User / Customer Requirements on Network Management

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Context

- Telecommunications world
- Liberalisation
  - Competition
  - Growth in the creation and use of teleservices
  - Separation of services from network
  - Customer requirements on service provider
  - Globalisation

Context

- Technology evolution - faster, more powerful, more widespread
- Innovative applications, especially mutimedia
- Heterogeneity - networks, vendors, services
- Support to ensure end-to-end QoS for multimedia teleservices
- More demanding managing requirements

Approach

- ❒ Introduction of Roles
  - End User
  - Customer
  - Service Provider
  - Network Operator
- ❒ TMN Functional Areas
- ❒ Boundary between Service and Network Management

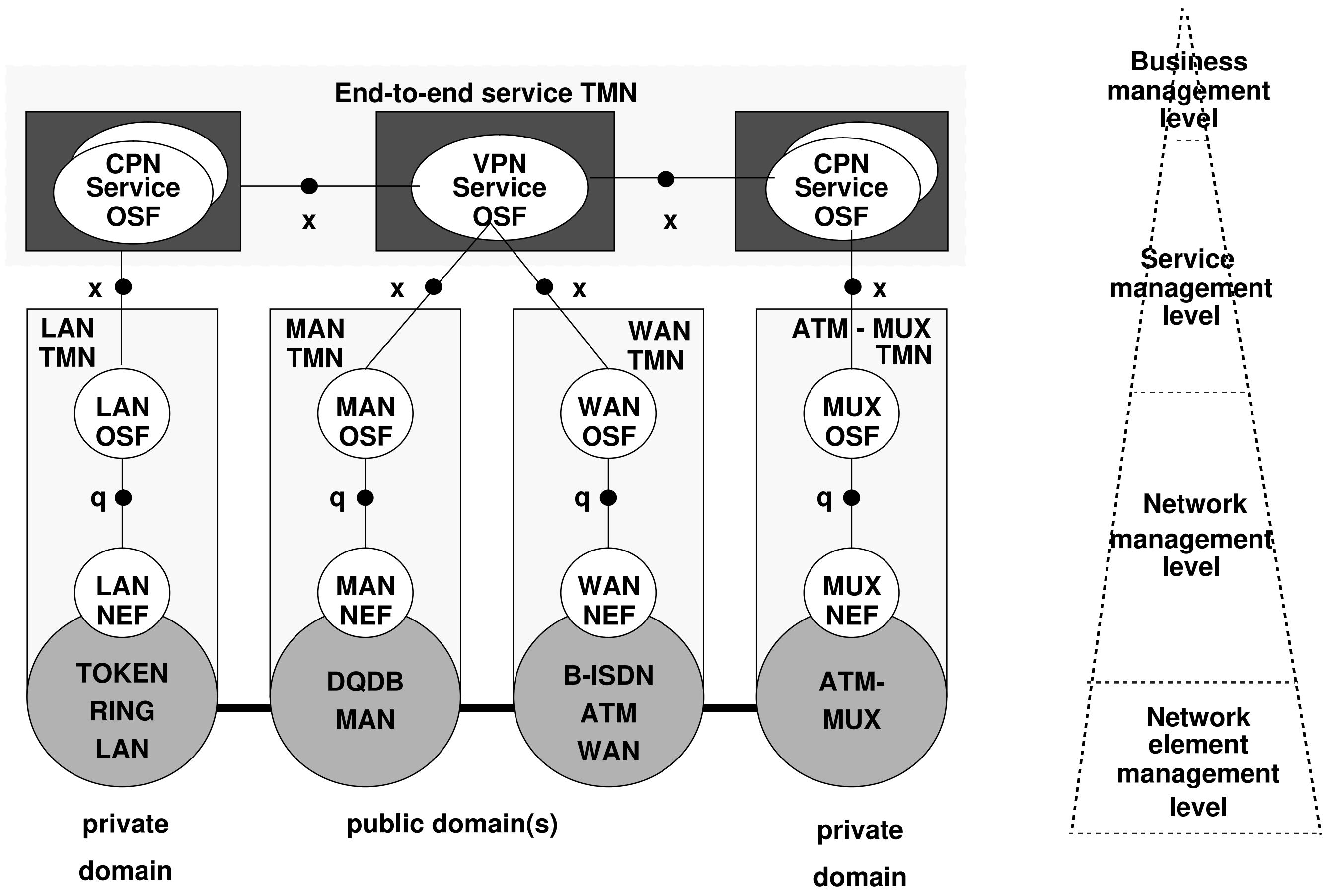
Requirements

- Customer management functionality
- Guaranteed quality of service
- Co-operative management between autonomous administrative domains
- Interaction between service and network management to ensure quality of service

