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4. Würzburger Workshop
"IP Netzmanagement, IP Netzplanung
und Optimierung„

27.-28. Juli 2004

QoS-Management as Closed Control Loop

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Outline

Outline
Motivation
Objectives
Integrated QoS-management
QoS-management Building Blocks
Outlook

- Motivation
- Objectives
- Integrated QoS-management
- QoS-management Building Blocks
  - Classification of Traffic and Marking
  - Topology Recognition
  - Network Planning
  - QoS-profile Provisioning
  - Call/Session Admission Control
  - QoS-/SLA-monitoring
- Outlook

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Motivation

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- Enterprise Networks migrate to multi-service networks
- Network must accommodate Different Traffic Types
  - Real-time Voice over IP (VoIP), interactive video-conferences
  - Mission-critical Enterprise Resource Planning (ERP)
  - Guaranteed throughput, best effort
- Over provisioning of network resources economically not feasible (e.g. over WAN-links)

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Objectives

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- QoS-management Framework
  - Addresses Professional Service and Managed Service needs (cost-effective service offering)
  - Supports self-maintainers (ease-of-use, intuitive)
  - Automated as far as possible
  - Transparent
  - Future-proof
  - Integrated with umbrella management functions
    - Fault Management / Network Map
    - Performance Management
    - Configuration Management

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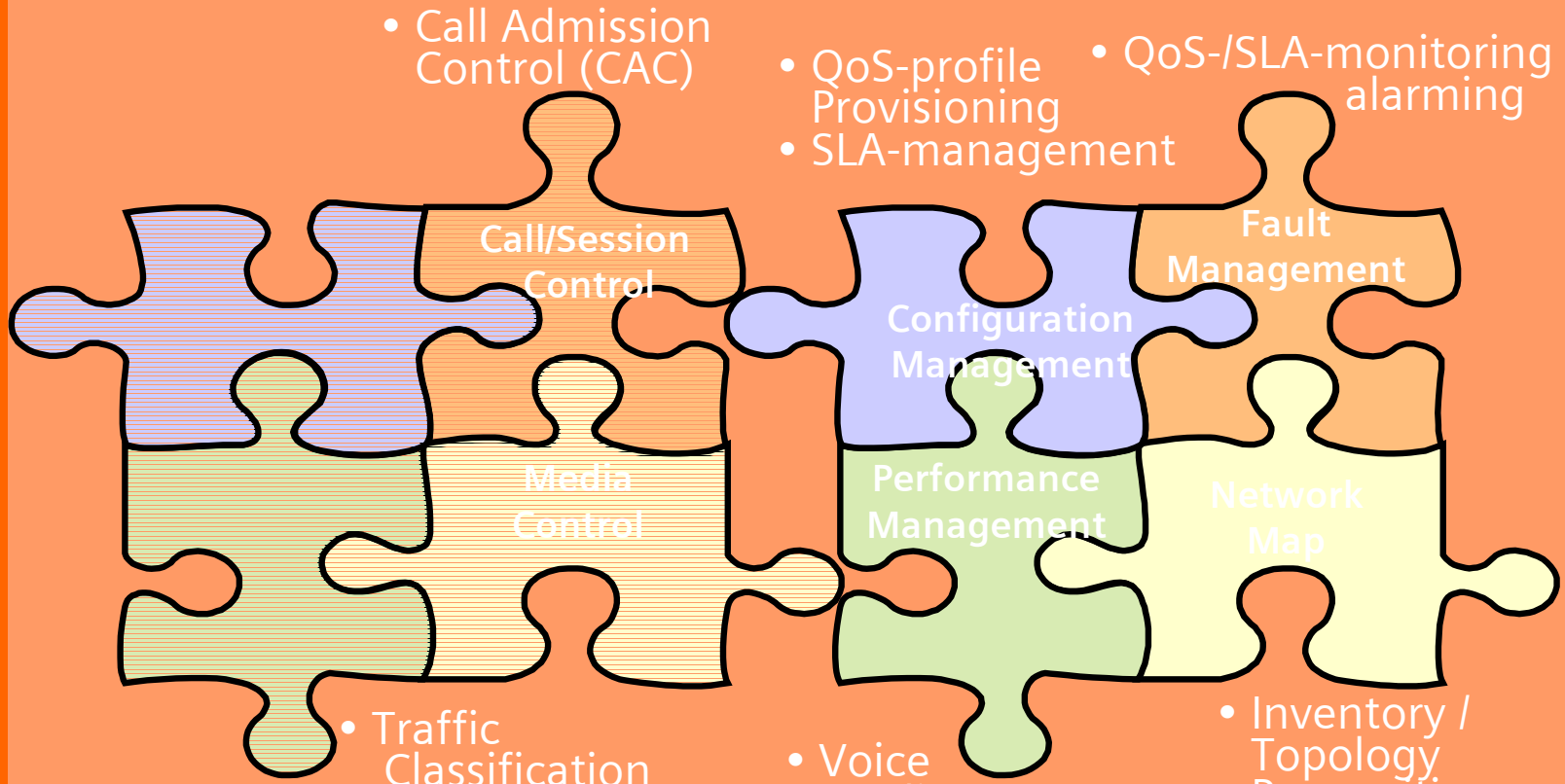
Integrated QoS-management

