AQUILA (IST-1999-10077)

# Adaptive Resource Control for QoS Using an IP-based Layered Architecture

Information Society Technologies
for
*Broadband Europe*

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http://www.ist-aquila.org/

# Outline

- Network Services
- AQUILA Architecture
- Inter-domain QoS
- AQUILA and GÉANT
- Outlook

# Consortium

Siemens, Germany

arvato systems, Germany

Dresden Univ. of Technology, Germany

Salzburg Research, Austria

T-Systems Nova, Germany

Polish Telecom, Poland

NTUA, Greece

Elisa Communications, Finland

CoRiTeL, Italy

Q-Systems, Greece

Telekom Austria, Austria

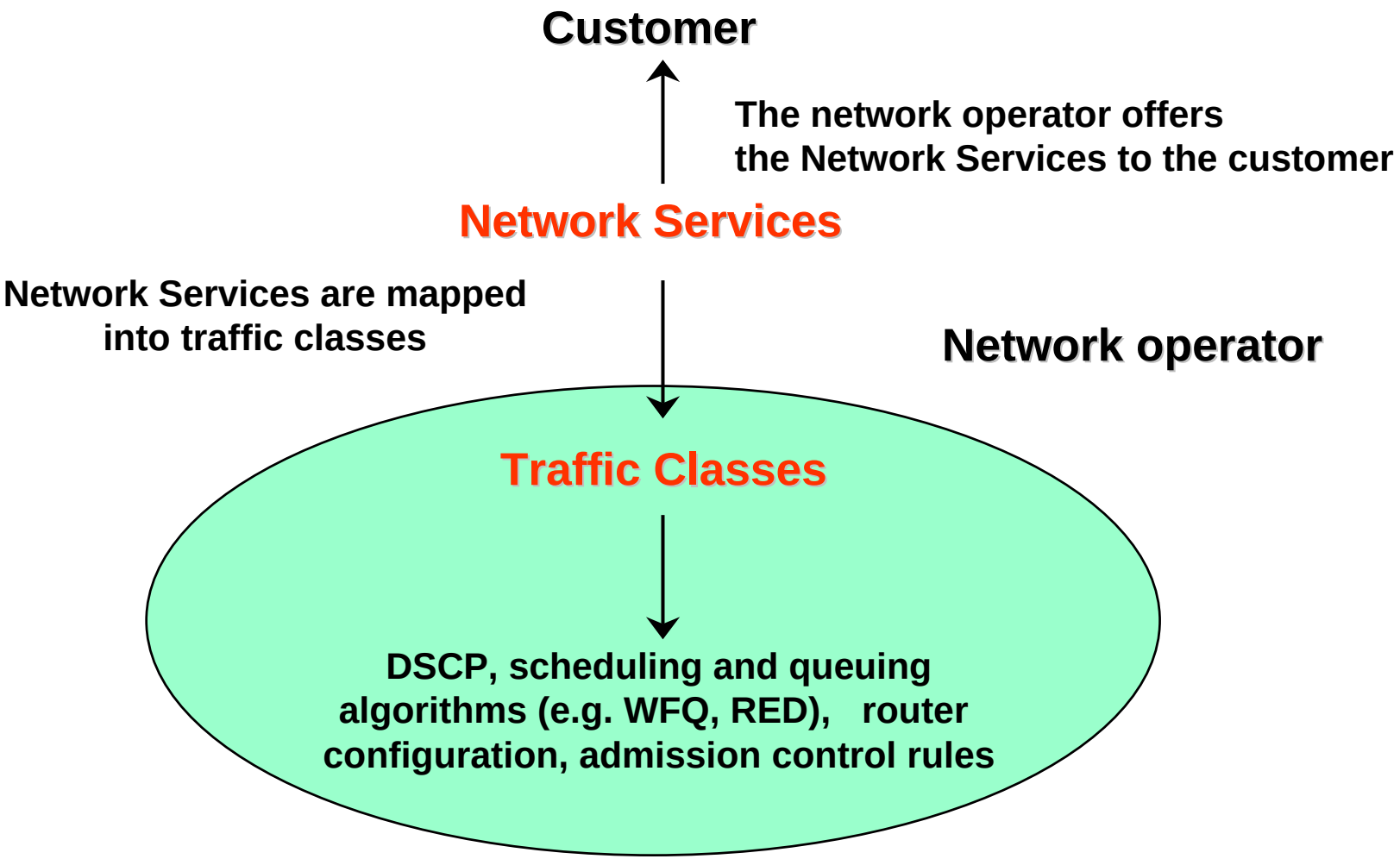
Warsaw Univ. of Technology, Poland

# Main Objectives

- Investigate dynamic end-to-end QoS Provisioning in IP Networks
- Implement Prototypes of a QoS Architecture for a Carrier Grade DiffServ Core Network
- Support a wide Range of Applications by providing a QoS Toolkit / API
- Continuously analyse Customer Requirements, Market Situations and Technological Trends and develop Business Models
- Contribute to Standardisation Bodies like IETF, ITU, ETSI, etc.

