Personal Satellite Services

5th International ICST Conference, PSATS 2013
Toulouse, France, June 27-28, 2013
Revised Selected Papers
Preface

It is our pleasure to welcome you to the 5th International Conference on Personal Satellite Services (PSATS) held in Toulouse, France during 27–28 June 2013.

Technology advances in communications together with changes in the regulatory framework are paving the way for next generation satellite systems. Broadband on the move, improved spectrum efficiency, flexible payloads are the keywords. These evolutions foster advances both for the end-users and the satellite operators, yielding opportunities for new value-added services including those that blur the frontiers between Earth observation, telecommunications and positioning. The legacy role of satellite communication as bearer of broadband and broadcast services is also confirmed as the need for global multimedia distribution rises.

In addition to that, the gap between terrestrial and the so-called space communication technologies is getting narrower. The space segment is now the natural bridge among heterogeneous networks providing flexible capacity wherever and whenever needed.

The Personal Satellite Service conference, confirms through its 5th edition that there is a need for a scientific forum where these evolutions are prepared. The conference provides a multifaceted floor for technology and networking where all R&D actors including academic and industrial researchers, practitioners, and students can meet and discuss. In organizing PSATS 2013, we were delighted to work with a dedicated team of volunteers whose efforts ensured a strong two day programme. The tireless work of these volunteers helped to ensure that PSATS continues to be a reputed conference in the area. We are grateful to the TPC chairs Dr Marie-Josée Montpetit (Cambridge MA, USA) and Dr. Daniel Lucani (Instituto de Telecommunicacoes Porto, Portugal). Thanks to their efforts, PSATS has a strong and focused technical programme. PSATS 2013 has 18 regular papers, 3 tutorials and 3 demos in diverse topics under Personal Satellite Services. The Technical Programme Committee of PSATS 2013 deserves a special mention, since their efforts have lead to a selective and strong technical programme. We thank the industrial chair Mr. Nicolas Chuberre (Thales Alenia Space, France), publicity chair Prof. Laurent Franck (Télécom Bretagne, Institut Mines Télécom, France), demos and tutorial chairs Dr. Emmanuel Dubois (CNES, France) and Dr. Fabrice Arnal (Thales Alenia Space, France), publications chair Dr. Lorenzo Mucchi (University of Florence, Italy), local organising chair Dr. Emmanuel Chaput (IRIT-ENSEEIHT, France). We are grateful to the web chair Dr. Julien Fasson (IRIT-ENSEEIHT, France) for a high quality and superb website. We are particularly grateful to the conference coordinator Ms Erica Polini (EAI, Italy). Her timely feedback and suggestions has ensured the organization of this two day program. We thank the venue manager and conference coordinator Ms. Elisa Mendini (EAI, Italy). Lastly, we are grateful to
the Steering Committee and the Advisory Committee for their support to the conference.

PSATS 2013 is proud to welcome Mr. Hugo Gonzales Perez, the programme officer for broadband and mobile initiatives at CNES (Centre National des Etudes Spatiales, France), as our keynote speaker. He will set the tone of the topic during the two days of the conference, with a special focus on new challenges for satellite communications.

PSATS 2013 includes three tutorials by experts in the area. The first tutorial, in the networking domain, entitled “Emergency Communications” is offered by Prof. Laurent Franck, Telecom Bretagne, France. The second tutorial, in the telecommunication domain, entitled “Advanced Techniques for Forward Error Correction for Future Satellite Systems” is presented by Prof. Jérôme Lacan, ISAE, France. The third tutorial entitled “Advanced Access & Networking Techniques for Future Aeronautical Systems Aided by Satellite” is offered by Mr. Christian Kissling, scientific researcher working in the Institute of Communications and Navigation at the German Aerospace Center (DLR), Germany. We sincerely hope that the delegates will find the state-of-the-art tutorials useful.

PSATS 2013 also included a panel discussion session of the topic: “Hybrid Satellite/Terrestrial Networks”. This session aims at discussing the most interesting scenarios combining satellite and terrestrial network technologies in the context of the future 5G network infrastructure. This session will bring in the view of the satellite operators, satellite research centres, SMEs and universities on the future role of satellite communications in our everyday life. We would also like to thank all the members of the panel session, and all the student volunteers of PSATS 2013.

PSATS has traditionally received strong support from industry over the years. This year as well, our corporate sponsors, have generously supported us with funds that enable us to hold a high quality conference. We thank our sponsors: ICST, Centre National des Etudes Spatiales (CNES, France), Institut National Polytechnique de Toulouse (INPT, France), Institut National de Recherche en Informatique (IRIT, France) and ASI, Italy, for their generous financial support. We thank Thales Alenia Space (TAS, France) for the technical support.

