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The Satellite and Space Communications (SSC) Committee is a volunteer group actively involved in advancing satellite and space communication technologies within the IEEE. This committee is approved by the IEEE Communications Society and is governed by the constitution and bylaws of the IEEE as well as the other twenty Technical Committees in the Society.

**SATELLITE & SPACE**

**- JOIN US -**

All conference attendees are welcome to join us in the SSC Committee meeting.

**Place:** Helsinki Fair Center  
**Room:** C7, First Floor  
**Date:** Wednesday June 13<sup>th</sup>  
**Time:** 7:00 am - 8:30 am

**Future SSC Meetings**

Nov. 2001 (GC) San Antonio  
 April 2002 (ICC) New York  
 Nov. 2002 (GC) Taipei

**ICC 2001 SSC Committee Activities**

Tutorial TU09: Mobile and Wireless Internet-  
 Protocols and Services  
 Monday June 11, 8:30 – 12:00, Half Day  
 A. Jamalipour and G. Omidyar

Wednesday, 13 June, 07:00 - 08:30, Breakfast and  
 SSC Technical Committee Meeting

Session G63: Advanced Technology for Satellite  
 Communications  
 Thursday June 14, 8:30 – 12:00

Session G76: Information Networks for Satellite  
 Communications  
 Thursday June 14, 13:30 – 17:00



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## SSC COMMITTEE OFFICERS

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## MESSAGE FROM THE CHAIR

*Iwao Sasase*

The Satellite and Space Communications Technical Committee (SSC TC) is a volunteer group actively involved in advancing satellite and space communication technologies within the IEEE. SSC TC is approved by the IEEE Communications Society (ComSoc) and is governed by the constitution and bylaws of the IEEE as well as the other twenty Technical Committees in the Society. The goal of SSC TC is to be actively on top of the new and revolutionary developments taking place in the field and to make sure that they are made visible to the IEEE ComSoc community via the various conferences and media. In addition, the SSC TC provides a forum to facilitate technical interchange among those working in the field. Toward this objective, we are in the process of formulating plans to attract new members particularly from the industries and organizations at the forefront of these new developments. Currently the SSC TC has over 100 members from academia and industry. The SSC officers are Iwao Sasase for Chair, Ron P. Smith for Vice Chair, and Abbas Jamalipour for Secretary.

The SSC Newsletter is published twice a year and distributed in ICC and GLOBECOM and also electronically at the SSC web site. Secretary Abbas Jamalipour is serving as the Editor and working actively to improve the contents of the SSC Newsletter and SSC Homepage. The SSC TC meeting is held semi-annually at the ICC and GLOBECOM conferences. The SSC TC has been sponsored many technical sessions, tutorials or

workshops on satellite and space communications at ICC, GLOBECOM, MILCOM, and other major IEEE conferences. At GLOBECOM 2000, the SSC TC and Communications System Integration and Modeling (CSIM) TC have jointly organized a symposium titled "Satellite Communications for the New Millennium", two sessions on LEO systems and TCP/IP, and one panel on Future Satellite Communication. Member Sastri Kota was the Chair of the symposium. At ICC 2001, SSC TC sponsors two sessions entitled "Advanced Technology for Satellite Communications", and "Information Networks for Satellite Communications", organized by member Takaya Yamazato. Also, one tutorial on "Mobile and Wireless Internet - Protocols and Services" is organized by member Guy Omidyar and Secretary Abbas Jamalipour. At GLOBECOM 2001, Secretary Abbas Jamalipour organizes a symposium on "Future Satellite Communications for Global IP and ATM Networking."