# Traffic Classes



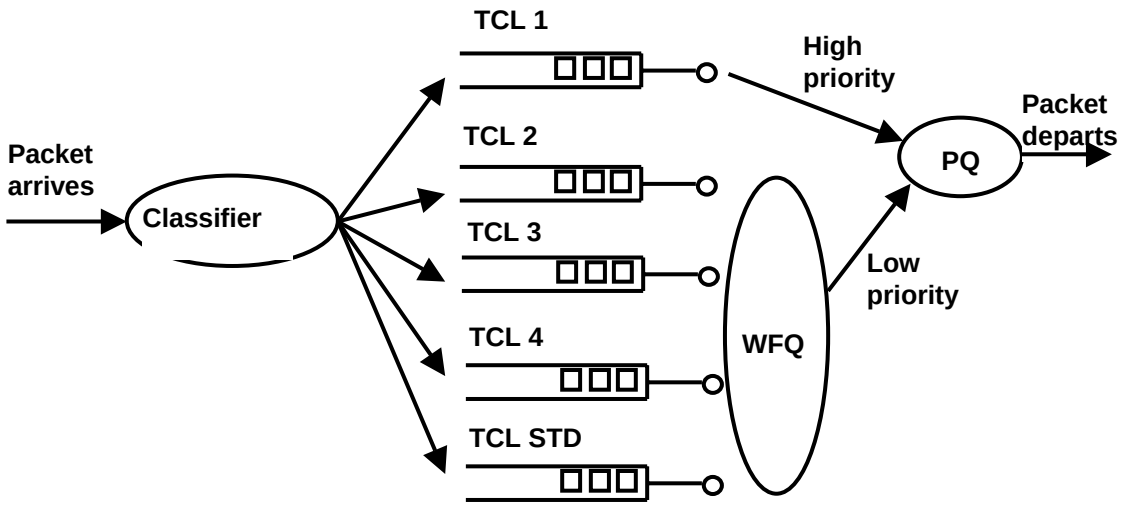

 

# Traffic Classes

- **Five Traffic Classes have been specified**

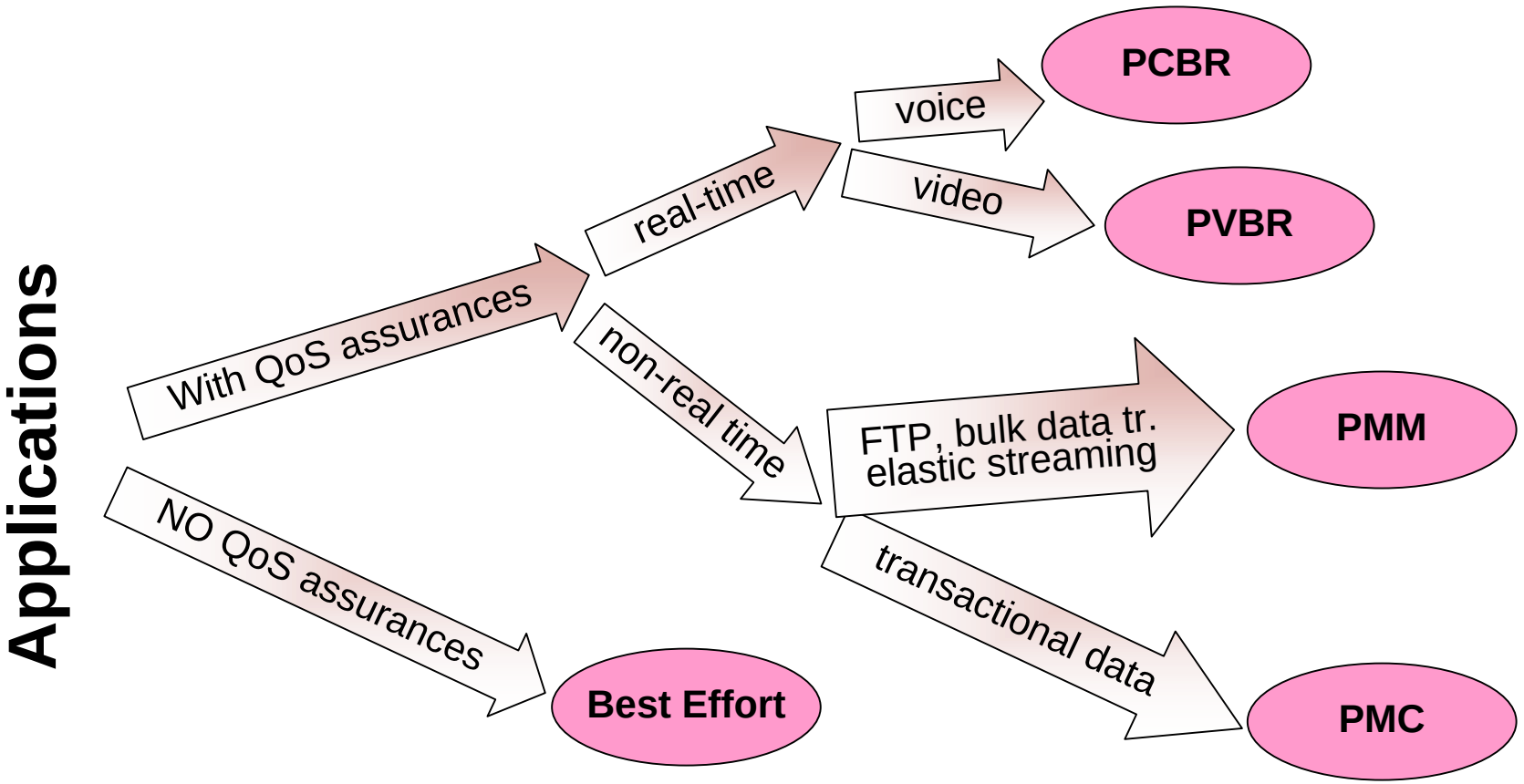
| **Network service** | Premium CBR | Premium VBR | Premium MultiMedia | Premium Mission Critical | Standard |
|---|---|---|---|---|---|
| **Traffic class** | TCL 1 | TCL 2 | TCL 3 | TCL 4 | TCL STD |

