Proven IP Network Services: from End-User to Router and vice versa

Gerald Eichler, Ralf Widera

T-Systems Nova, Technologiezentrum Darmstadt

Gerald.Eichler@t-systems.com, Ralf.Widera@t-systems.com

Anne Thomas

Dresden Technical University, Department of Computer Science, Institute SMT

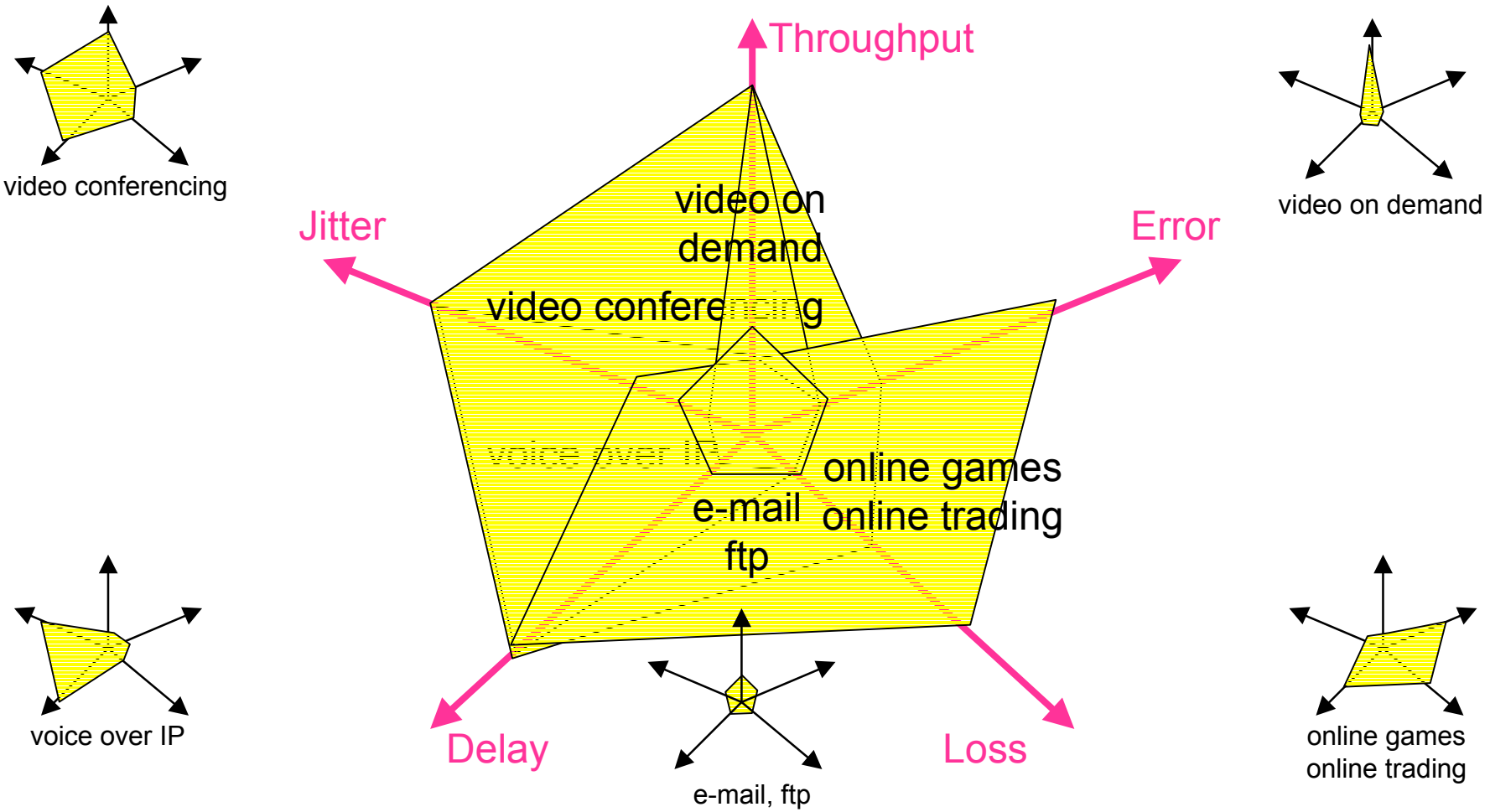
Anne.Thomas@inf.tu-dresden.de

This work is partially funded by the European Union under contract number IST-1999-10077 "AQUILA"