The SSC TC has also been actively promoting satellite communications systems and technology via professional journals, transactions, and magazine publications. Advisor Desmond Taylor continues to serve as a Senior Editor of the IEEE Journal on Selected Areas in Communications. Member Michel Bousquet serves on the editorial panel of the International Journal of Satellite Communications. Member Marie-Jose Montpetit and Chair Iwao Sasase serve as area editors in radio and satellite communications for the IEEE Communications

## SSC Newsletter

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Surveys Electronic Magazine. Because of the broad range of the technologies involved, and the necessity of integrating and interfacing satellite communications with other networks, the committee has attempted to develop liaisons with other technical committees such as Multimedia Communications, Personal Communications (PC), and CSIM. Vice Chair Ron P. Smith established active working relationship with the American Institute of Aeronautics and Astronautics (AIAA). Member Michel Bousquet served as the General Chair of 2001 AIAA International Communications Satellite System Conference (ICSSC-19). Chair Iwao Sasase established working relationship with IEICE (Institute of Electronics, Information and Communication Engineers of Japan) Technical Groups on Communications Systems and Satellite Communications.

The SSC TC continues to provide a forum to facilitate technical interchange among those working in the field. The current emphases are on the evolution of new satellite and space-based systems and on the applications of emerging technologies to satellite and space communications. With the development of digital technologies, satellites have emerged in the forefront of multimedia delivery techniques. The ability to deliver high performance and cost effective broadband satellite network solutions is essential to the growth of e-Business in emerging markets. Satellite networking is now a well-established solution for the global interconnectivity. Satellite will have a major role in providing a global interconnectivity for the next generation wireless networks where the IP and high-speed broadband applications are the dominant services. Satellite access and network technology will both enable and improve the delivery of broadband Internet, e-Commerce and applications anywhere in the world.

From the coming GLOBECOM 2001, SSC TC will organize a symposium on satellite communications regularly to provide an active forum for researchers and engineers to exchange their new ideas by technical paper presentations and panel discussions. The symposium also intends to bring together various satellite network systems developers

to discuss the current status, technical challenges, standards, fundamental issue, and future services and applications in the form of workshops and tutorials. At ICC2002, a symposium on "Satellite Communications" is organized by Iwao Sasase. At GLOBECOM 2002 two symposia on "Satellite Communications – Systems architectures, Protocols and Services", and "Broadband Wireless" are organized by member Guy Omidyar and Willie W. Lu, respectively. The topics of interest include but not limited to:

- Emerging Satellite Systems and Satellite Network Architectures
- Ka-Band Satellite Communications and Inter-Satellite Links
- IP Protocols and Quality of Service (QoS) for Satellite
- Voice over IP over Satellite ATM
- Internet Services and TCP/IP Performance over Satellite
- New Transport Protocols for Satellite
- Hybrid Satellite and Terrestrial Networks
- Related Standards Status (ITU, ATM Forum, ETSI, TIA and IETF)
- Mobile Satellite Communications and Broadcasting Satellites
- Simulation and Modeling of SATCOM Networks
- On-Board Processing and Switching
- Advances in Coding and Modulation for Satellite Communications
- Reservation Protocols for Satellite Access

Clearly, the field of satellite communications continues to grow rapidly and remains interesting and exciting. We encourage all who are interested in this field to join our committee. Visit our website (<http://www.comsoc.org/socstr/techcom/ssc/>) where you can get all information on SSC TC activities including SSC Charter, Overview, Newsletter, Meeting Minutes, Operating Procedure, SSC Membership, SSC Reviewers, TC Survey, Call for Papers, events, upcoming meetings, and interact with committee.

*Prof. Iwao Sasase, Chair  
Satellite and Space Communications  
Technical Committee*

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## SCANNING THE WORLD

*Ron P. Smith*

In the last issue of this newsletter I mentioned the Direct Satellite Radio market. These systems are now being advertised to consumers and reported in the popular media. It appears that this market is nearing its launch using alliances with auto-makers to provide the first year subscription fees bundled in the price of the automobile. After-market car radios,

portable and home radios will also be available for use with these systems.

I recently returned from Toulouse, France where I attended the AIAA 19<sup>th</sup> International Communications Satellite Systems Conference. This is now an annual conference and has been one of the best technical conferences in the field since it started in

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1966. The remainder of this article will refer to activities at this conference. More information is available through the web at [www.aiaa-icssc.org](http://www.aiaa-icssc.org). Next year ICSSC-02 will be in Montreal in May, follow the link to future conferences for details.