- **… as well as the related Traffic Control Mechanisms in the Routers**



# Why different Network Services ?
# An application-oriented perspective…



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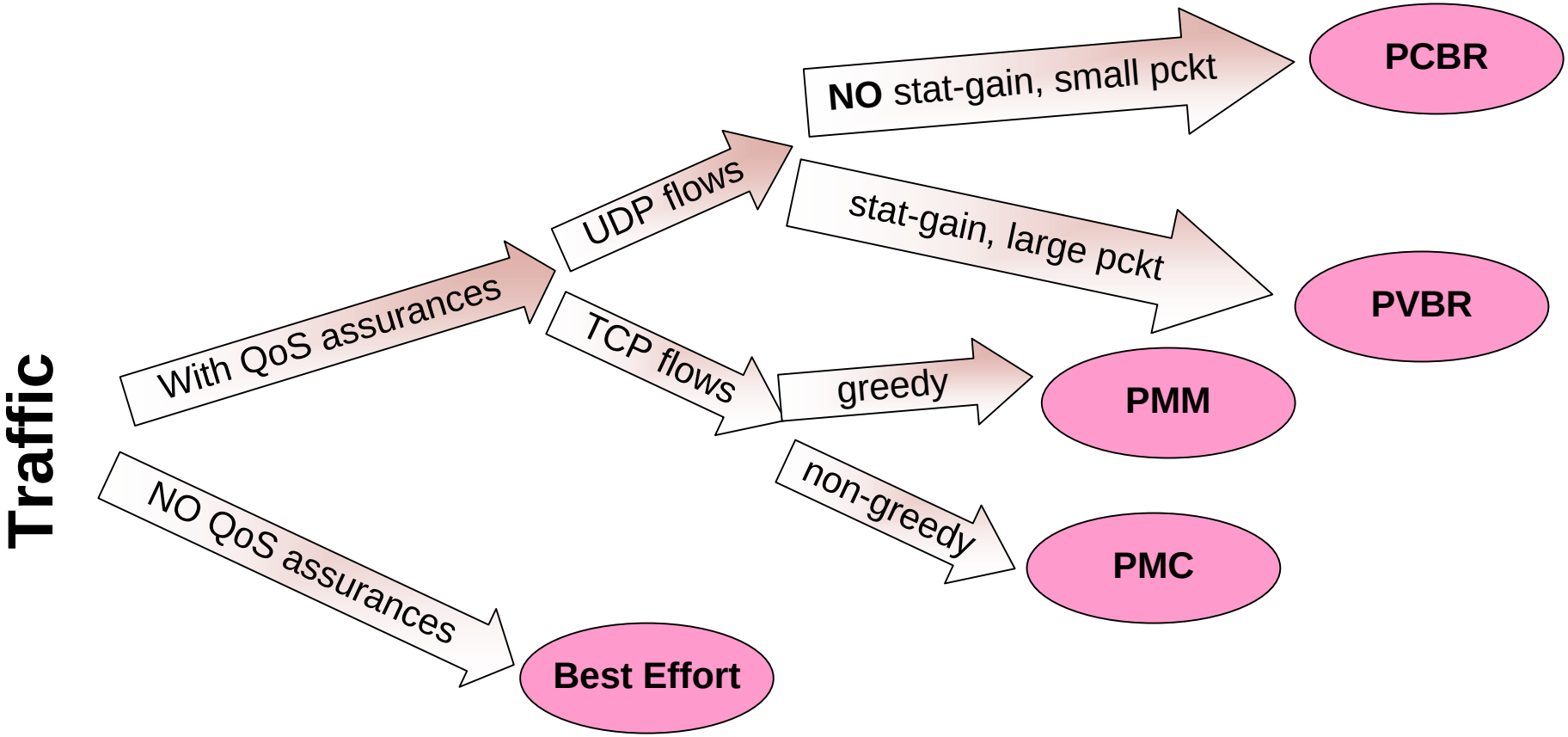
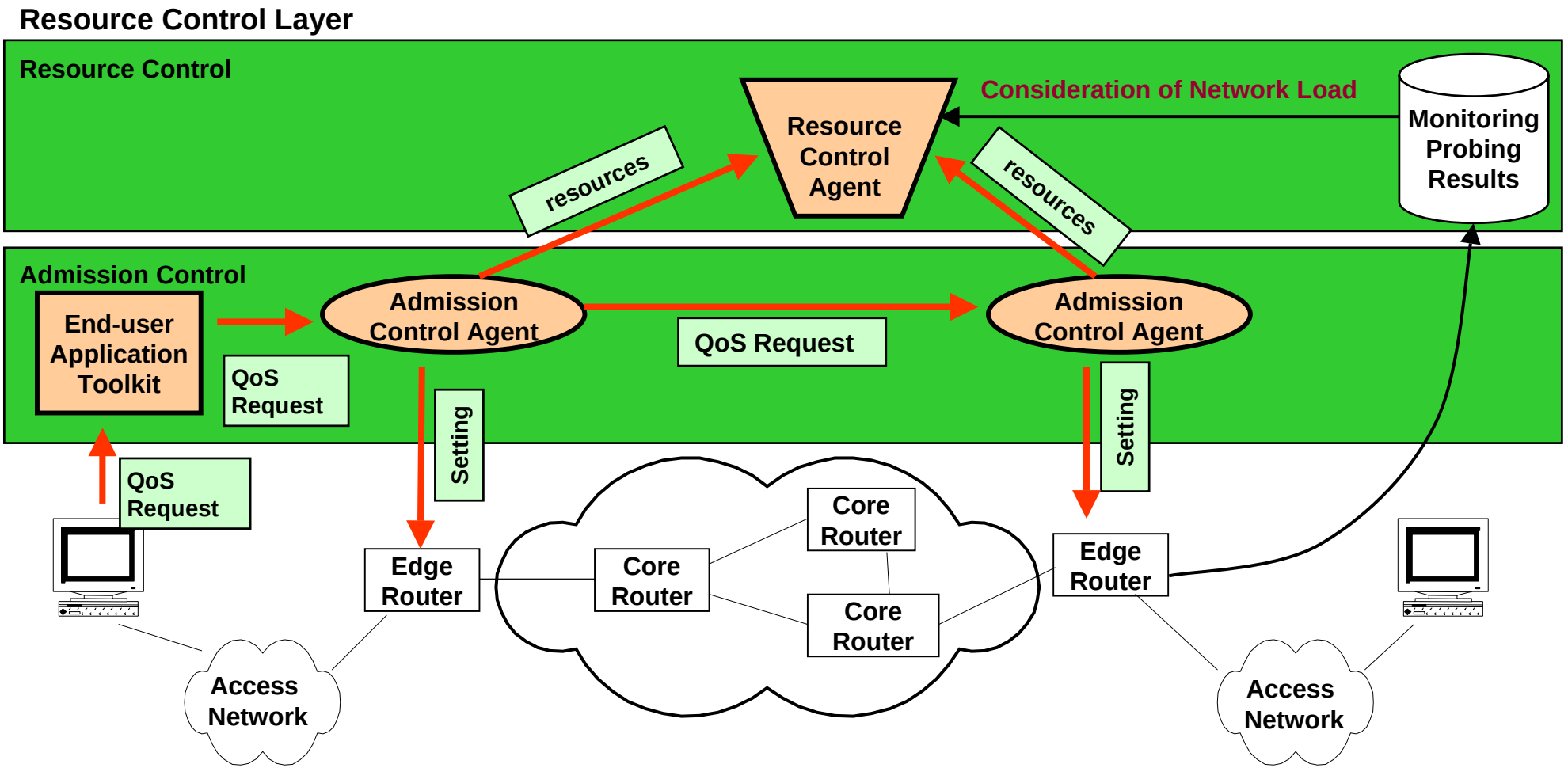