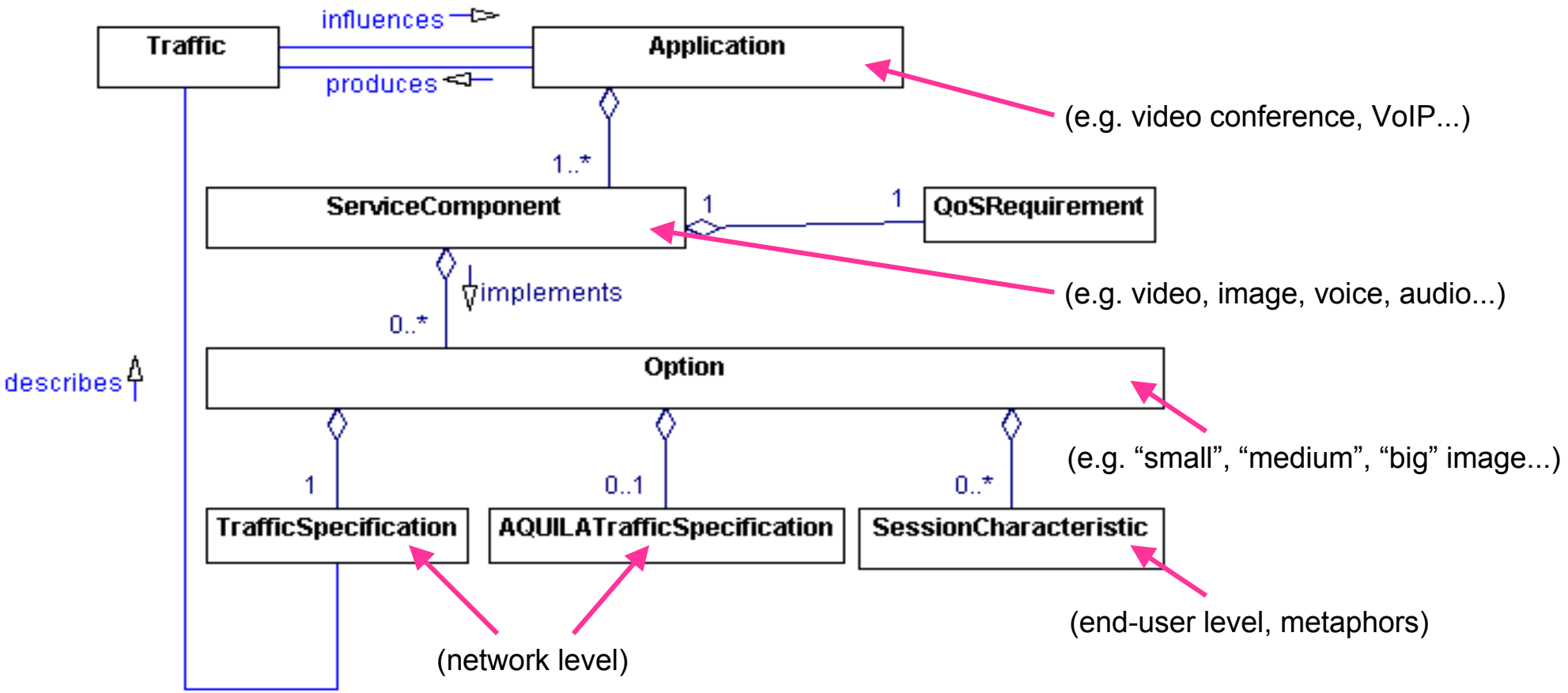
Outline

- **Applications: the Centre of the QoS Offer**
  - end-user perception
  - application modelling
- **Network Services: the Network Operator's Offer**
  - service level specification
  - graphical user interface
- **Traffic Classes: the Engineering of IP Quality of Service**
  - router configuration
  - network QoS parameters
- **Measurements: the Proof Technique at Network Level**
  - distributed measurement architecture
- **Outlook and Summary**