Outline
Motivation
Objectives
Integrated QoS-management
QoS-management
Building Blocks
Outlook



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Integrated QoS-management
Closed Control Loop

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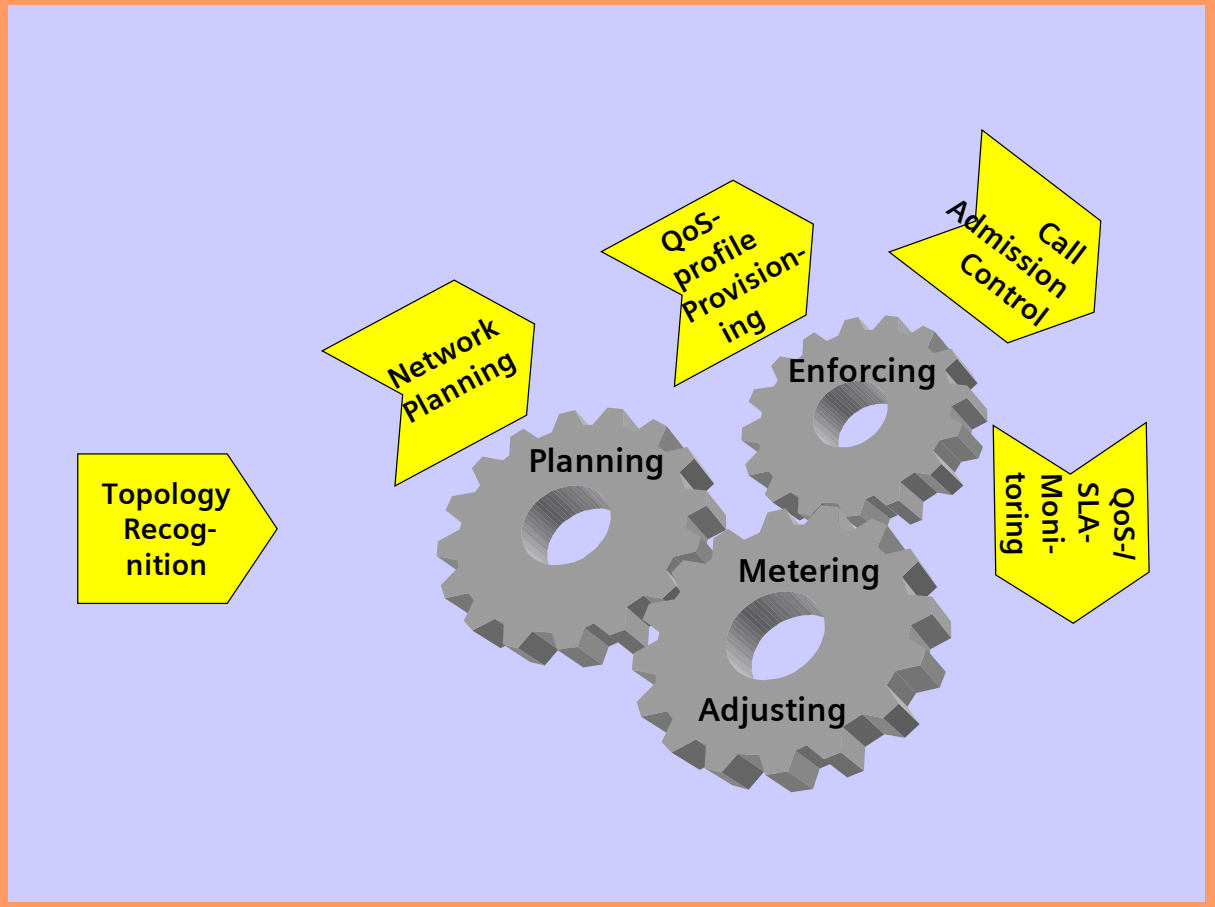
Motivation
Objectives
Integrated QoS-management
QoS-management
Building Blocks
Outlook