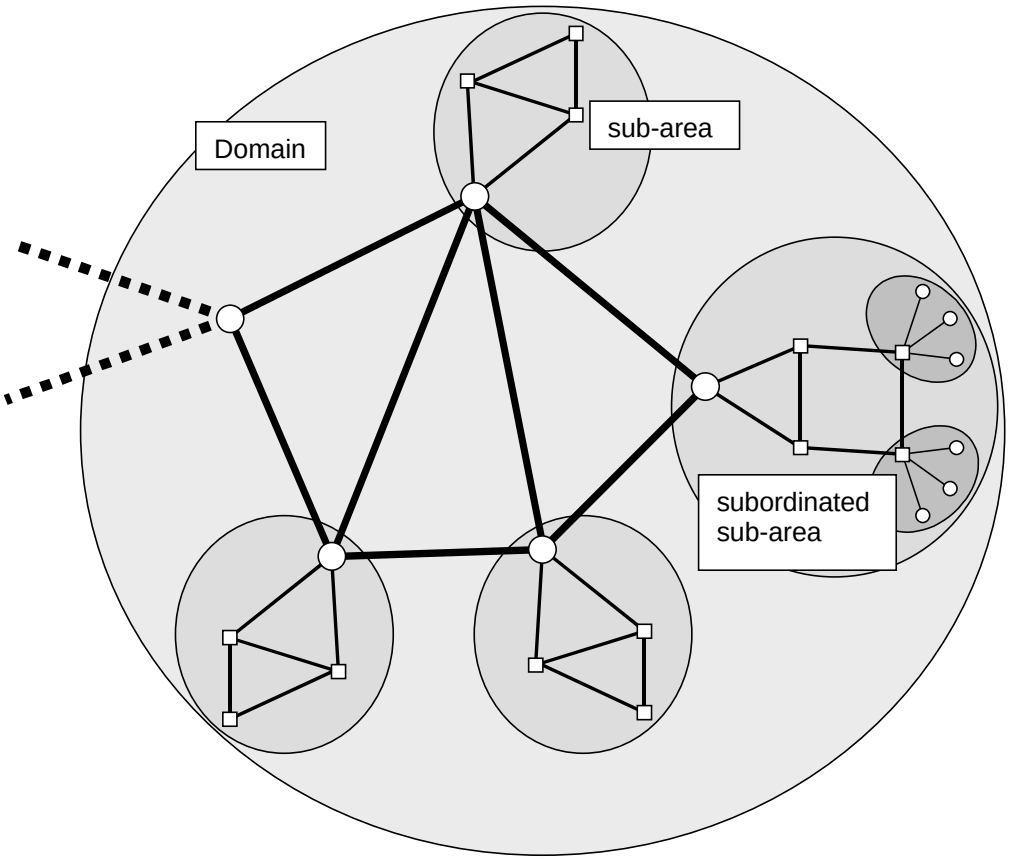
# Architecture



# Resource Pools

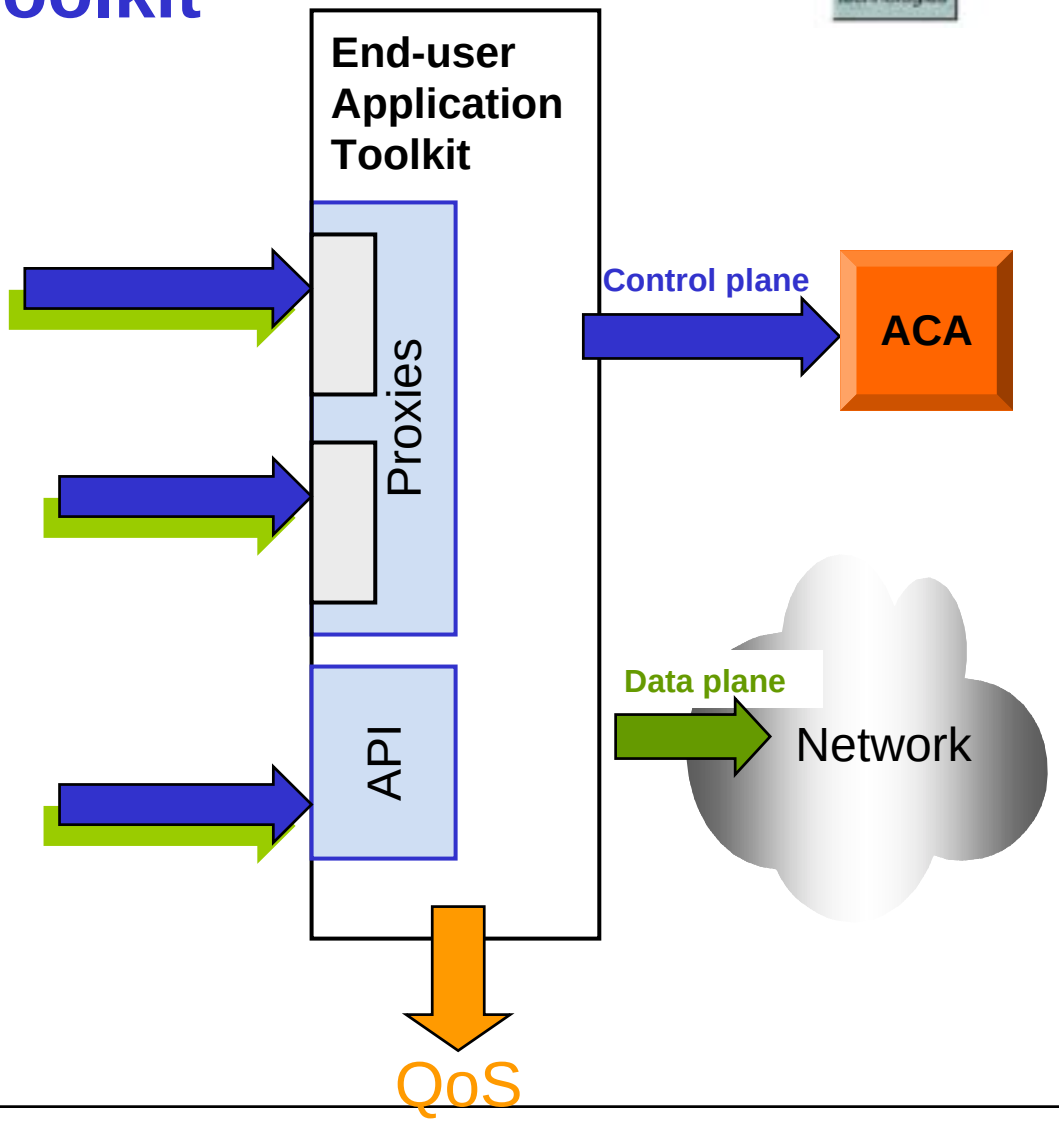
- **Resource Limits**
  - Limit amount of QoS traffic from each edge router
- **Group neighboured Routers**
  - Limit amount of QoS traffic from each group
- **Dynamic Distribution**
  - Dynamically shift resources within group
- **Hierarchical Structure**
  - “Groups of groups”



# End-user Application Toolkit Objectives

- Enable Access to QoS to non QoS aware Legacy Applications
- Support QoS aware Applications (RSVP, DiffServ) / Support various QoS Request Methods
- Provide a Methodology and a Programming Interface to support the Construction of new QoS aware Applications
- Provide an End-user friendly QoS Access