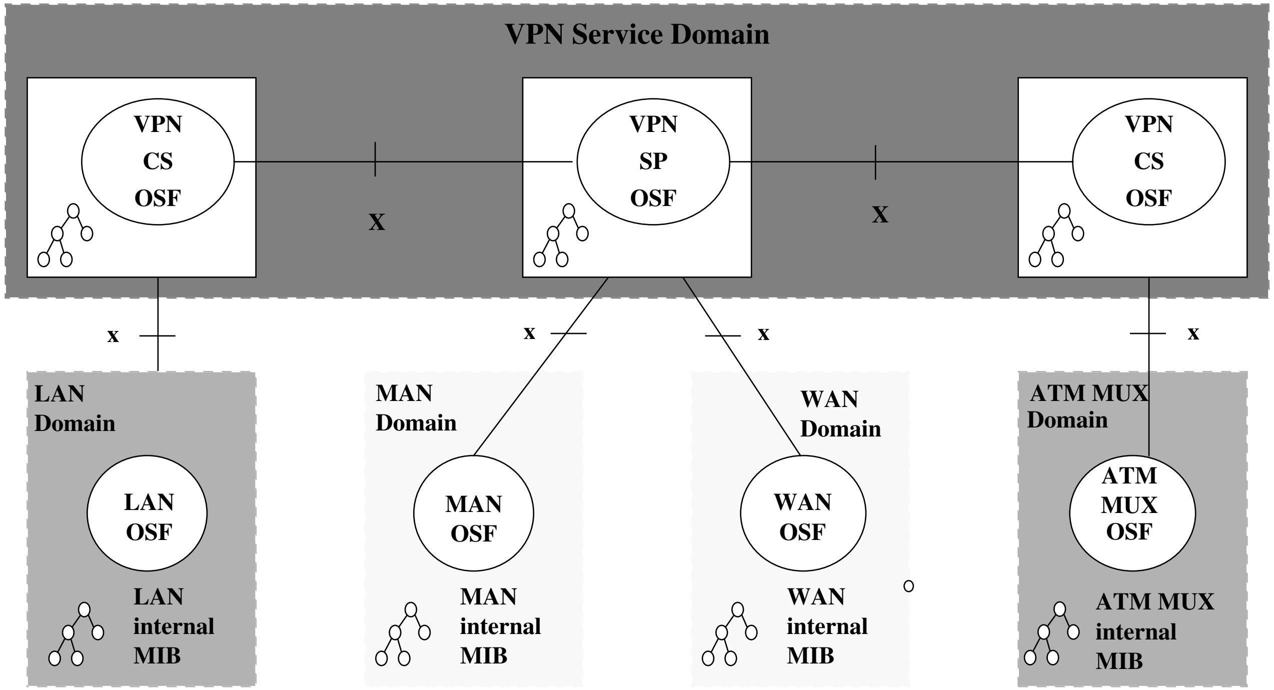
Inter-Domain Management

- End-to-end management of VPN services
- Inter-domain management involving public and private domains involving an ATM-based testbed
- Interactions between network management and service management
- Interactions between customer management and service provider management systems

Inter-Domain Management Architecture



Inter-Domain Information Model



SP: Service Provider
CS: Customer Service

VPN SERVICE CONTAINMENT TREE

```
system
|
|--->customer
     |
     |--->customerProfile
     |
     |--->cpn
     |       |--->endUser
     |       |
     |       |--->te
     |       |
     |       |--->userStream
     |       |
     |       |--->vdl
     |             |--->userStreamSegment
     |--->vpn
             |
             |--->cap
             |
             |--->serviceUserGroup
             |
             |--->userStream
             |
             |--->pVLL
                   |--->userStreamSegment
```

VPN Management Services

- ❐ Customer Administration Services
- ❐ End User Access Information Management Services
- ❐ Traffic and Switching Management Services
- ❐ Quality of Service Management Services