We thank all the authors and speakers for their technical contributions and the attendees for their participation. Given the excellent technical program and the hard work put in by all the organizers, we are sure that you will all have an intellectually stimulating and enjoyable PSATS 2013. We wish you a pleasant stay in Toulouse, France and we hope you will greatly enjoy the conference!

June 2013

Riadh Dhaou
André-Luc Beylot
Organization

Program Committee

Carlos Aguilar  
Paolo Barsocchi  
Matteo Berioli  
Carlo Caini  
Nedo Celandroni  
Bernhard Collini-Nocker  
Michaël Crosnier  
Haitham Cruickshank  
Philip A. Dafesh  
Franco Davoli  
Vincent Deslandes  
Roberto Di Pietro  
P Fabio Dovis  
Alban Duverdier  
Benoît Escrig  
Gorry Fairhurst  
Julien Fasson  
Carles Fernandez-Prades  
Alberto Gotta  
Gentian Jakllari  
Igor Kotenko  
Ajay Kulkarni  
Michele Luglio  
Muriel Medard  
Maria Luisa Merani  
Gabriele Olingeri  
Athanasios Panagopoulos  
Charly Poulliat  
Anand Prasad  
Jose Radzik  
Patrice Raveneau  
Cesare Roseti  
Renaud Sallantin  
Raffaele Secchi  
Aaditeshwar Seth  
Petia Todorova  
Alexey Vinel

XLIM, France  
ISTI-CNR, Italy  
German Aerospace Center (DLR), Germany  
University of Bologna, Italy  
ISTI-CNR, Italy  
University of Salzburg, Austria  
ASTRIUM, France  
University of Surrey, UK  
The Aerospace Corporation, USA  
CNIT, Italy  
EADS-Astrium, France  
University of Rome, Italy  
Politecnico di Torino, Italy  
CNES, France  
IRIT, France  
University of Aberdeen, UK  
IRIT, France  
CTTC, Spain  
ISTI-CNR, Italy  
IRIT, France  
SPIIRAS, Russia  
Cisco Systems, USA  
University of Roma2, Italy  
Cambridge MA, USA  
University of Modena & Reggio Emilia, Italy  
ISTI-CNR, Italy  
ICCS-NTUA, Greece  
IRIT, France  
NEC Corporation, Japan  
ISAE, France  
IRIT, France  
University of Rome, Italy  
IRIT, France  
University of Aberdeen, UK  
IIT Delhi, India  
Fraunhofer Institut FOKUS, Germany  
SPIIRAS, Russia
Conference Organization Credits

Steering Committee
Imrich Chlamtac Create-Net, Italy
Kandeepan RMIT, Australia
Sithamparanathan ESOA/Eutelsat, France
Agnelli Stefano University of Genoa, Italy

Advisory Committee
Giovanni Giambene University of Siena, Italy
Fun Hu University of Bradford, UK
Vinod Kumar Alcatel-Lucent, France

General Chairs
Riadh Dhaou IRIT-ENSEEIHT, France
André-Luc Beylot IRIT-ENSEEIHT, France

Industrial Chair
Mme Isabelle Buret Thales Alenia Space, France

Publicity Chair
Laurent Franck Telecom Bretagne, France

Demos and Tutorial Chairs
Emmanuel Dubois CNES, France
Fabrice Arnal Thales Alenia Space, France

Publications Chair
Lorenzo Mucchi University of Florence, Italy

Local Organising Chair
Emmanuel Chaput IRIT-ENSEEIHT, France

Conference Coordinators
Erica Polini EAI, Italy

Website Chair
Julien Fasson IRIT-ENSEEIHT, France
TPC Chairs
Marie-Josée Montpetit Cambridge MA, USA
Daniel Lucani Instituto de Telecommunicacoes Porto, Portugal