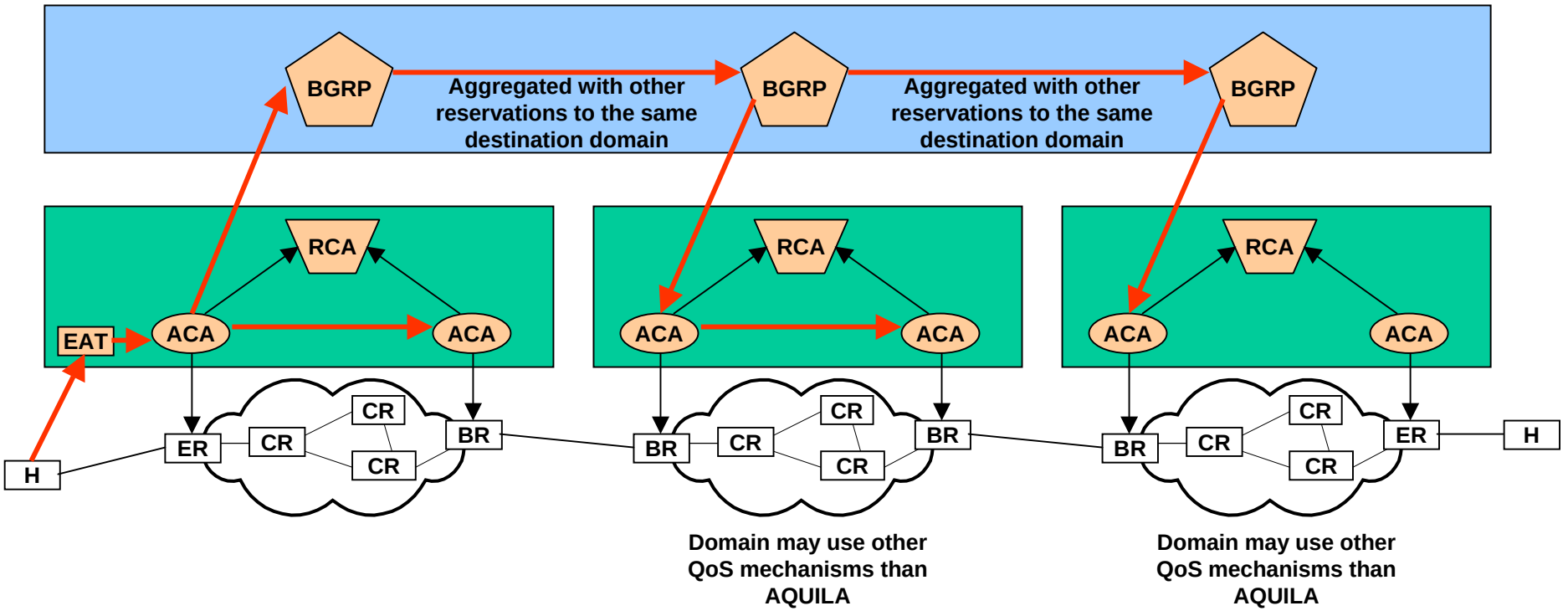


# Lessons Learnt from 1st Trial

- **Verification of AQUILA QoS architecture**
- **Network services**
  - fulfil assumptions
    - Delay, packet loss <= specification
  - do not mix streaming and elastic traffic in one service
    - else UDP will degrade TCP
    - UDP will not reach QoS
  - Fair bandwidth sharing for TCP flows
- **Resource and admission control**
  - General mechanisms work
- **Router**
  - WFQ noticeably degrades performance of Cisco routers

# Inter-domain Resource Control



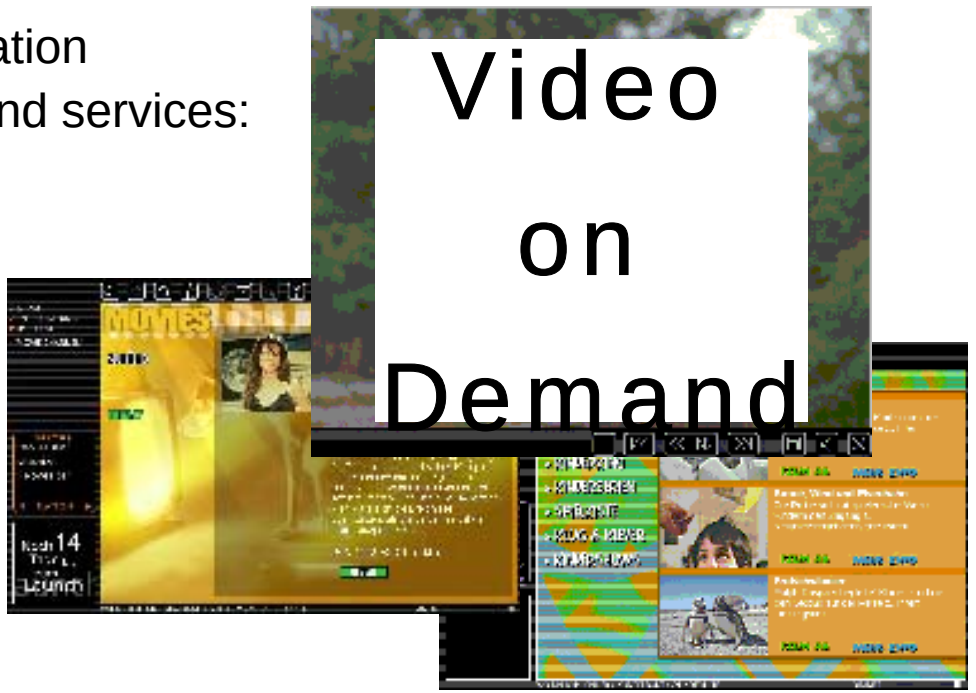
# 2nd Trial Features

- **Evaluation of Measurement Based Admission Control (MBAC)**
  - Feedback for improved network utilisation
- **Real user involvement in Warsaw, Vienna and Salzburg**
  - Subjective and objective tests
- **Inter-domain QoS provisioning**
  - Near-to-reality, scalability, BGRP
- **Complex Internet Service (CIS)**
  - Mediazine, SIGMA, HotStreams

# QoS applications used in the 2nd trial

- **NetMeeting**
- **SIGMA (Sip-based IntelliGent Multimedia Application)**
- **Mediazine**
  - IP based Internet / TV application
  - Different multimedia broadband services:
    - video / audio on demand
    - games
    - news
    - email
    - chat
    - e-commerce