Selection of Scenarios for two VPN Services

- ❐ PRESS - connectionless service
  - Addition/removal of a customer access in/from a VPN
  - Dynamic change of customer a access bandwidth
  - Testing availability of a VPN relation
- ❐ PROVE - isochronous service
  - Initial customer configuration
  - Teleconference set-up and subsequent bandwidth renegotiation
  - Handling quality of service deterioration

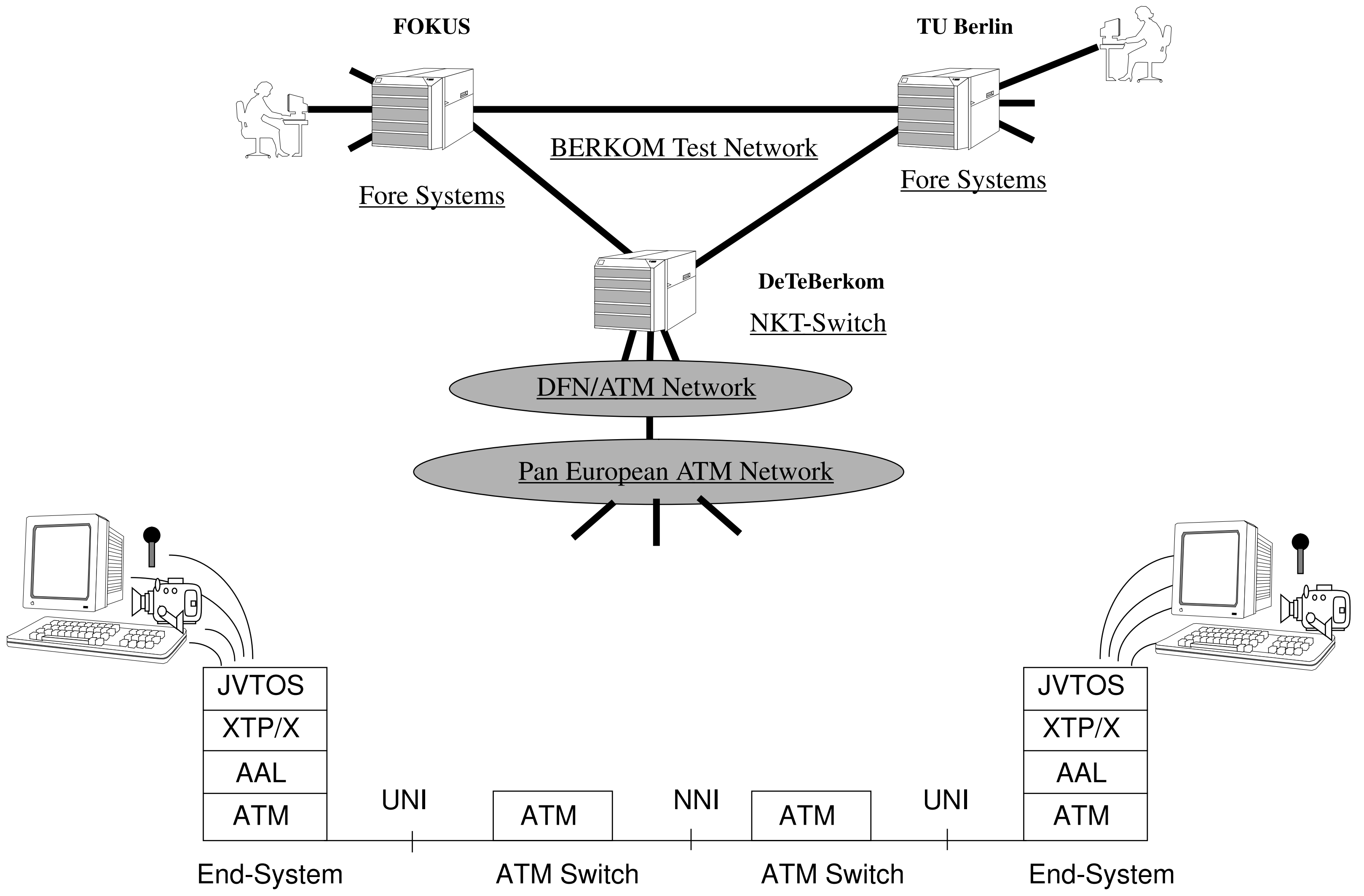
The notion of Quality-of-Service

- ❒ QoS vs. System Performance
- ❒ Objective vs. subjective QoS
- ❒ Planned (contracted) QoS vs. Achieved QoS
- ❒ QoS can be modelled using the brick model
- ❒ QoS exists at every timeline (call, customer contract, and service infrastructure)
- ❒ QoS for multimedia collaboration services during a session includes in particular performance-oriented (measurable) QoS for audio, video, telepointer, and normal data streams
  - ☞ throughput, delay with jitter and skew, error rates