Technical Program Committee
Carlos Aguilar XLIM, France
Paolo Barsocchi ISTI-CNR, Italy
Matteo Berioli German Aerospace Center (DLR), Germany
Carlo Caini University of Bologna, Italy
Nedo Celandroni ISTI-CNR, Italy
Bernhard Collini-Nocker University of Salzburg, Austria
Michaël Crosnier ASTRUM, France
Haitham Cruickshank University of Surrey, UK
Philip A. Dafesh The Aerospace Corporation, USA
Franco Davoli CNIT, Italy
Vincent Deslandes EADS-Astrium, France
Roberto Di Pietro University of Rome, Italy
Fabio Dovis Politecnico di Torino, Italy
Alban Duverdier CNES, France
Benoit Escrig IRIT, France
Gorry Fairhurst University of Aberdeen, UK
Julien Fasson IRIT, France
Carles Fernandez-Prades CTTC, Spain
Alberto Gotta ISTI-CNR, Italy
Gentian Jakllari IRIT, France
Igor Kotenko SPIIRAS, Russia
Ajay Kulkarni Cisco Systems, USA
Michele Luglio University of Roma2, Italy
Muriel Medard Cambridge MA, USA
Maria Luisa Merani University of Modena & Reggio Emilia, Italy
Gabriele Oligeri ISTI-CNR, Italy
Athanasios Panagopoulos ICCS-NTUA, Greece
Charly Pouliiat IRIT, France
Anand Prasad NEC Corporation, Japan
Jose Radzik ISAE, France
Patrice Raveneau IRIT, France
Cesare Roseti University of Rome, Italy
Renaud Sallantin IRIT, France
Raffaealo Secchi University of Aberdeen, UK
Aaditeshwar Seth IIT Delhi, India
Petia Todorova Fraunhofer Institut FOKUS, Germany
Alexey Vinel SPIIRAS, Russia
Table of Contents

Satellite for Emergency and Aerocommunication

DTN LEO Satellite Communications through Ground Stations and GEO Relays.................................................... 1
Pietrofrancesco Apollonio, Carlo Caini, and Martin Lülf

Airborne Base Stations for Emergency and Temporary Events .......... 13
Alvaro Valcarce, Tinku Rasheed, Karina Gomez, Sithamparanathan Kandeepan, Laurent Reynaud, Romain Hermenier, Andrea Munari, Mihael Mohorcic, Miha Smolnikar, and Isabelle Bucaillé

A Realization of Integrated Satellite-Terrestrial Communication Networks for Aeronautical Services via Joint Radio Resource Management ......................................................... 26
Yongqiang Cheng, Kai J. Xu, Anju Pillai, Prashant Pillai, Yim Fun Hu, Muhammad Ali, and Adeel Ahmed

On the Impact of Link Layer Retransmissions on TCP for Aeronautical Communications ........................................ 38
Nicolas Kuhn, Nicolas Van Wambeke, Mathieu Gineste, Benjamin Gadat, Emmanuel Lochin, and Jérôme Lacan

Satellite and Wireless Links Issues in Healthcare Monitoring......... 49
Rahim Kacimi and Ponia Pech

Satellite for networking

Content Delivery in Hybrid Networks Using SatTorrent ................. 65
Bernd Klasen

Efficient Synchronization of Multiple Databases over Broadcast Networks .......................................................... 77
Muhammad Muhammad, Stefan Erl, and Matteo Berioli

Study on Research Challenges and Optimization for Internetworking of Hybrid MANET and Satellite Networks ......................... 90
Ye Miao, Zhili Sun, Fang Yao, Ning Wang, and Haitham S. Cruickshank

Security Architecture for Satellite Services over Cryptographically Heterogeneous Networks ................................. 102
Yingli Sheng, Haitham S. Cruickshank, Martin Moseley, and John Ashworth
### Resource Management

**Manlio Bacco, Pietro Cassarà, Erina Ferro, and Alberto Gotta**

Performance Evaluation of SPDY over High Latency Satellite Channels ................................................ 123  
**Andrea Cardaci, Luca Caviglione, Alberto Gotta, and Nicola Tonellotto**

Fuzzy Based CRRM for Load Balancing in Heterogeneous Wireless Networks .................................................. 135  
**Muhammad Ali, Prashant Pillai, Yim Fun Hu, Kai J. Xu, Yongqiang Cheng, and Anju Pillai**

Flexible QoS Support in DVB-RCS2 ................................. 146  
**Ziaul Hossain, Arjuna Sathiaseelan, Raffaello Secchi, and Gorry Fairhurst**

### Air Interface

Impact of the Railway Centerline Geometry Uncertainties on the Train Velocity Estimation by GPS ......................... 156  
**Guoliang Zhu, Lionel Fillatre, and Igor Nikiforov**

A Satellite Radio Interface Compatible with Terrestrial 3GPP LTE System .................................................. 162  
**Hee Wook Kim, Taechul Hong, Kunseok Kang, and Bon-Jun Ku**

Physical Channel Access (PCA): Time and Frequency Access Methods Simulation in NS-2 ........................................ 174  
**Nicolas Kuhn, Olivier Mehani, Huyen-Chi Bui, Jérôme Lacan, José Radzik, and Emmanuel Lochin**

Spatial Filtering for Underlay Cognitive SatComs .................... 186  
**Shree Krishna Sharma, Symeon Chatzinotas, and Björn Ottersten**

Network Coding Advantage over MDS Codes for Multimedia Transmission via Erasure Satellite Channels ............. 199  
**Paresh Saxena and M.A. Vázquez-Castro**

### Author Index

.................................................. 211