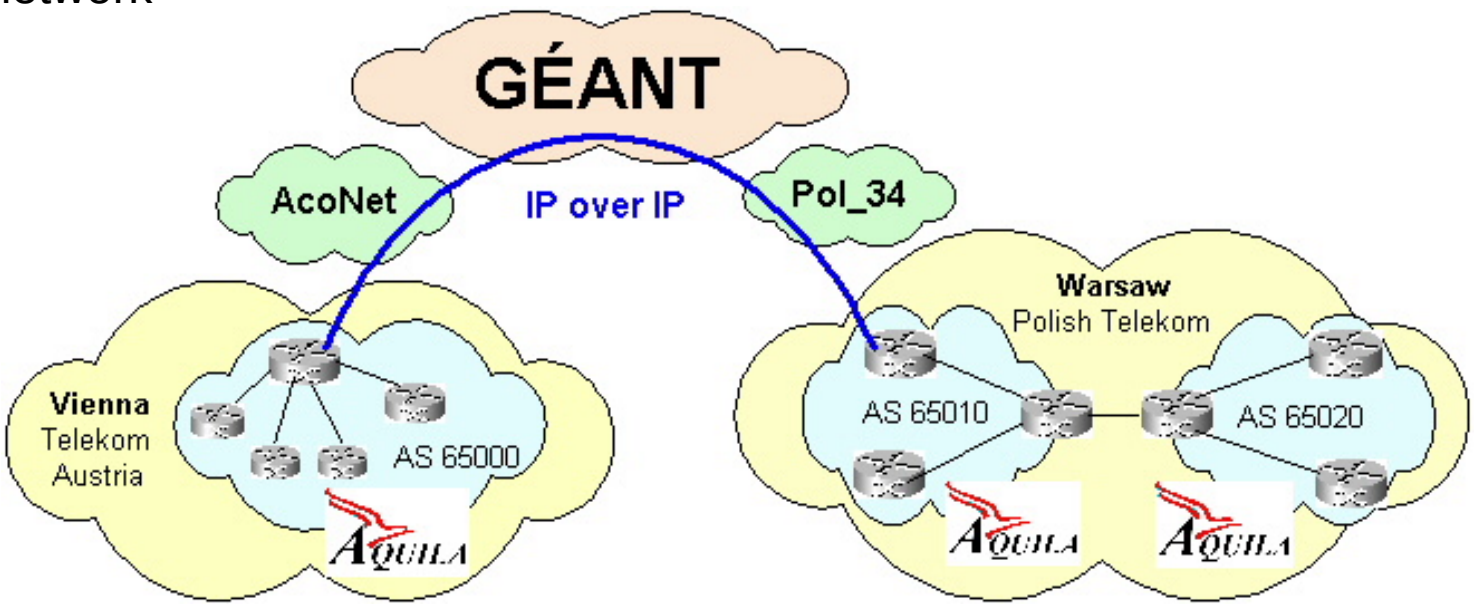
# Mediazine Screen Shots



# Trials of inter-domain AQUILA architecture

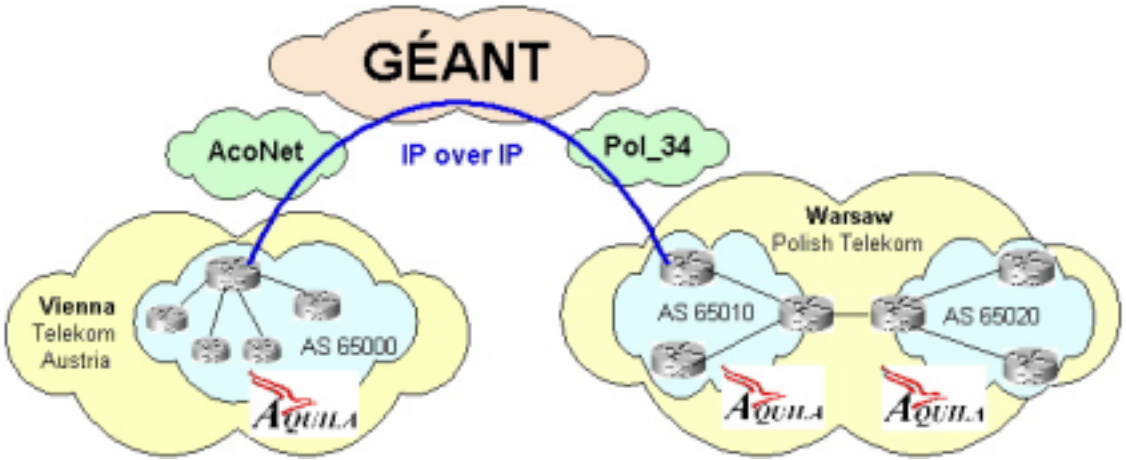
- **Trials are performed to evaluate the benefits of the AQUILA inter-domain architecture**
  - Testing environment should be as close as possible to the real conditions
  - In order to achieve this, the testbeds located in Polish Telecom (Warsaw) and in Telecom Austria (Vienna) were inter-connected via the GÉANT network