QoS Parameter affecting Application Perception

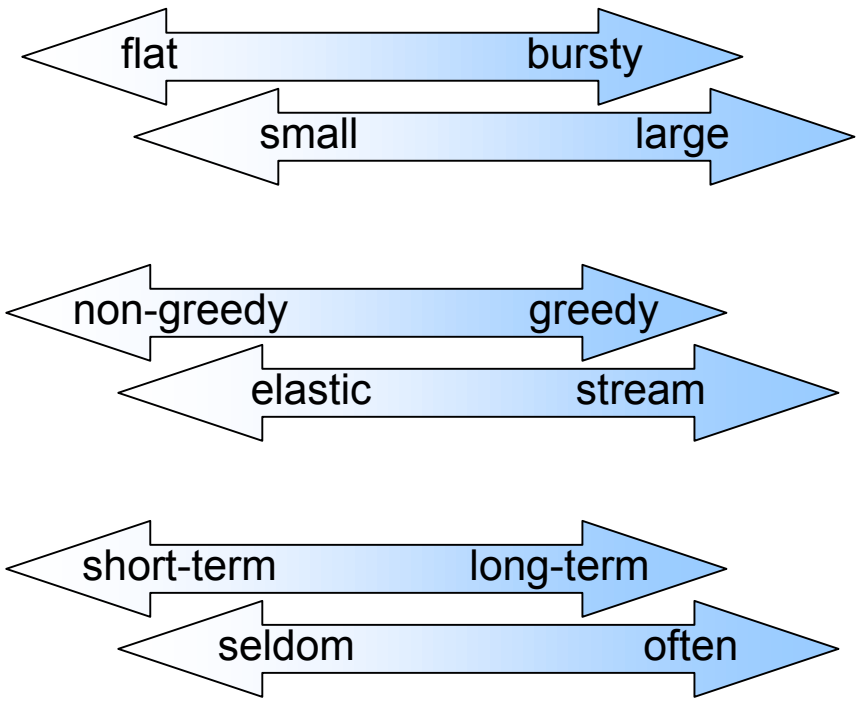


Application Modelling

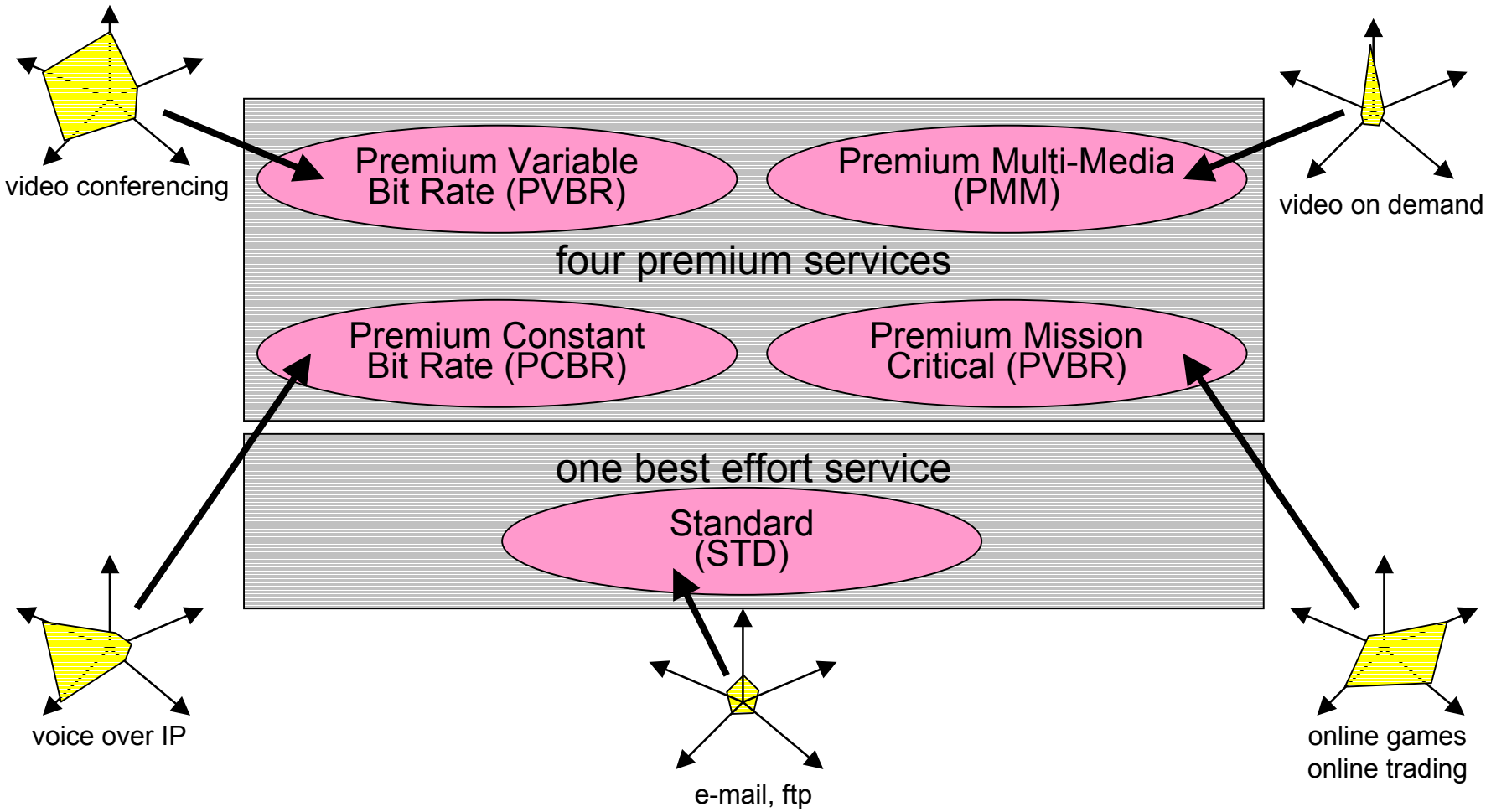


Traffic Characterisation Alternatives

