QoS as service enabler for broadband access

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Introduction

About the IST MUSE project:

• The overall objective of the MUSE project is the research and development of a future low-cost, full-service access and edge network, which enables the ubiquitous delivery of broadband services to every European citizen.

• MUSE investigates several scenarios of introduction of Ethernet and IPv4 / IPv6 technologies for the access and edge network.

This paper presents QoS management principles that are under study in the MUSE project.

Content of the presentation

1. How QoS is requested to the network
2. How the network manages its resources to provide QoS
3. Structure of the service enabler that will setup IP flows with QoS
How QoS is requested to the network (1/2)

QoS can be requested to the network in several ways, leading to the definition of 4 service models.

The user-oriented model: The user requests separately the service (from a service provider) and the resources for that service (from a network provider). No correlation between both.

The service provider oriented model: The user requests the service from a service provider. The service provider then requests resources from a network provider before accepting the service request.
How QoS is requested to the network (2/2)

> The application signalling based models: The user requests a service from a service provider. The application signalling is intercepted by the network provider to determine the QoS to apply.

> With policy push: resources are reserved and network equipments are directly configured before accepting the service request.

> With policy pull: resources are reserved, an authorization token is sent back to the user when service is accepted. Equipments are configured only when the user sends a network signalling message including the authorization token.

[Diagram showing network resource control, application signalling proxy, service provider, and user interactions between A party and B party, with network providers 1 and 2 indicated.]
Connectivity is based on the use of VLANs between Access Node – Edge Node.

First approach:
- VLANs are preprovisionned with certain engineered resources budgets, adapted on a time scale of hours or minutes.

The network resource control:
- Has a view of network resources
- Has a view on the allocation of IP addresses
- Has a view on the use of resources
- Controls admission of new IP flows based on the availability of resources.
- Controls the policing functions of the network elements in order to let the traffic go into the reserved resources.
Second approach:

- Same connectivity mechanisms based on VLANs between Access nodes - Edge nodes.
- From a resources point of view, bandwidth resources are no longer associated to VLANs, but to the physical links.
- For a new QoS request,
  - The resource controller determines the path of the new flow
  - It then checks whether resources are available on all the links on that path.
  - If one link of the path has not sufficient bandwidth for the new flow, the request is rejected.
Third approach: use of network signalling

- Each node in the path of the required flow reserves the resources for the link until the end-to-end path resources are reserved.

- Two scenarios:
  - Network signalling generated by user equipment and forwarded in the access network
  - Or network signalling remains internal to the network provider domain, without any impact on user domain.

- Protocols to be considered: (G)MPLS, RSVP, NSIS?
Structure of the service enabler that will setup IP flows with QoS

Requests for IP flows with QoS

IP address allocation given by autoconfiguration Servers (Radius, DHCP)

Centralized Resource mediation

Access Node equipment control

Access switches equipment control

Edge node equipment control

Agregation network management

Access multiplexer

Switch

Edge node
Conclusion

> We have presented:

- Several service models
  - User-oriented, service provider oriented, application signalling based with policy pull or push.
- Several resource management approaches
  - A centralized network resource control that manage resources per VLAN or per link.
  - Or an approach based on network signalling (RSVP, NSIS…)
- A functional description of the service enabler that will setup IP flows with QoS.

> Work will continue: the principles described in this paper will lead to more precise specifications that will be studied within the MUSE project during year 2005.