Guest-editorial

ACTS satellite communication projects

The Advanced Communication Technologies and Systems (ACTS) programme, implemented over the 1994–1998 period and sponsored by the European Union, has represented a major effort in support of collaborative research in the field of telecommunication networks, systems and services. The ACTS programme was structured around five main themes of research:

- Multimedia content, tools and technologies;
- Photonic networks;
- High Speed Networking;
- Mobile and Personal Pommunications Systems; and
- Service Engineering and Security.

In each of these domains, the goal was clearly to carry out research in the context of trials, with the objective of validating the technology in as broad a context as possible, including industry, operators and users.

About 200 projects have been implemented under the 670 Meuro financial envelope of the programme. Very high quality results have been achieved in a number of sectors, and the output of the collaborative work has formed the basis to support European positions in a large number of standardisation fora such as ETSI, ITU, and DAVIC. In the multimedia domain, technologies such as interactive TV, virtual reality, picture coding (MPEG 4), content creation and protection (watermarking) have been developed and successfully demonstrated. In the Photonics domain, significant work has been performed in the direction of the 'all optical networks', with pan-European trials of technologies such as WDM (Wavelength Division Multiplexing), optical switching, passive optical networks and all-optical network management. In the high speed networking domain, ACTS has allowed the deployment of the largest world ATM infrastructure. This has been complemented with a number of ATM trials, including satellite links. This work, in turn, has been complemented by an extensive activity on IP evolution and has allowed the validation of a number of QoS concepts retained for Ipv6. In the domain of mobile and personal communications, ACTS projects have largely contributed to the development of the next generation mobile communication systems, and notably to the ETSI decision of January 98 adopting a standard for UMTS. Advanced service concepts such as those developed by the WAP forum, decoupling the application from the underlying network in order to provide full roaming capability, have also been validated through trials. Finally, the Service Engineering domain has developed an open framework for Electronic Commerce, which covers all aspects of an electronic transaction and significantly progressed work on network management to ensure that future high speed and mobile networks both interconnect and inter-work.

In the particular field of satellite communication, it has to be noted that the ACTS programme did not include any specific domain related to satellite technologies and system. The retained approach has been to integrate satellite communication projects of ACTS in the domain where they best fit. Three domains have attracted work on satellite communication:

- *the high speed networking domain*, where satellite projects related to the development of broadband systems for the Fixed Satellite Services and also related to interoperability with terrestrial networks technologies, such as ATM and IPv6, have been supported;
- *the multimedia domain*, which has supported satellite communication projects related to innovative broadcasting systems such as HDTV broadcasting or interactive DBS systems; and finally,
- *the mobile domain* which has supported satellite communication activity primarily in relation to Satellite UMTS (S-UMTS) and its integration with terrestrial networks.

This approach has allowed the fostering of collaborative work between the 'terrestrial projects' and the 'satellite projects', which in turn has helped to demonstrate the interworking capabilities of satcom systems with terrestrial systems, and outlined their capability to

successfully operate with standards and technologies originally developed in a terrestrial context (ATM, IP, UMTS). With the involvement of industry, operators at large and users, ACTS work in the field has usefully complemented the work carried out by Space Agencies such as ESA, which is traditionally more directed to the space industry, even if the total ACTS budget dedicated to satcoms (in the order of 50 Meuro) may appear to be modest compared to space agencies funding.

The four papers presented in this special issue all originate from projects (ACCORD, SINUS, TOMAS and NEWTEST) that have been supported by the ACTS mobile and personal communication systems. They offer a good illustration of the work that has been performed in this domain and, as outlined above, have their main focus on S-UMTS and integration with terrestrial networks.

The first paper, from the ACCORD project, outlines the architectural concepts that have been developed to support broadband satellite mobile communication at Ka-band, which can be considered as a long term evolution of S-UMTS. The work carried out under ACCORD complements the work of another ACTS satellite project, SECOMS, and propose solutions to integrate a Ka-band mobile satellite system with a broadband mobile terrestrial infrastructure also operated at higher frequency bands. The result would notably allow for the development of a mixed satellite-terrestrial infrastructure fully supporting mobility and inter-segment roaming.

The second paper, related to the SINUS project, describes the work carried out in relation to S-UMTS at S-band, and its integration with the terrestrial UMTS component. The project has, in particular, developed a W-CDMA testbed, with characteristics close to the terrestrial W-CDMA option retained for terrestrial UMTS, and performed interworking trials with an ATM based access network, complemented with

mobility management functionalities, provided by the RAINBOW ACTS project.

The third paper, emanates from project TOMAS, which has provided a mobile platform with INMARSAT and EMS space segments to other ACTS projects interested in testing and validating services and application over an advanced satellite mobile platform. This project has notably demonstrated the capability of MPEG 4 video coding to be successfully transmitted and used with a satellite.

Finally, the last paper introduces work that has been carried out at basic technology level by project NEWTEST. In this project, a new approach for equalisation of a non linear non memoryless satellite channel at S-band has been developed, based on utilisation of Neural Networks. Results of the trials are promising and should be applicable to an S-UMTS mobile channel.

These papers give altogether a summary picture of the work that has been performed under ACTS. There is no doubt that work on satellite communication will be further pursued under the IST programme now starting, that will span over the 1999–2002 period. The programme is expected to offer opportunities to satellite communication actors at large to develop and validate technologies and applications, with the objective of demonstrating the technical and economic potential of satellite communications in an ever more competitive sector. In this context, I am particularly grateful to the IOS Press Publishers for this special issue on satellite communications and in particular to Kirsten Wilbrink whose efforts and patience have been invaluable in putting it together.

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