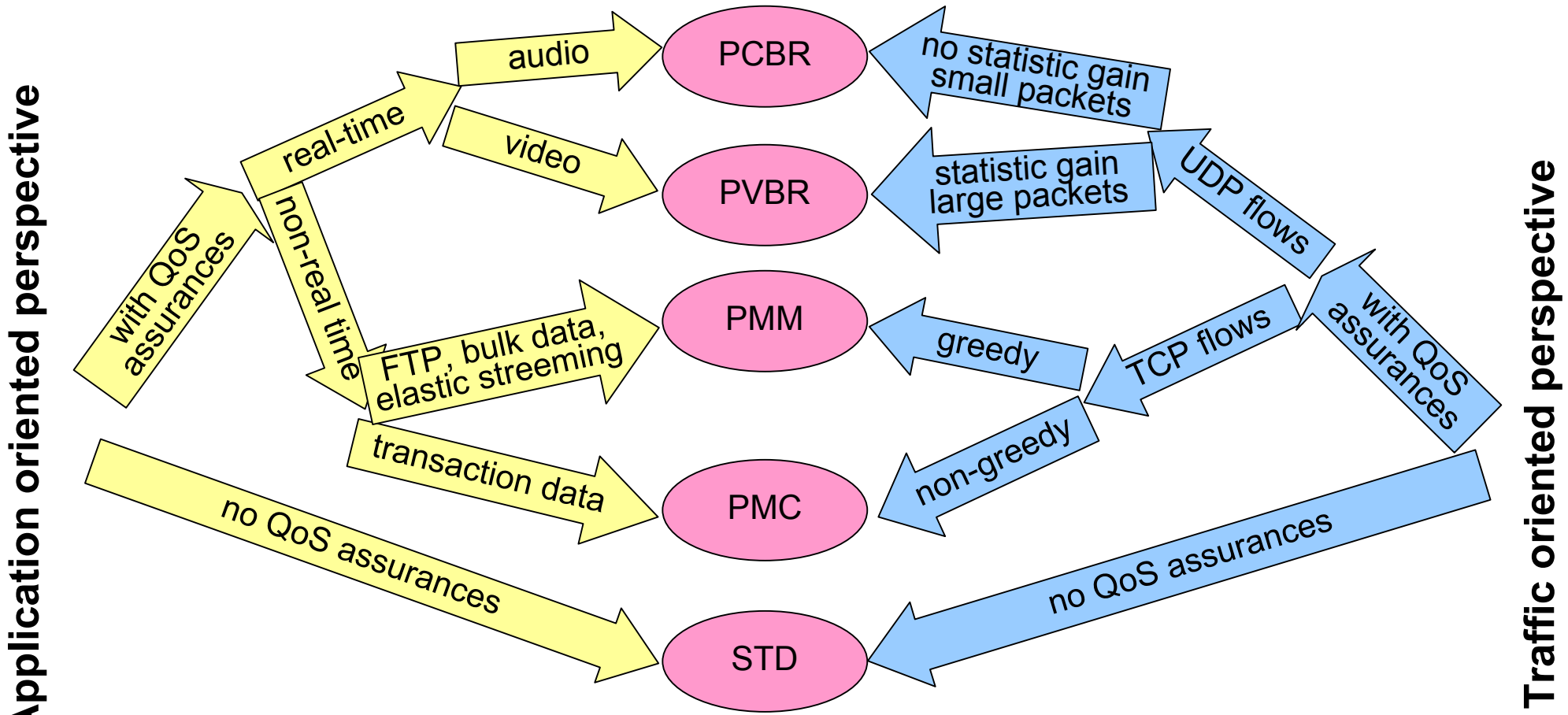
- **Traffic Packet Characteristics**
  - burstiness
  - packet size
- **Traffic Flow Characteristics**
  - greediness
  - elasticity
- **Schedule Constraints**
  - life time
  - frequency