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QoS-management Building Blocks
Traffic Classification and Marking

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Motivation
Objectives
Integrated QoS-management
QoS-management Building Blocks
Outlook

Establishment of QoS-policy profile

- Corresponding Traffic Marking
  - IEEE802.1D, Differentiated Services
  - Preferably by endpoints (hosts)
  - In application-aware access switches on behalf of the endpoints
- Central, consistent QoS-profile provisioning in endpoints (IP-phones, soft-phones, access points and gateways)
- Application-layer classification

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QoS-management Building Blocks
Topology Recognition

Outline
Motivation
Objectives
Integrated QoS-management
QoS-management Building Blocks
Outlook

- Detect layer 2 and layer 3 topology
  - Routers, switches, hubs, and hosts
  - Connectivity and routing tables
- Explore properties of the links
  - Link capacities
  - Applied QoS-policies
- Create and maintain topology database
- Detection of topology changes via SNMP or OSPF
- Cope with the following problems:
  - Erroneous MIB-contents, VLAN detection

Detailed presentation by Marie Tromparent, TU Munich - LKN

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QoS-management Building Blocks
Network Planning

Outline
Motivation
Objectives
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Traffic Modeling
- Derive Service Rate (r) under given QoS-constraints according to established SLA
  - Includes max. delay boundary, packet loss
- Link Dimensioning
  - Acceptable bandwidth demand calculation for almost guaranteed QoS at given target outage probability
- Network Dimensioning
  - Import physical layer from Topology Recognition
  - Apply traffic matrix per service

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QoS-management Building Blocks
Network Planning

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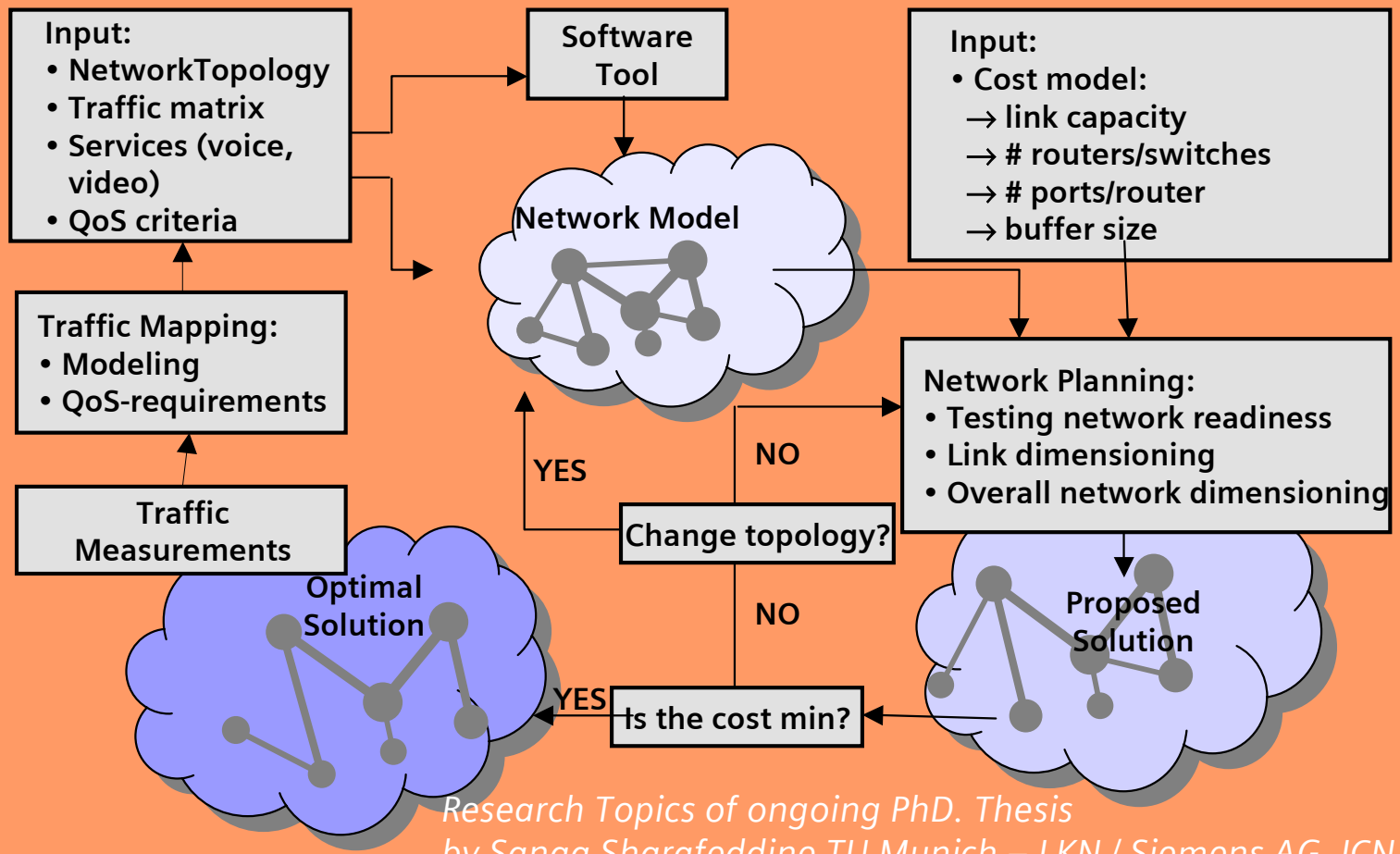
Motivation
Objectives
Integrated QoS-management
QoS-management Building Blocks
Outlook