# AQUILA connects with SEQUIN / GÉANT

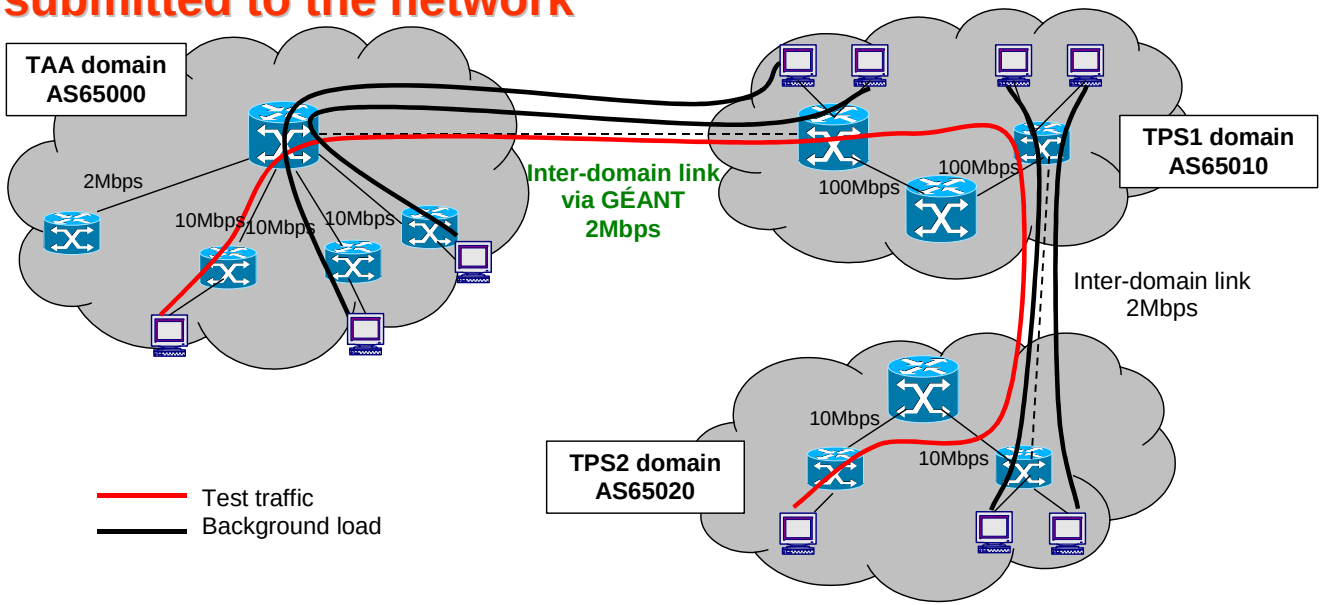
- Four AQUILA traffic classes would be mapped into Premium IP
- DiffServ Code Points (DSCP) would be changed
- AQUILA traffic between Warsaw and Vienna must not be interfered during this trial
- In the future, Globally Well-Known Services (GWKS) may help



# Trials of efficiency of inter-domain network services

- Artificial traffic flows, emulating the traffic generated by applications, are submitted to the network

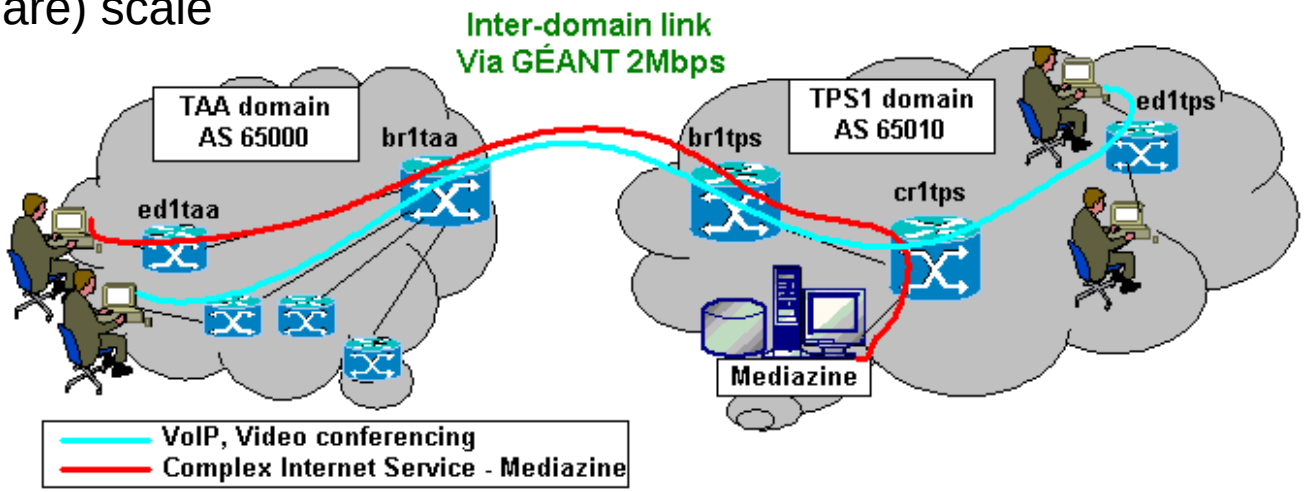



- QoS metrics (i.e. delay, jitter, packet loss, etc) are measured by using the measurement tools
- Thanks to GÉANT Premium IP service, the interconnection link is transparent from the point of view of achieved QoS

# Trials with real users

- **Demonstration of benefits of QoS to the „real" users**
  - Users are located in Vienna and in Warsaw
  - Applications used for the trial
    - Voice over IP - SIP user agent
    - Videoconference – NetMeeting
    - Complex Internet Service - Mediazine
  - QoS perceived by the users is evaluated in terms of MOS (mean opinion square) scale



# Experiences with GÉANT

- **Establishment within shortest time from initial request (04/2002)**
- **SEQUIN / GÉANT network engineers very helpful**
- **Network fulfills the AQUILA requirements**
  - Positively prooven using applications like ftp, telnet, AQUILA QMTool, …
- **AQUILA started it's 2nd trial using the NREN/GÉANT infrastructure**
  - Test scenarios for inter-domain QoS provisioning
  - Evaluation of MBAC
  - Real user involvement in Warsaw, Vienna and Salzburg

# Outlook

- **Enhancement of Standardization Activities**
  - Inter-domain QoS signalling: the BGRP+ architecture
    - draft-salsano-bgrpp-arch-00.txt (May 14, 2002)
      - » requirements and scalability of inter-domain resource reservation
    - draft-nikolouzou-bgrpp-sim-00.txt (July 26, 2002)
      - » mechanisms for inter-domain resource management and simulation results
  - Standardized GWKS
  - Standardization of DiffServ usage (like port numbers e.g.)
- **Further availabilty of pan-European (and international) Research Network infrastructure**

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# Thank you for your attention !

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