Limited Set of Network Services



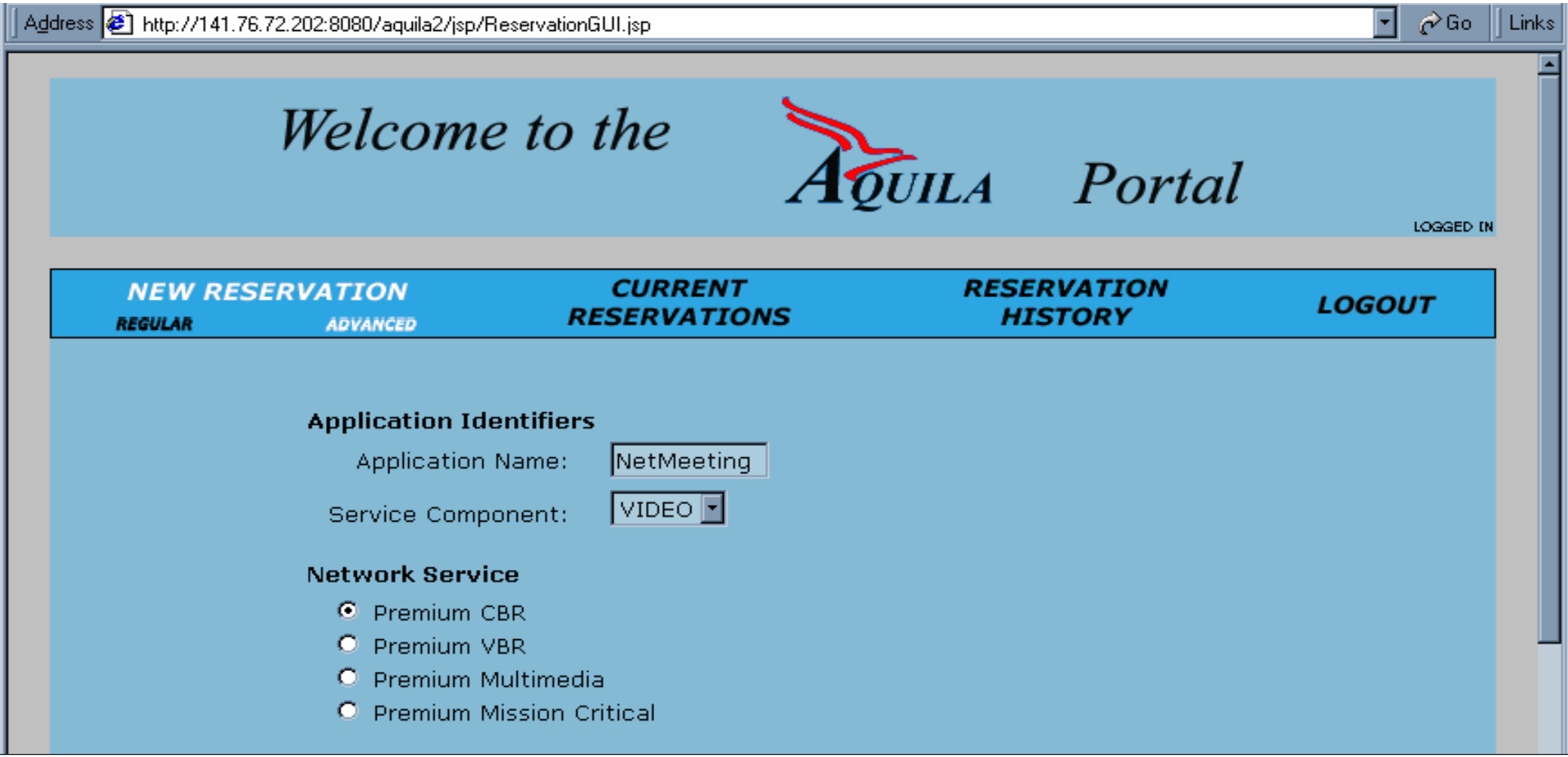
Network Services Landscape



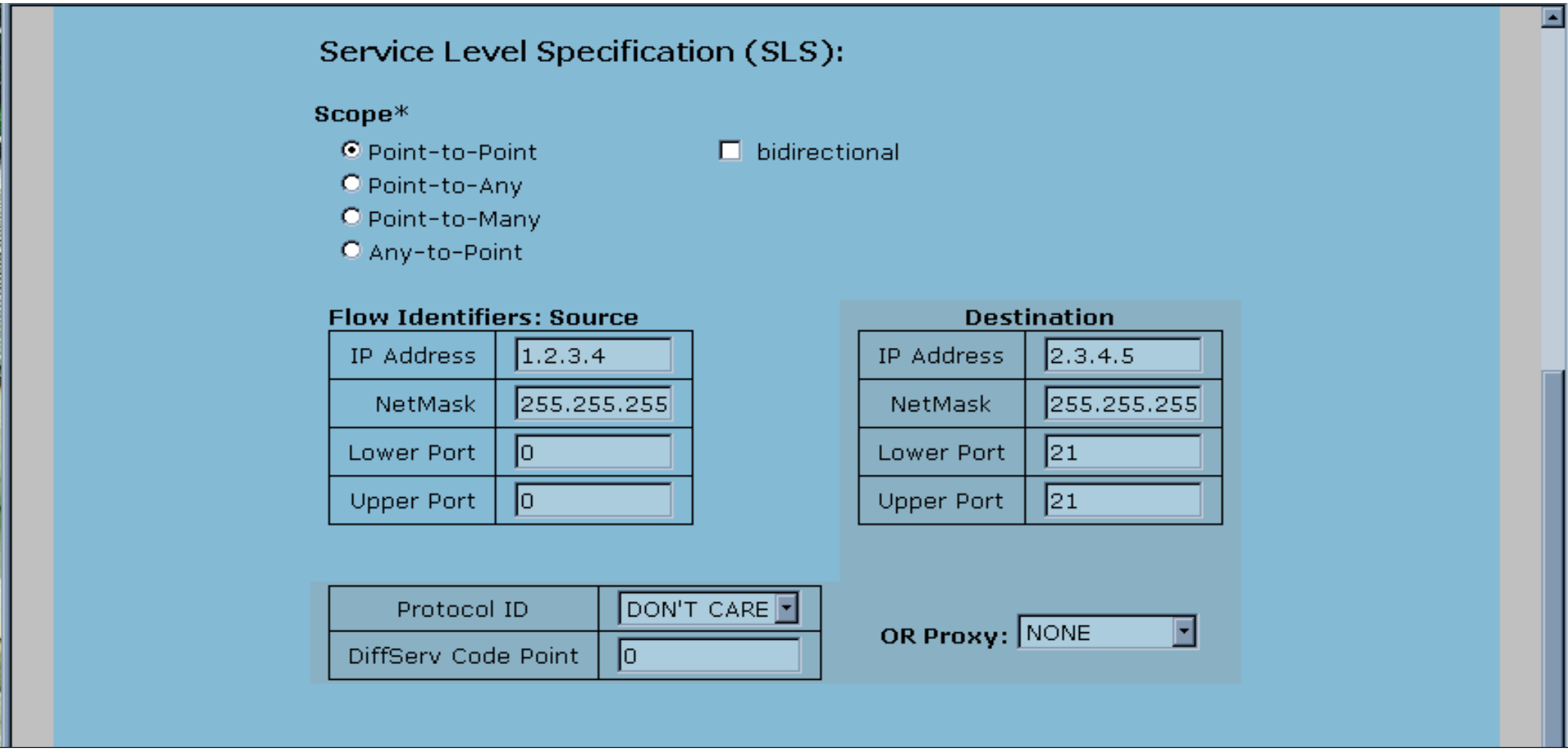
Service Level Specification for Reservation

- **Scope**
  - indicates the topology of ongoing reservation with reference to end-points of the traffic flow
- **Flow Indication**
  - focuses on the association between packet level and application level
- **Traffic Description/Conformance Testing**
  - describes the traffic relevant for the reservation
- **Performance Guarantees**
  - summarises the commitment of the network operator to fulfil the customer requirements
- **Service Schedule**
  - provides information regarding the start time and the service duration

Reservation GUI: Application Selection



Reservation GUI: Service Level Specification



Reservation GUI: Traffic Specification

Traffic Specification

Peak Rate (bit/s)	0
Bucket Size for PR (bytes)	0
Sustainable Rate (bit/s)	0
Bucket Size for SR (bytes)	0
Min. Policed Unit (bytes)	0
Max. (allowed) Packet Size (bytes)	0
Max. Latency (ms)	0.0
Max. Variation (% of delay)	0.0
Max. Packet Loss Probability (%)	0.0
Degree of Bandwidth Guarantee (%)	0.0
Packetordering	☐