ICSSC-19 was the first to be held in Europe. The Satellite industry of Toulouse including Supaero University and the CNES and ESA organizations made the most of the opportunity to showcase this event. Expert plenary panels and industry tours were highlights in addition to the comprehensive technical sessions and related poster sessions.

The plenary on "Advanced Communications Satellites" featured executives from the industry leaders discussing topics such as the difficulties of LEO phone systems and success of regional GEO phone systems, introduction of satellite radio and the progress toward global GEO broadband systems. Additional plenary covered "Advances in Navigation" and "Emerging Applications and Services."

Throughout the conference, six technical sessions ran in parallel covering 43 topic areas. I attended sessions mostly related to On-Board Processing, Satellite Phone Systems, Spectrum Regulation and Digital Signal Processing. I am glad to have the CD-ROM proceedings to review at my

leisure. You may still be able to order the proceedings if you go to the above web address, follow the links to Past Conferences, ICSSC-19 and then to the Order Form.

There were excellent opportunities for networking with colleagues as well, both at the exhibits and the various meals and social events. The following are two items I learned through networking that others may find interesting. Kul Bhasin of NASA Glenn Research Center is interested in organizing an annual workshop on satellite communication technology geared towards engineers early in their careers. Harald Skinnemoen of NERA-Norway is interested in organizing workshops on satcom standards. If anyone is interested in participating in or helping to organize either of these workshops, please contact either the AIAA Technical Committee on Communication Systems (TCCS) at the web address above or the IEEE SSC TC. Both of these TC's hope to work together to support these and similar activities.

*Dr. Ron Smith, Vice Chair  
Satellite and Space Communications  
Technical Committee*

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### FORTHCOMING GLOBECOM AND ICC CONFERENCES

**Globecom 2001**  
25-29 November 2001  
San Antonio, USA

**ICC 2002**  
28 April - 2 May 2002  
New York, USA

**Globecom 2002**  
November 2002  
Taipei, Taiwan

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### COSPONSORING / RELATED CONFERENCES AND WORKSHOPS

**Milcom 2001** (Oct. 28 - 31, 2001, McLean, VA, USA)  
IEEE Military Communications Conference

MILCOM 2001 marks the 20th year of this premier Military Communications Conference and promises to be one of the best. The conference is being held October 28 - 31, 2001 in suburban Washington, D.C. MILCOM 2001 will have over 60 unclassified and classified technical sessions, several timely panels, six tutorials on important technical topics and several very distinguished speakers. 80 industry exhibitors will demonstrate their latest technologies and systems.

**ICSSC 2002** (May 13-15, 2002, Montreal, Quebec, Canada)  
20<sup>th</sup> AIAA International Communications Satellite Systems Conference (ICSSC) and Exhibit; <http://www.icssc2002.com/>

The theme of the Conference "Satellite Communications: Broadband Access to the World" will focus on new satellite services and applications while addressing more traditional satellite technology topics. The Conference will provide a forum to present advances in communication techniques, ground and on-board technologies, spacecraft and launch vehicles, satellite systems architecture, applications and services in the field of multimedia satellite communications, for fixed, broadcast, mobile, and personal applications.

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#### **SSC Newsflash:**

- ❖ SSC TC mailing list has been established in January 2001 <[ssc@comsoc.org](mailto:ssc@comsoc.org)>; it's open to all SSC members!
- ❖ The new "Distinguished Contributions to Satellite Communications Award" is coming soon from SSC TC!
- ❖ SSC TC membership number exceeded 110!