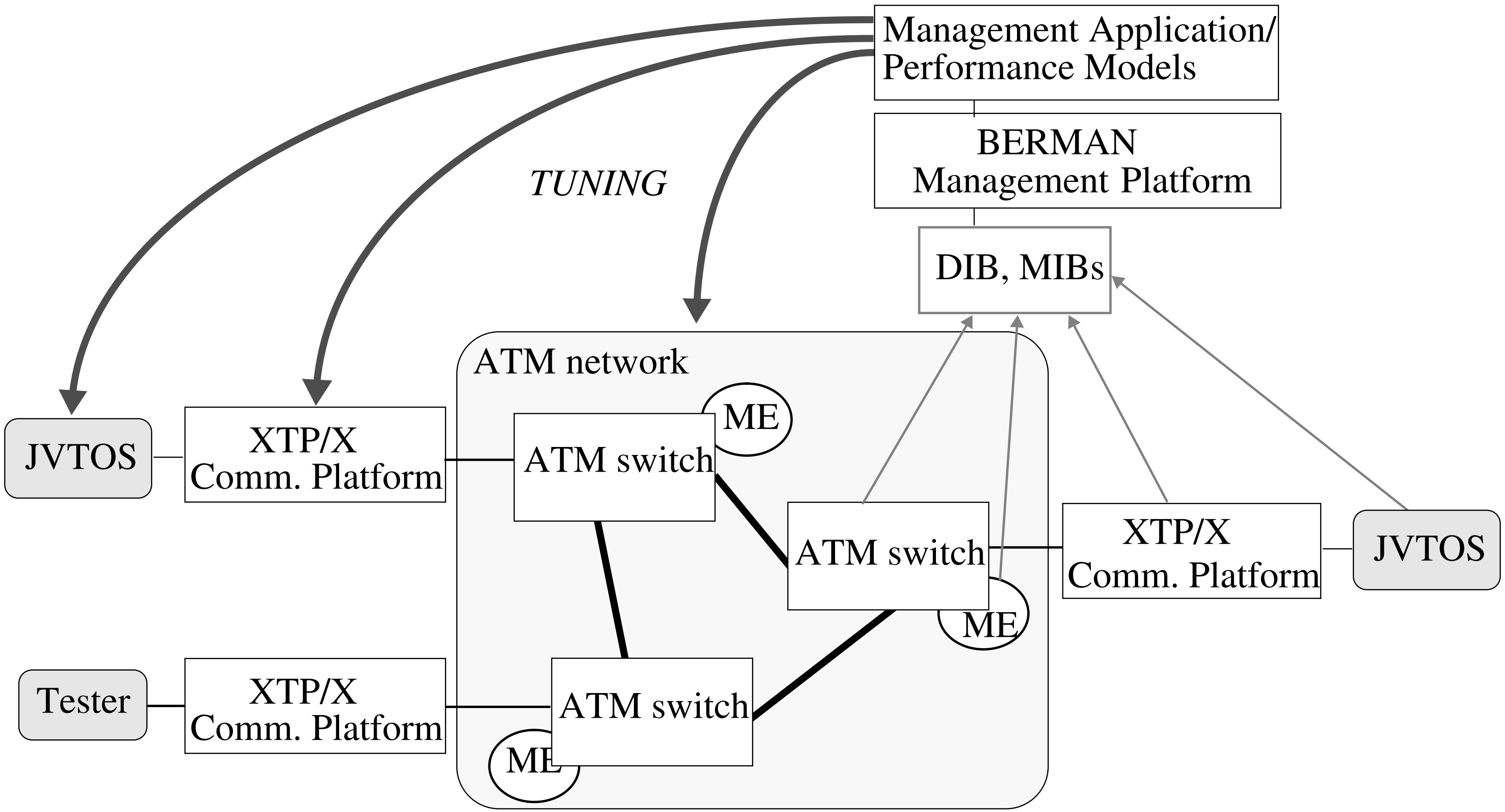
Total Management of end-to-end QoS ?