Submit Reset

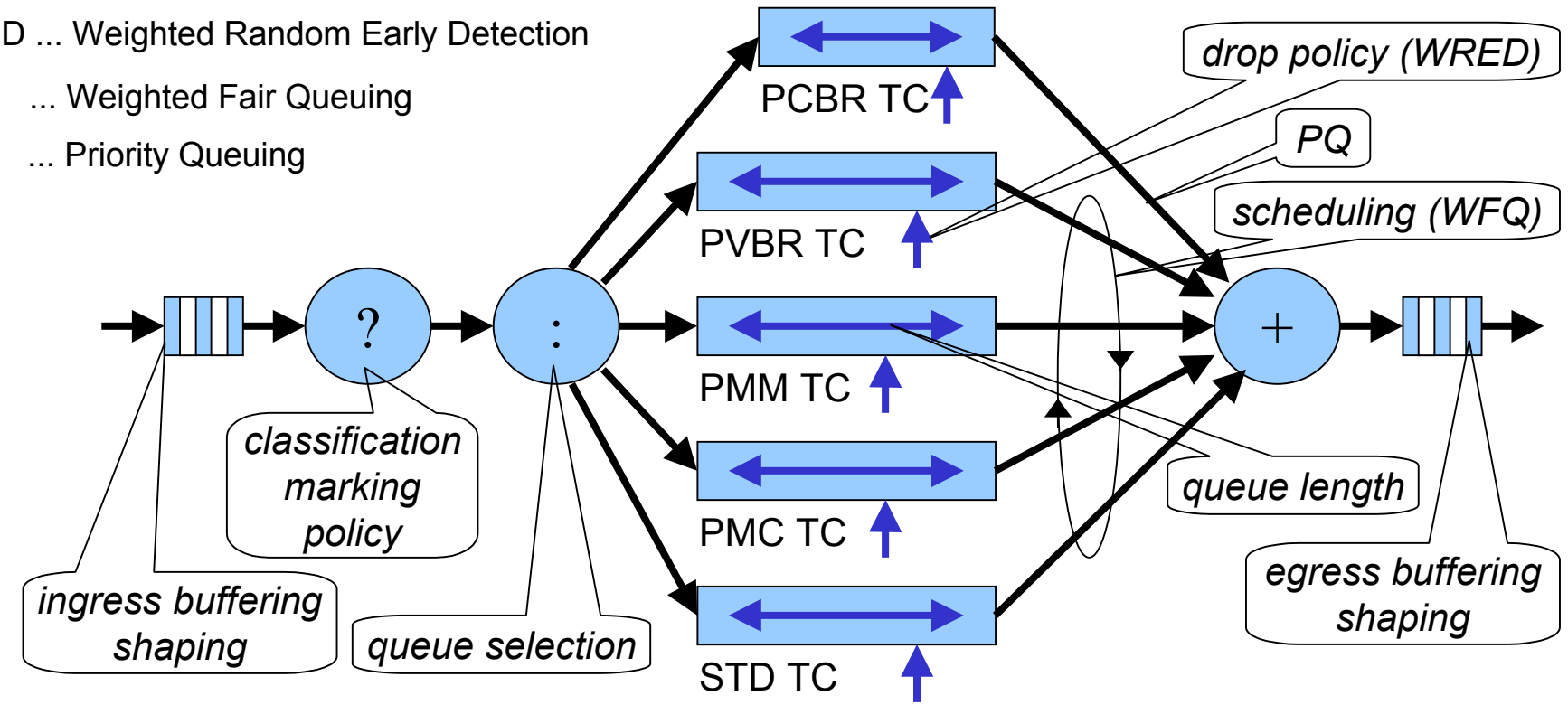
Router Capability Exploitation

TC ... Traffic Class

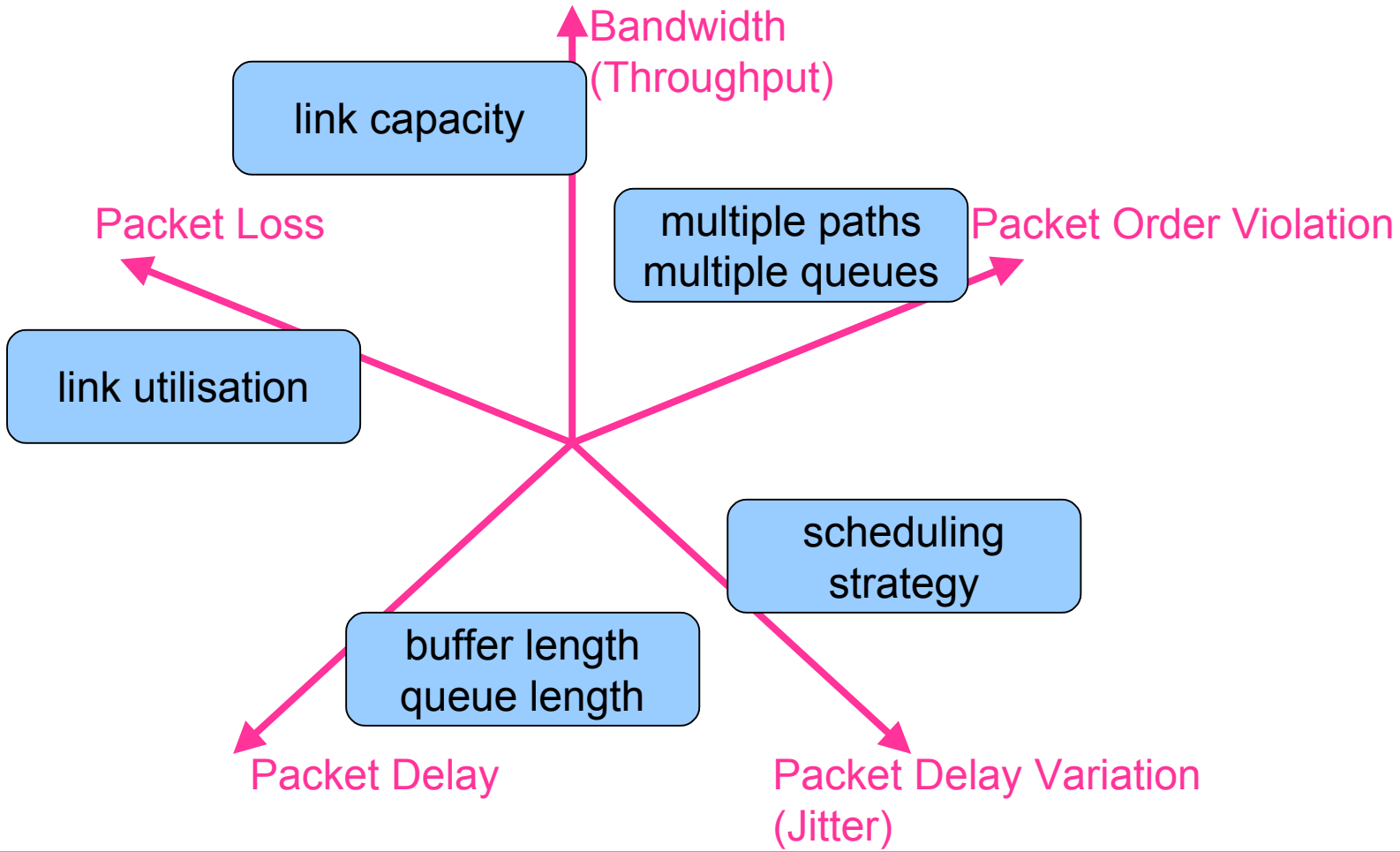
WRED ... Weighted Random Early Detection