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**CONFERENCE CALENDAR**


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<b>Conference</b>	<b>Date / Location</b>	<b>Information</b>
<b>APCC2001</b> The 7 <sup>th</sup> Asia-Pacific Conference on Communications	Sept. 17-20, 2001 Tokyo, Japan	Email: <a href="mailto:contact@apcc2001.ieice.org">contact@apcc2001.ieice.org</a> <a href="http://www.apcc2001.ieice.org/">http://www.apcc2001.ieice.org/</a>
<b>PIMRC2001</b> The 12 <sup>th</sup> IEEE Int. Symp. on Personal, Indoor and Mobile Radio Communications	Sept. 30-Oct. 3, 2001, San Diego, CA, USA	TPC: Shuzo Kato, Mitsubishi Wireless, USA <a href="http://www.pimrc2001.org">http://www.pimrc2001.org</a>
<b>VTC 2001 Fall</b> IEEE Semiannual Vehicular Technology Conference	Oct. 7-11, 2001 Atlantic City, NJ, USA	Mr. Arthur Greenberg 50 Boonstra Dr. Wayne, NJ 07470 E-mail: <a href="mailto:a.h.greenberg@ieee.org">a.h.greenberg@ieee.org</a>
<b>MILCOM 2001</b> IEEE Military Communications Conference	Oct. 28-31, 2001 McLean, VA, USA	TPC: Dr. Stephen D. Huffman MITRE Corporation <a href="mailto:shuffman@mitre.org">shuffman@mitre.org</a> <a href="http://www.milcom.org/2001/">http://www.milcom.org/2001/</a>
<b>GLOBECOM 2001</b> IEEE Global Telecommunications Conference	Nov. 25-29, 2001 San Antonio, TX, USA	TPC: Arthur Henley, P.E. E-mail: <a href="mailto:ahenley@comsoc.org">ahenley@comsoc.org</a> <a href="http://www.globecom2001.com/">http://www.globecom2001.com/</a>
<b>WCNC2002</b> IEEE Wireless Communication and Networking Conference	March 18-22, 2002, Orlando, FL, USA	TPC: Larry Milstein, UCSD <a href="http://www.wcnc.org/2002/">http://www.wcnc.org/2002/</a>
<b>ICC2002</b> IEEE Intl Conference on Communication	April 28- May 2 2002, New York City, NY, USA	TPC: Malathi Veeraraghavan, Polytechnic University, USA Email: <a href="mailto:icc2002@poly.edu">icc2002@poly.edu</a> <a href="http://www.icc2002.com">http://www.icc2002.com</a>
<b>ICSSC 2002</b> 20 <sup>th</sup> AIAA International Communications Satellite Systems Conference (ICSSC) and Exhibit	May 13-15, 2002, Montreal, Quebec, Canada	TPC: Chris Hoeber Space Systems/Loral, USA Email: <a href="mailto:hoeber.chris@ssd.loral.com">hoeber.chris@ssd.loral.com</a> <a href="http://www.icssc2002.com/">http://www.icssc2002.com/</a>
<b>INFOCOM2002</b> The IEEE Conference on Computer Communications	June 23-27, 2002 New York City, NY, USA	TPC: David Lee, Bell Labs Research China and Ariel Orda, Technion-Israel Inst. of Tech. <a href="http://www.ieee-infocom.org/2002/">http://www.ieee-infocom.org/2002/</a>

**To all SSC members:** If your postal or e-mail addresses, telephone or fax numbers have been changed, please update them with the committee secretary. You can review our current records on our web page at [www.comsoc.org/socstr/techcom/ssc](http://www.comsoc.org/socstr/techcom/ssc)

## Voice over IP and Satellite

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<sup>3</sup>Universidad de Valladolid

In this article, the implications of the interaction of Voice over IP and satellite systems are discussed. In the first part, the outcomes of an already finished project are described, and in the second a perspective overview of a second project that extends the scope of the former is outlined. Research in this combined field (VoIP+satellite) has been very scarce although we can find recently a good reference at [1] (which addresses mainly the implication of low BER of satellite links in VoIP packets and has therefore different scope than current article), complemented with one from the initial stages of both Voice-over-IP and ATM satellites, [2]. Voice over IP (VoIP) services have strongly emerged as a low-cost alternative to the traditional Public Switched Telephone Network (PSTN) and its potential should be addressed in the satellite field.