- End-to-end relevance of system performance
- Global, end-to-end system state has to be considered for local choice of best-suited communication services to be used
- QoS management of the end-system including the end-user communication stack as well as of the whole data communication network
- Use of network management to tune the network performance, decision making process based on performance models
- Adopt measurement equipment to observe network element performance

BALI: Berliner ATM-LAN Interconnection

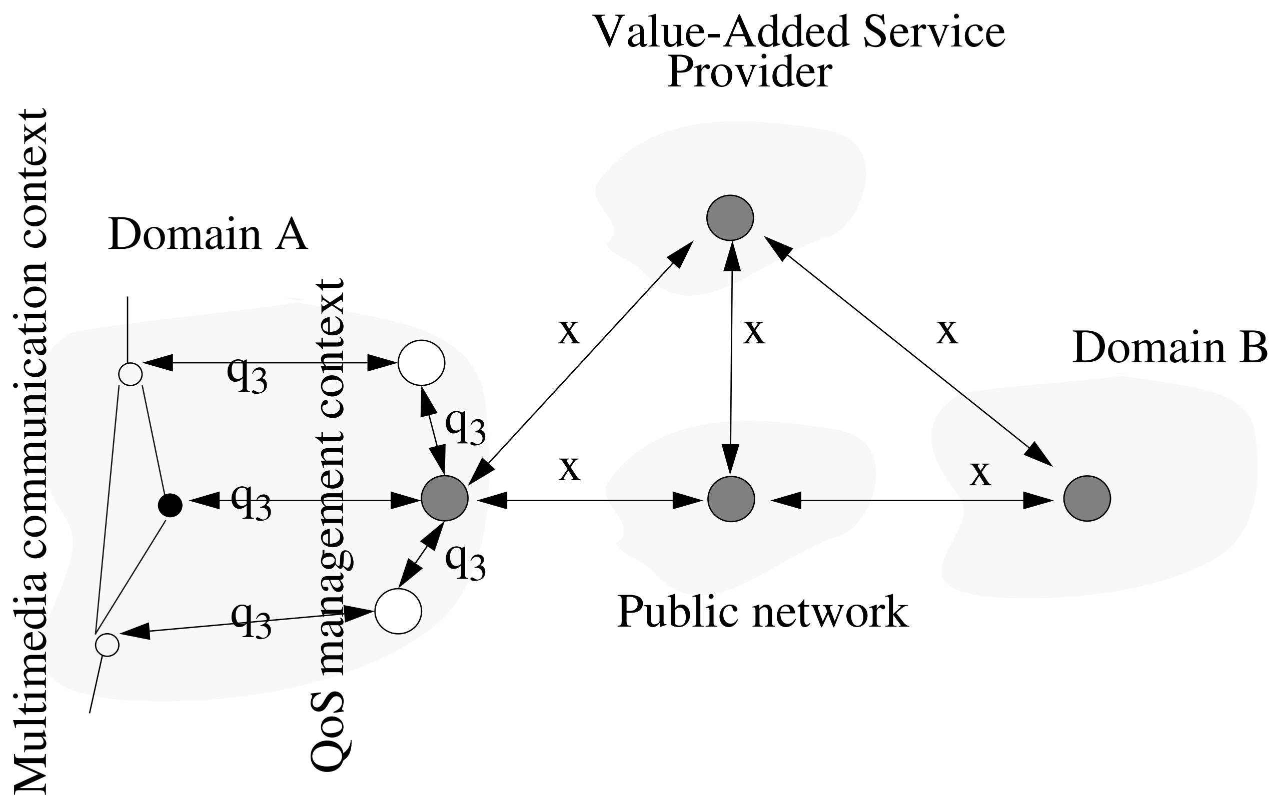


The overall architecture



ME - Measurement equipment

Inter-domain QoS Management



- ○ Network element manager/ multimedia end system
- ● Multimedia central server/ network management manager
- Domain Quality Manager:
  - VASP
  - CPN
  - PN
- End-System Quality Manager

Basic Network elements in ATM network and their Functionalities

- ATM switch: set-up thresholds for traffic management strategies, change routing tables
- Measurement equipment: collect data, alarm on threshold violation
- Multimedia application: change compression algorithm for audio or video, adjust frame size of a video at the source, adjust playout buffer.

A Scenario

Multimedia collaboration service: VBR service with SCR, PCR suitable for video transmission.

