VIRTUOUS (Virtual Home UMTS on Satellite)

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Action line(s): IST 1999 - IV.5.3, IV.3.2, IV.5.2, IV.2.3
Clusters: Beyond 3G, Satcom

Main Objectives
The VIRTUOUS project has to achieve the following specific objectives:
• design, development and implementation of both an URAN (UMTS Radio Access Network) Radio Technology Independent (RTI) part and two URAN Radio Technology Dependent (RTD) parts able to handle a terrestrial and a satellite link, respectively;
• make available two hardware Test Beds representative of satellite and terrestrial UMTS physical layers respectively;
• definition of the Satellite UMTS components;
• design, development and implementation of appropriate terminal and network Inter-Working Units (IWUs) aiming at integrating the GPRS and the UMTS segments;
• implementation, integration and testing of a demonstrator including three segments: GPRS, terrestrial UMTS and satellite UMTS. This demonstrator is intended to represent the first migration step towards UMTS;
• perform trials of meaningful UMTS service. In this perspective, voice over IP is a candidate for trials.

Technical Approach
The migration path towards UMTS identified by VIRTUOUS foresees two steps. Step 1 will be actually designed and demonstrated, while Step 2, which represents the final UMTS architecture, will only be studied.
• Step 1) In the first step an URAN (i.e. an UMTS Radio Access Network) will be gradually introduced which will provide real UMTS access. The RTI and RTD URAN functions and features will still be limited. In this phase, the URAN will be used to enhance second generation capacity and to provide third generation mobile users with a higher bit rate access (with respect to second generation systems) and with a limited set of (possibly downgraded) UMTS services. In this perspective, the service which is the target for VIRTUOUS demonstration is voice over IP. Moreover, since the third generation coverage is not yet completed, UMTS third generation mobile users are expected to be provided with mobile equipment compatible also with second generation systems, i.e. multi-mode terminals. In order to guarantee the inter-working between UMTS and GPRS, appropriate IWU's are placed both on the terminal and on the network side. On the other hand, the Network IWU has the basic role of enhancing in the UMTS direction the features and functions of a GPRS Core Network node.
• Step 2) In the second migration step the URAN RTI and RTD parts, as well as the Network IWU will be upgraded in order to encompass the whole set of UMTS functions and features. This will allow the deployment of the full set of UMTS services.

Key Issues
The project primarily addresses key action IV (Essential Technologies and systems).
• Network integration, interoperability and internetworking: VIRTUOUS is expected to provide major contributions to this key action, since one of the key objectives of the VIRTUOUS project is just to develop inter-working procedures. In particular, inter-working among second generation (GPRS) and third generation (T-S-UMTS) Access and Core Networks and inter-working among T-UMTS and S-UMTS networks will be addressed. The developed and experimented inter-working procedures will carry into effect the VHE (Virtual Home Environment) concept, namely the ability of the interconnected networks to be perceived by an user travelling through the various access networks, as if the user was roaming in its home network.
• Engineering of intelligent services: VIRTUOUS will address the problem of providing services across heterogeneous networks (i.e. second and third generation terrestrial and satellite networks). In this respect, service negotiation, quality assurance and management in an heterogeneous network will be key issues dealt with in the VIRTUOUS project.
• Terrestrial wireless system and networks: VIRTUOUS is expected to provide major contributions to this key action, since it is expected to develop and experiment 6) meaningful functions of the RTI and RTD parts of the URAN (UMTS Radio Access Networks), (ii) appropriate IWU's. The above-mentioned equipment will deal with fundamental wireless system procedures such as resource management, flow control, signalling, QoS adaptation, intelligent mobility (roaming, handover), etc..
• Integrated satellite systems and services: VIRTUOUS will contribute to the development and experimentation of the S-UMTS standard proposed by the European Space Agency (ESA). Moreover,
VIRTUOUS will integrate the S-UMTS in the URAN; this means that a common RTI (Radio Technology Independent) part between S-UMTS and T-UMTS will be developed. Finally, VIRTUOUS will cope with the problem of inter-working a satellite system with the terrestrial networks (inter-segment mobility procedures, inter-segment QoS adaptation, etc.).

**Expected Impact**

VIRTUOUS will facilitate the introduction of Terrestrial/Satellite - UMTS by
- drawing and demonstrating a viable migration path from second to third generation systems,
- introducing UMTS functions in a modular, flexible and scalable way,
- sponsoring and demonstrating the S-UMTS standard sponsored by ESA,
- designing and demonstrating inter-working procedures among second-third, terrestrial-satellite, Access-Core Networks,
- experimenting attractive UMTS services.

**List of participants**

- Telespazio
- European Business Associates
- University of Rome
- Space Engineering
- TILAB
- University of Aachen
- Siemens Austria
- Thales
- Ascom
- Telefonica

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