WFQ ... Weighted Fair Queuing

PQ ... Priority Queuing



Influence Factors on Network QoS Parameters



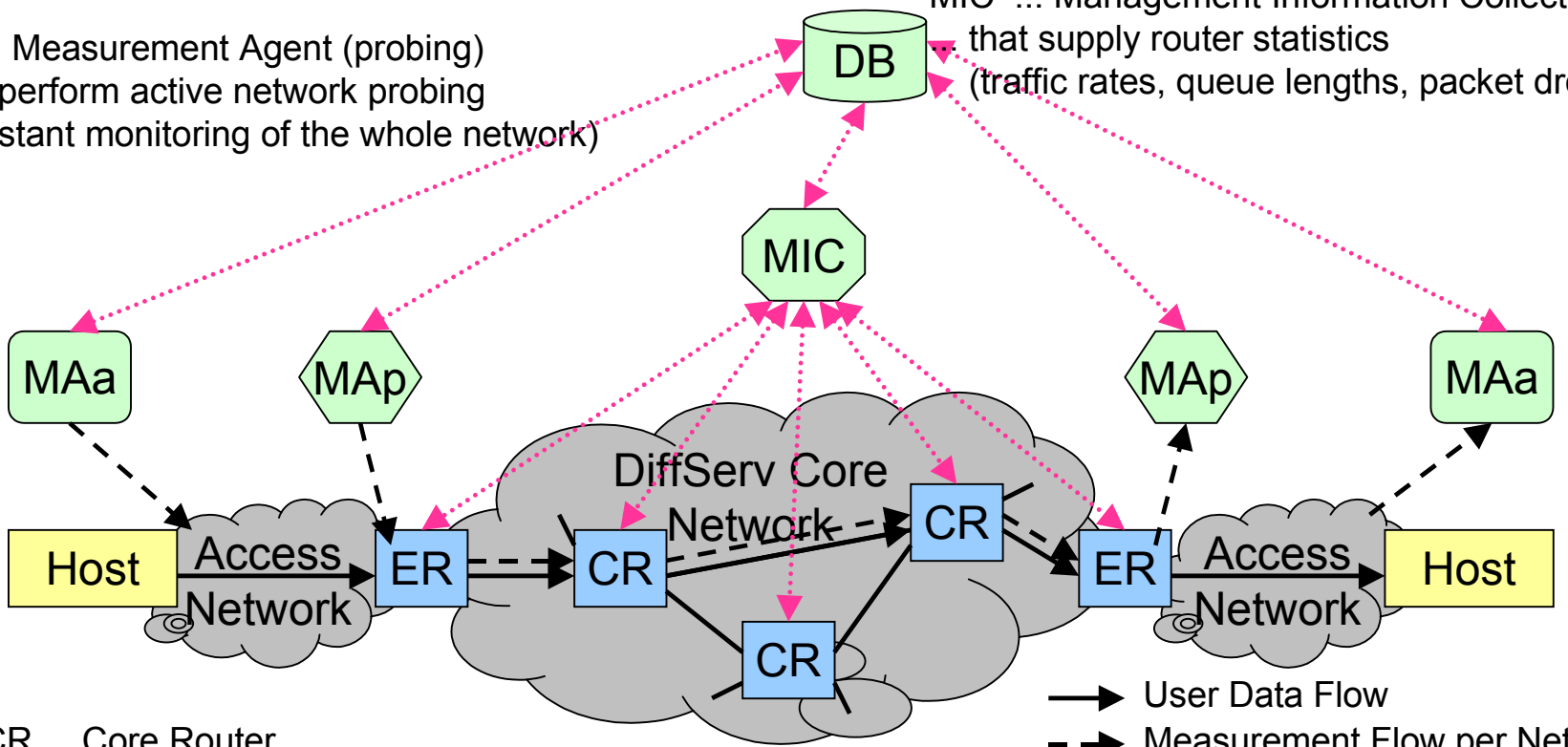
Distributed Measurement Architecture

MAa ... Measurement Agent (application-like)
... with traffic generators that produce application-like flows
(reproducible experiments as opposed to real applications)

MAp ... Measurement Agent (probing)
... that perform active network probing
(constant monitoring of the whole network)

DB ... Database
...stores configuration data and measurement results

MIC ... Management Information Collector
... that supply router statistics
(traffic rates, queue lengths, packet drop counters)