Research Topics of ongoing PhD. Thesis
by Sanaa Sharafeddine TU Munich – LKN / Siemens AG, ICN EN

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QoS-management Building Blocks
QoS-profile Provisioning

Outline
Motivation
Objectives
Integrated QoS-management
QoS-management Building Blocks
Outlook

QoS-profile Provisioning

- Central QoS-parameter deployment services for
  - Complementary QoS-appliances
  - Workpoints and gateways
- Interface to IP-network vendor-specific Policy Management

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QoS-management Building Blocks
Call/Session Admission Control

Outline
Motivation
Objectives
Integrated QoS-management
QoS-management Building Blocks
Outlook

- Complete call only if IP-network resources are available for the call with toll quality
  - Endpoints have to identify negotiated codec type, speech samples per packet
  - Central signaling entities (H.323 Gatekeeper, SIP-proxy) intercept call and query resource manager (bandwidth broker) for admission
- Option: Abstracted Network Topology focusing on over-provisioned zones and bottleneck link
- Option: Link-by-link reservation along the connection path
- Option: Static vs. adaptive (dynamic) approach
- Reapply reservations after network changes

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QoS-management Building Blocks
QoS-/SLA-monitoring

Outline
Motivation
Objectives
Integrated QoS-management
QoS-management Building Blocks
Outlook

- QoS-monitoring agents in work-points and access-points
  - Monitor received RTP/RTCP-stream
  - Check against provisioned thresholds
  - Send QoS-reports after time interval or at the end of the call/session for post processing
  - Issue SNMP-traps in case of threshold violations
- SLA-monitoring for WAN via QoS-appliances