Validation of IP-Telephony over EuroSkyWay Network (VIP-TEN) is a project that has been carried out within the European TEN-TELECOM programme, by six partners from industry and academia from Italy, UK and Spain. It has aimed to study the feasibility of IP-telephony services over EuroSkyWay (ESW) network, and evaluating the quality it provides.

ESW is a telecommunication network based on geostationary satellites operating in the *Ka*-band for up/down links, and *V*-band for Inter-satellite Links (ISL). The deployment of ESW is planned in two phases: The first is planned to be operative in 2003, providing coverage of Europe with two satellites and the second is to extend the first-phase coverage to Africa and Asia with three additional satellites. ESW will provide broadband connectivity services and support multimedia interactive applications of the users equipped with small fixed or portable satellite terminals. It is both an access and core network that provides switched capacity on demand. ESW is designed for integration with terrestrial networks in the service area through dedicated gateway stations.

The first part of the project was devoted to adapt IP telephony protocols to the characteristics of geostationary satellite networks in general, mainly due to their high delay, and to ESW in particular. H.323 was the IP telephony protocol chosen and optional parameters of its implementation, like FastConnect, were chosen to make it more suitable for satellite environments. Also adaptations were needed for the interworking of ESW link layer (connection oriented) to IP (non-connection-oriented) and H.323. Regarding the latter, RTP voice packets monitoring was chosen as the best approach to establish ESW connections on demand for voice conversations. Also some fields of the IP/UDP/RTP header were removed in order to allocate one voice packet in only one ESW cell (53 payload bytes).

The Quality of Service (QoS) analysis used for the project was based on the E-model. This model computes the Quality Rate factor, which describes the full acoustic-to-acoustic quality, experienced by a user, for a typical situation using a standard telephony handset. The relation between R and the user perception of quality is defined by ITU-T recommendation G.109, according to the combination of several impairment factors like delay, packet loss, and echo. Theoretical results give a low value for the R factor due to the high delay of the satellite path.

Moreover, ETSI definition of the QoS classes for TIPHON systems according to the end-to-end delay evolved to be more restrictive in the last two years, from an initial limit of 450 ms, changed to 350 ms and finally to 150 ms (ETSI TS 101 329-2 V1.1.1). As a consequence of this, the VIPTEN consortium promoted actions within ETSI to involve TC SES (Technical Committee Satellite Earth Stations & Systems) to take care of GSO (geostationary orbit) networks in TIPHON activities. In the last meeting of TIPHON held in March, there has been a proposal to redefine QoS classes to take into account satellite systems.

A measurement campaign was planned within the scope of the project with various IP-Telephony scenarios (phone-to-phone, phone-to-PC and PC-to-PC), and several measurements such as end-to-end-delay, packet loss and jitter were recorded. Since EuroSkyWay is not available yet, Italsat transport (also *Ka*-band) was used for the campaign. However, a terrestrial simulator of EuroSkyWay on-board processing was used, so that the conditions resembled at most that of the target system.

Figure 1 and 2 show two important results obtained in the validation. Higher mean delay imposed by the satellite is compensated by very low jitter figures, and with almost null packet losses, thanks to an end-to-end communication under a single controlled network.

Future work on this topic will be carried out under the frame of ICEBERGS project (1 year and half), under the European Commission IST programme. This project will address multi-videoconference services over GEO satellites, which are ideally suited for multicast traffic. The service architecture will be based on the Session Initiation Protocol (SIP). The satellite network will be complemented with a portion of terrestrial Internet upgraded to cope with QoS sensitive multicast services. The proposed architecture will maintain the compatibility with the existing best effort Internet. Therefore, extensions devised to previous work are IP video and IP multicast. Project focuses on the study of EuroSkyWay network, with the objective of identifying the elements to introduce in its initial architecture to incorporate this type of services. Also the necessary implications to offer an end-to-end quality of service will be analyzed, in a mixed architecture, combining Internet and satellite.

