teaches the advanced course of Telecommunication Networks at the University of Siena. From 1999 to 2003 he participated to the project “*Multimedialità*”, financed by the *Italian National Research Council* (CNR). From 2000 to 2003, he contributed to the activities of the “Personalised Access to Local Information and services for tOurists” (PALIO) IST Project within the fifth Research Framework of the European Commission (www.palio.dii.unisi.it). At present, he is involved in the SatNEx network of excellence of the FP6 programme in the satellite field, as work package leader of two groups on radio access techniques and cross-layer air interface design (www.satnex.org). He is also vice-Chair of the COST 290 Action (www.cost290.org), entitled “Traffic and QoS Management in Wireless Multimedia Networks” (Wi-QoS). He is author or co-author of the following books: (i) A. Andreadis, G. Giambene, “Protocols for High-Efficiency Wireless Networks”, Kluwer Academic Publishers, February 2003, ISBN 1-4020-7326-7, Boston, MA; (ii) G. Giambene, “Queuing Theory and Telecommunications: Networks and Telecommunications”, Springer, May 2005, ISBN 0-387-24065-9, New York, NY; (iii) G. Giambene (Ed.), “Resource Management in Satellite Networks: Optimization and

Cross-Layer Design”, Springer, April 2007, ISBN 978-0-387-36897-9, New York, NY. Dr. Giambene is IEEE member and author of more than 60 papers in international journals and conferences. His research interests

include third-generation mobile communication systems, medium access control protocols, traffic scheduling algorithms, and queuing theory.