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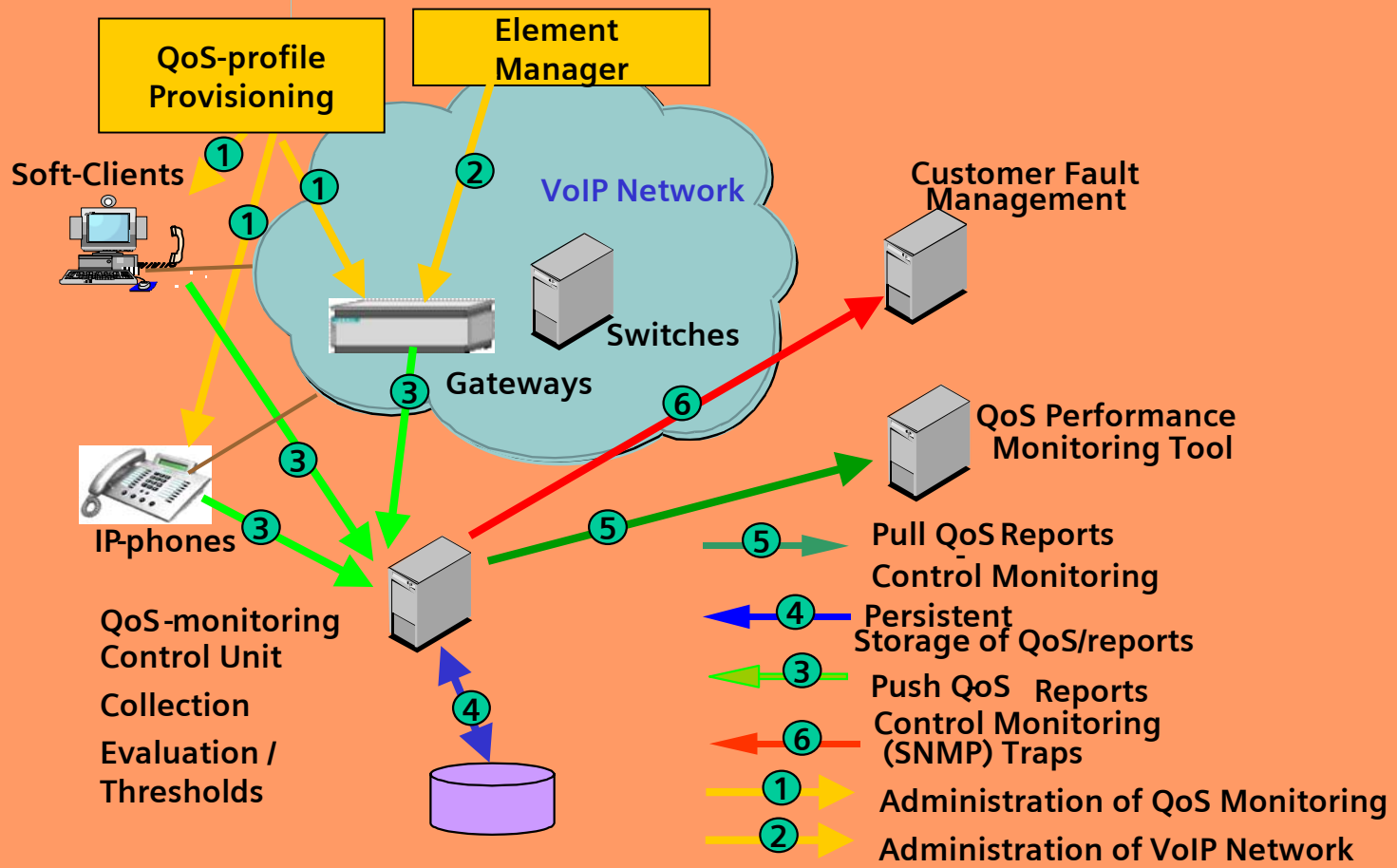
QoS-management Building Blocks
QoS-/SLA-monitoring

Outline
Motivation
Objectives
Integrated QoS-management
QoS-management Building Blocks
Outlook



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Outlook

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Motivation
Objectives
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- Need for QoS-management is emerging
- Network vendors should move from proprietary CLI to emerging standard interfaces
- QoS-related interfaces should be protocol independent to be applicable for both H.323 and SIP
- Existing MIBs should be setup consistent and meaningful
- Customers should demand for and honor QoS-management functions

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Disclaimer

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QoS-management
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Outlook

The concept described in this presentation is a result of corresponding research in this area.

This presentation does not commit any realization of the presented concepts in corresponding products at this time or in future.

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Backup

Outline
Motivation
Objectives
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Outlook

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QoS-profile

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Objectives
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Traffic Type	*IEEE 802.1D Priority*	*DiffServ Code Point (DSCP)*
Voice Payload	5	EF (101110)
Fax Payload	5	EF (101110)
Video Payload	5	AF43 (100110)
Instant Messaging	3	AF21 (010010)
Signaling	3	AF31 (011010)
All Other Traffic	0	DE (000000)

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Related Standards

Outline
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- IEEE 802.1D
- IEEE 802.11e
- RSVP, DiffServ, MPLS
- COPS, SNMPConf
- RaQMom