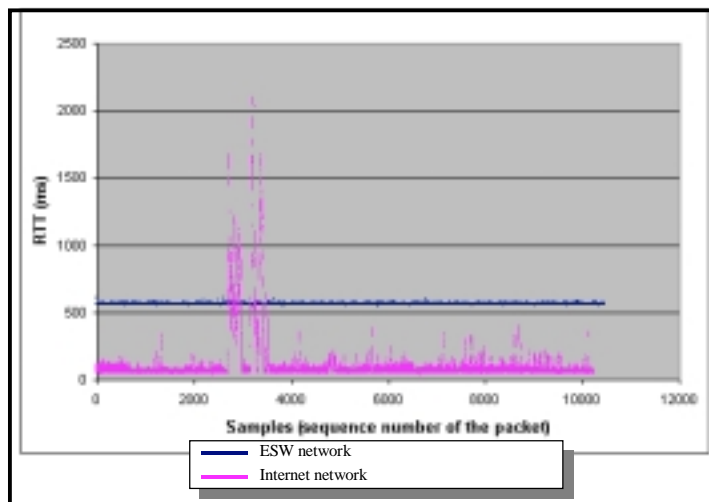


Figure 1. Round trip time comparison.

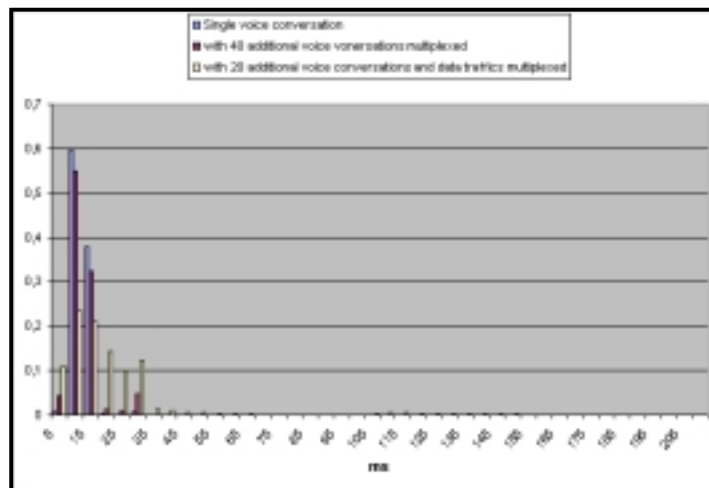


Figure 2. Satellite jitter comparison.

- [1] Thuan Nguyen, Ferit Yegenoglu, Agatino Sciuto, and Ravi Subbarayan, "Voice over IP Service and Performance in Satellite Networks," IEEE Communications Magazine, pp. 164-171, March 2001.
- [2] Koroush A. S. and Norm B: "IP Voice over ATM Satellite: Experimental Results Over Satellite Channels," SPIE Photonics East Conference, Boston, USA, November 1998.

Responsibility for the contents rests upon authors of signed article and not the IEEE or ComSoc or SSC TC or their members.

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## SSC COMMITTEE MEMBERSHIP APPLICATION

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You can participate in the SSC Committee as a member by attending the SSC Committee meeting which is held twice a year during ICC and GLOBECOM conferences or you can participate as an associate member by filling in and mailing the application form below (preferably send an e-mail with the same information). Please note there is no difference between a member and an associate member except that an associate member has never attended an SSC Committee meeting.

The members and associate members can receive various information through the SSC newsletter and on our web page at [www.comsoc.org/socstr/techcom/ssc](http://www.comsoc.org/socstr/techcom/ssc), and also may propose hot topics, workshops and tutorials as well as provide paper reviews for conferences and publications. The members and associate members may provide regional conference / workshop information to the Editor which may appear in the SSC newsletter and on our web page if it is applicable to the committee's charter.

Place  
Stamp  
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