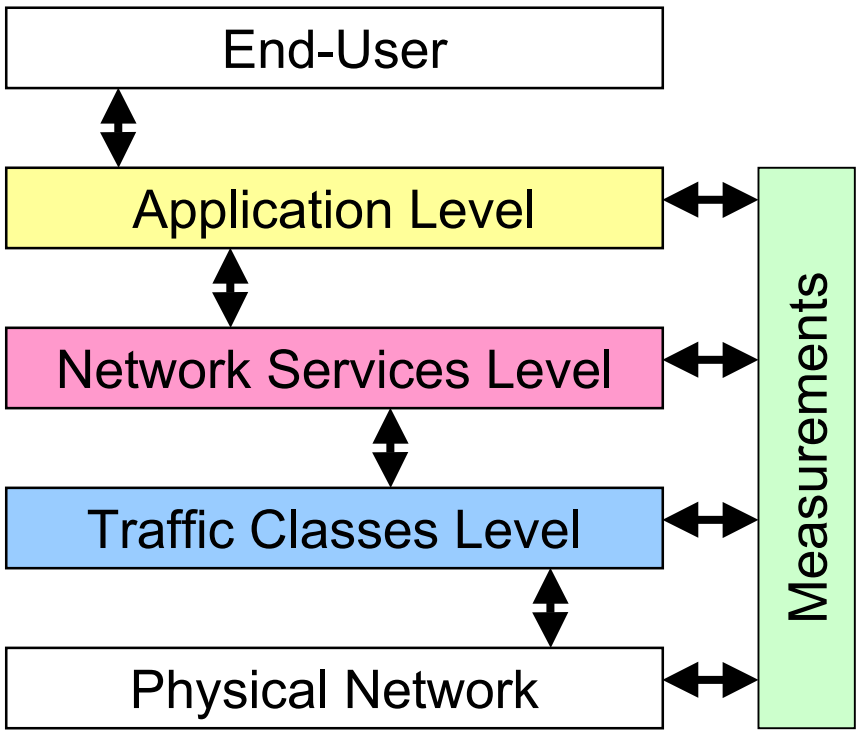
CR ... Core Router
ER ... Edge Router

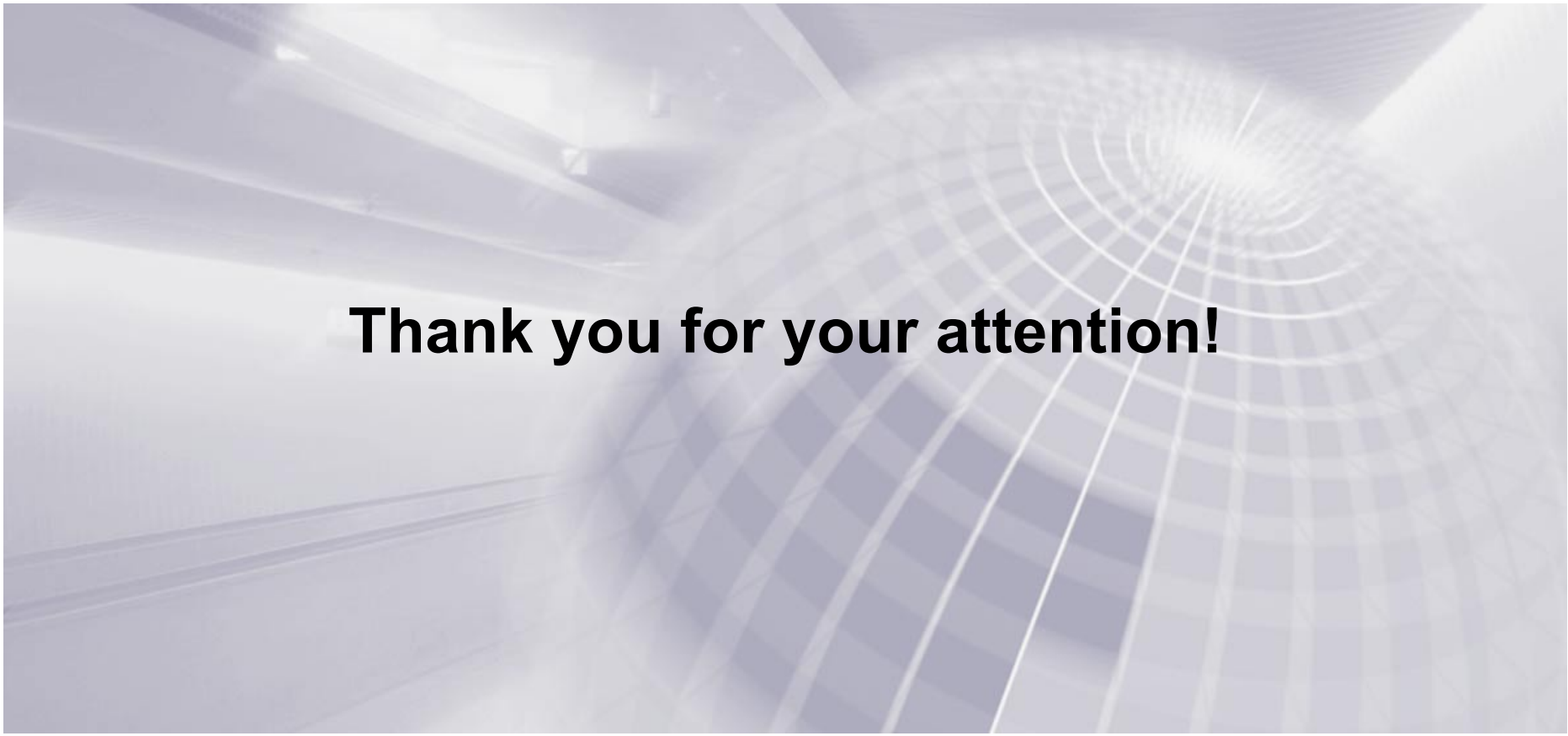
Outlook

- **Under Common Development**
  - support of “Globally Well-Known Services” for inter-domain QoS
  - definition and support of “Application Profiles”
  - selection of a QoS definition language
  - development of enhanced measurement tools
- **Within the AQUILA Project**
  - pan-European trial with multiple domains
  - verification of the enhanced architecture
  - adaptation of Network Services
- **Further Information**
  - URL: http://www.ist-aquila.org/

Summary

- **A Level based Approach ...**
  - reflects the ***Innovative*** chain: customer ⇔ ISP ⇔ operator
  - provides predefined services for ***Internet*** application support
  - allows optimised network entity configuration ***Computing***
  - ensures the given guarantees by measurements
  - supports a vertical and horizontal ***System's*** scalability




Thank you for your attention!