# MOICANE

**Multiple Organisation Interconnection for Collaborative Advanced Network Experiments**

**Abstract**

The MOICANE project investigated several aspects related to providing proper end-to-end quality of service (QoS) in the future new generation network environment, on both the theoretical and pragmatic points of view. Eight network islands featuring different access technologies and implementing the IETF IP QoS models, namely IntServ and DiffServ, within their access and core IP networks were set up. Advanced new components such as RSVP/IntServ-aware applications, QoS-aware DiffServ border routers and bandwidth brokers were deployed along with existing equipment. Trials and tests were then performed and the validity of the currently proposed methods for the support and management of QoS IP services in a single and multi-domain context evaluated and assessed.

**Objectives**

The project's main goal was to realise a distributed test-bed interconnecting several network islands, characterized by different access technologies and supporting different services, such as tele-lecturing, virtual-classroom, virtual-laboratory on which test the IETF architectural models for IP Quality of Service, and assess their effectiveness.

In October 2001, the architecture, network elements and applications to be deployed were defined and specified. The development of specific network elements and services was completed in January 2002. The integration of existing and developed elements and services was completed in June 2002.
The Romanian Partners joined the Project in January 2002 and the integration of the Bucharest Islands was completed late in July and the trials were than carried out later in the year.
The MOICANE testbed is shown in the above map. In total, eight islands were realised: one in Portugal (Lisbon), three in Italy (Ivrea, Pisa, Vimercate), two in Greece (Athens) and two in Romania (Bucharest).
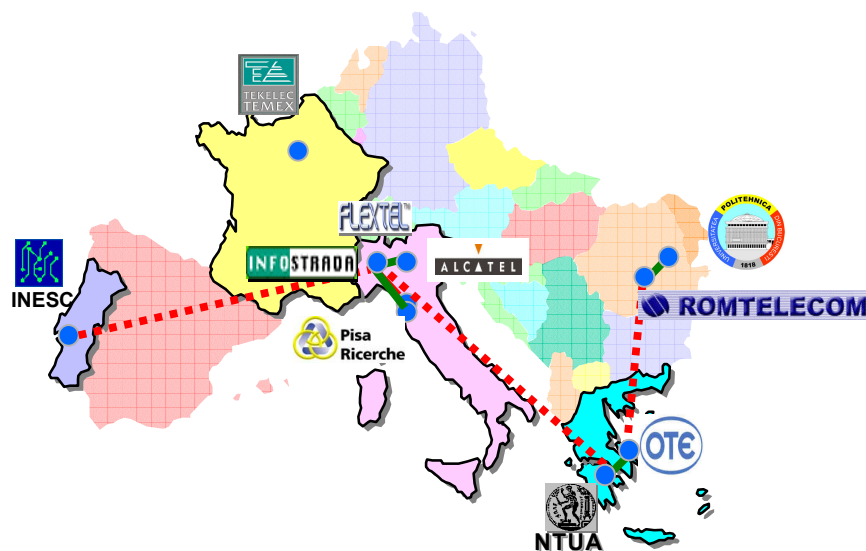
**Technical Approach**

The project considered three network sections namely the access technology, the access IP network and the core IP network. Four different access technologies were deployed:
- Ethernet-based LANs,
- Asymmetric Digital Subscriber Lines (ADSL) allowing high bit rates on existing subscriber copper lines,
- Wireless LAN (both IEEE 802.11b and 802.15 – Bluetooth) addressing mobility related issues,
- Local Multipoint Distribution Systems (LMDS) offering broadband communications to residential and business customers via radio link in a limited area from a local base station.

Provisioning of IP QoS was based on the two architectural models defined by the IETF:
- IntServ, which makes use of explicit reservation of resources for each individual IP flow, in the access IP network,
- DiffServ, which focuses on aggregates of a number of individual flows having identical sensitivity to the delays and losses introduced by the network, in the core IP network.

Studies within the MOICANE project were related to practical operation, management, and performance of implementations of these models both alone and in combination.

Some specific hardware and software network components were developed by the partners. Besides existing and new commercial applications running on hosts, specific applications were developed to match the need of the project especially with regard to their RSVP/IntServ awareness. Specific and commercial applications were used as components of the E-learning and virtual laboratory services that formed the basic traffic for several tests.


**Testbed and Experiments**

The islands used specific as well as commercial network elements and applications. As part of the collaborative work and experiments, each island focused on one or two specific access technologies and results and conclusions were shared with other partners. However, all islands featured standard LANs to support the E-learning service. Most tests were conducted within a each island. Tests between interconnected islands were performed through the national and international links provided by FCCN, GARR, GRNET, ROEDUNET and GEANT.


**Results**

The project contributed to the advance of the state of the art in access technologies and QoS implementation for new generation networks by:
- implementing specific components such as:
  - QoS-aware DiffServ border router,
  - Bandwidth broker,
  - End-to-end QoS measurement, instruments
- integrating them with other commercial network elements,
- testing and validating through the distributed trial the effectiveness of proposed methods for allocating and negotiating resources as well as the efficiency of the relevant communication protocols.


**Innovation**

MOICANE focused on trial and validation aspects. In particular it showed:
- the feasibility of the delivery of an end-to-end transparent IP-QoS transport service across heterogeneous access technologies (wired and wireless) and protocols (e.g.: RSVP, HTTP, H.323, SIP);
- the possibility to bridge to network QoS many legacy end-user QoS-demanding applications (with legacy protocols) without any change by properly enhancing network UNI intelligence;
- that QoS delivery at the UNI is today feasible, and can be engineered in such a way to be scalable, sustainable and market-ready.

**Success Stories**

During its life the Project Partnership was extended involving two Network Operators and a Research Center to ensure an appropriate exploitation of the results, bring in the Project the prospective of Romanian Users and support the EU effort to pave the way to the future enlargement of the EU.

In November 2002, a joint demo with the GEANT and ATRIUM Projects was successfully organised and carried out at the IST 2002 Event in Copenhagen. In that occasion the User controlled activation of end to end QoS over a complex IP Network was successfully demonstrated.

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MOICANE

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Collaboration with other EC funded projects:
ATRIUM

GÉANT

**IST - Research Networking - Research on Networks  - Access Technologies**