QoS requirements, i.e. frame refresh rate, frame size, delay, and error rate), are forwarded to the ESQM.

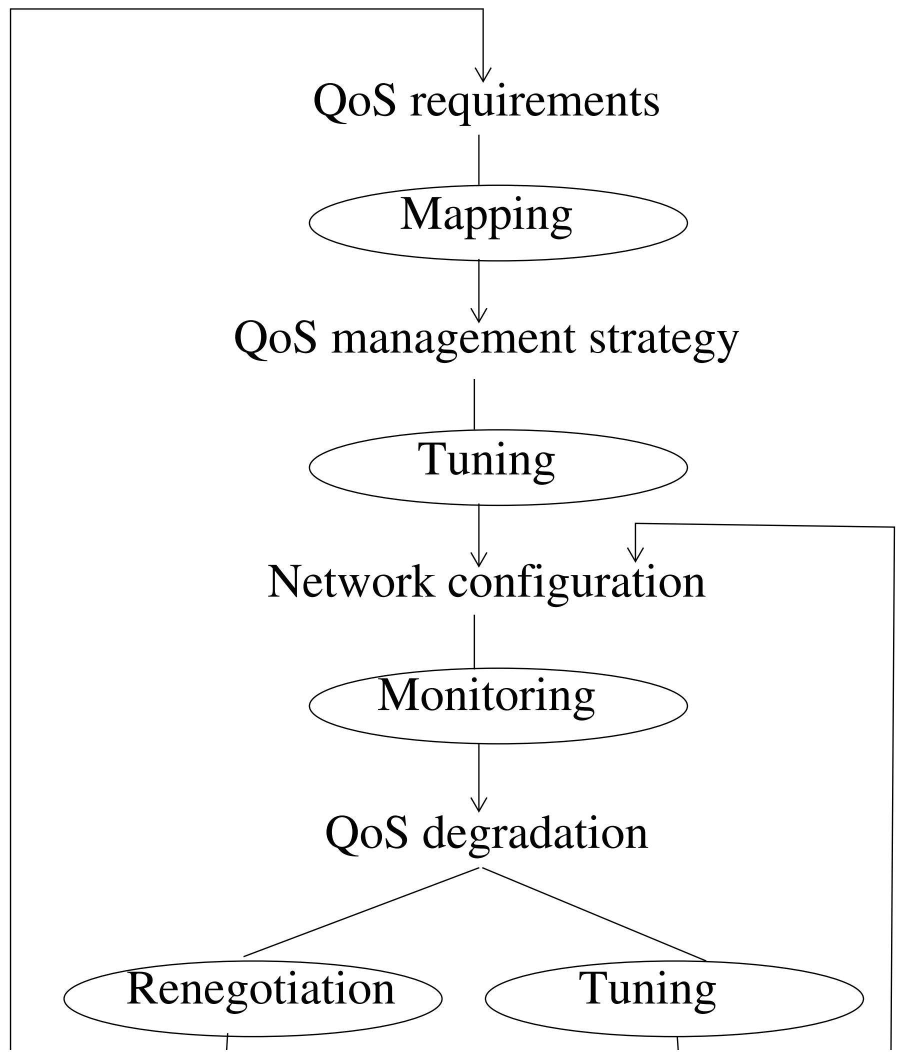
Throughput and cell error rate of the virtual channel is measured.

Overload and congestion, i.e. throughput at some communication link may drop below the specified SCR, causes the generation of a notification.

In order to re-establish contracted QoS the communication link can be tuned or re-routing is started.

If that does not work, feedback to the user for renegotiation of its QoS requirements or simple termination of the connection.

Control Flow of a QoS Management OS



QoS Management vs. Network Management

End-user oriented	Network provider oriented
Guarantee QoS for one dis-tinguished session	Optimize network load to sell as much as possible
Uses network management to tune the network perform-ance	Uses QoS Management for QoS guaranteed transmis-sion services offered to the network user
Includes management for end-system and the whole communication stack with the end-user applications	Includes management for the lower network layers, excludes management for end-user applications

Conclusions

- ❒ Customer requirements for management functionality and quality of service
- ❒ Importance of a modelling approach to structure and classify the issues
- ❒ Need both horizontal and vertical perspectives to meet customer requirements on end-to-end services
- ❒ The two perspectives are complementary and both are necessary