As terrestrial telecoms dial into satellite networks

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Improving the integration of satellite networks with more traditional terrestrial telephone infrastructures, will help next generation telephony move from concept towards reality, as researchers are demonstrating.

Historically, we have been accustomed to using fixed-line infrastructures for traditional telecommunications, cellular networks for mobile services, and satellite architectures for high-capacity links and 'one-to-many' broadcasting. While more and more operators are starting to offer both fixed-line and mobile services, satellite services have remained distinctly separate.

But if the concept of UMTS (Universal Mobile Telephone Services) – of individuals having a single universal number for all their communication services – is ever to become a reality, operators and service providers need to find a way to integrate satellite architectures and their distinct advantages of high-capacity and wide coverage with the more familiar terrestrial infrastructures.

The best of both worlds

Completed in June 2005, the IST-funded SAILOR project demonstrated the viability of combining telecom services from both terrestrial and satellite-based UMTS networks, to produce communication services that combine the best of the advantages from these widely differing infrastructures.

The partners in SAILOR implemented a demonstration platform consisting of a UMTS core network with full IP compatibility, efficient multicast (similar to broadcasting) procedures and two wideband access-network emulators (one terrestrial and the other satellite). The access networks included innovative procedures for resource optimisation (i.e. advanced Connection Admission Control (CAC), Intelligent Segment Selection (ISS) and advanced cellular planning facilities).

"Our main achievement was to develop a complete architecture for terrestrial and satellite-based services, with a working platform to demonstrate how the different service types could be integrated," says project coordinator Arnoldo Giralda of Telespazio in Rome. "Using this platform, we were able to show key functions in potential future services such as telelearning and telemedicine."

What are the advantages of integrating satellite-based services into a UMTS architecture? "Of course a key advantage is satellite's unique one-to-many broadcast or multicast capability," says Giralda. "Satellite services can effectively supply common information using a single channel to users over a wide area. Achieving this coverage with terrestrial networks would entail simultaneous use of large numbers of individual channels."

As for the key advantages of the SAILOR platform, Giralda describes them as:

-- Providing flexibility in terms of quality of services – the platform optimises all the functions to this end.
-- Saving network capacity through the ability to exploit the advantages of satellite technology, i.e. sending very large amounts of information using

the minimum number of communication channels.
-- Minimising the cost of new services for telecoms operators and equipment manufacturers by making possible the design and use of low-cost communication terminals.

Based on an ‘exploitable’ approach

The SAILOR platform embraces high-speed data as well as voice services, and exploits the special features of satellite communication to best advantage, i.e. providing coverage to geographic areas suffering from limited or no telecommunications service (which can include ships at sea as well as land-based destinations), and boosting the bandwidth and hence speed of all connections. The platform also focuses on an ‘exploitable’ approach to combining the different architectures; the services offered are designed to be affordable as well as high-quality.

One important new function for example is in the area of controlling user access to services, to maintain service quality and prevent overload. Says Giralda, “the system provides us with the ability to accept or reject call requests from a user, according to the capacity of the system.”

Another key achievement was the development of an innovative software Cellular Planning Tool to help optimise any integrated terrestrial/satellite cellular network layout. The new tool is designed to help operators plan the optimal cellular-antenna deployment to satisfy traffic needs for a certain area. “The tool enables us to design the deployment and coverage of cellular base stations and antennae so as to minimise the number of satellites required.”

Now that SAILOR is complete, one of the project partners (Siemens) is already investigating how to implement the work undertaken within the project into its organisational procedures. The work on RASN (Radio Access Support Network), which covers the functions involved in interfacing IP networks and mobile architectures, is proving of particular interest.

SAILOR’s results are also feeding into the work of a number of key standardisation bodies, for example that of the Advanced Satellite Mobile Systems S-UMTS task force, where they are providing the market scenarios and innovative technical features to support a range of new services and functions. And they are contributing to the relevant UMTS ETSI and 3GPP standardisation groups, which are involved in developing new market scenarios for the latest satellite systems and the network tools to support them.

Source: IST Results