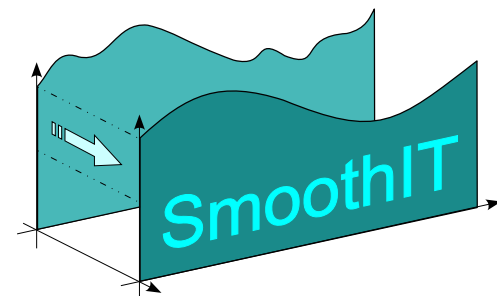


*Simple Economic Management Approaches of  
Overlay Traffic in Heterogeneous Internet Topologies*

*European Seventh Framework STREP FP7-2007-ICT-216259*



# SmoothIT – An Economic Traffic Management Approach

UZH, DoCoMo, TUD, AUEB, PrimeTel, AGH, ICOM, UniWue, TID

COST605 Plenary Meeting  
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**Peter Racz, UZH**



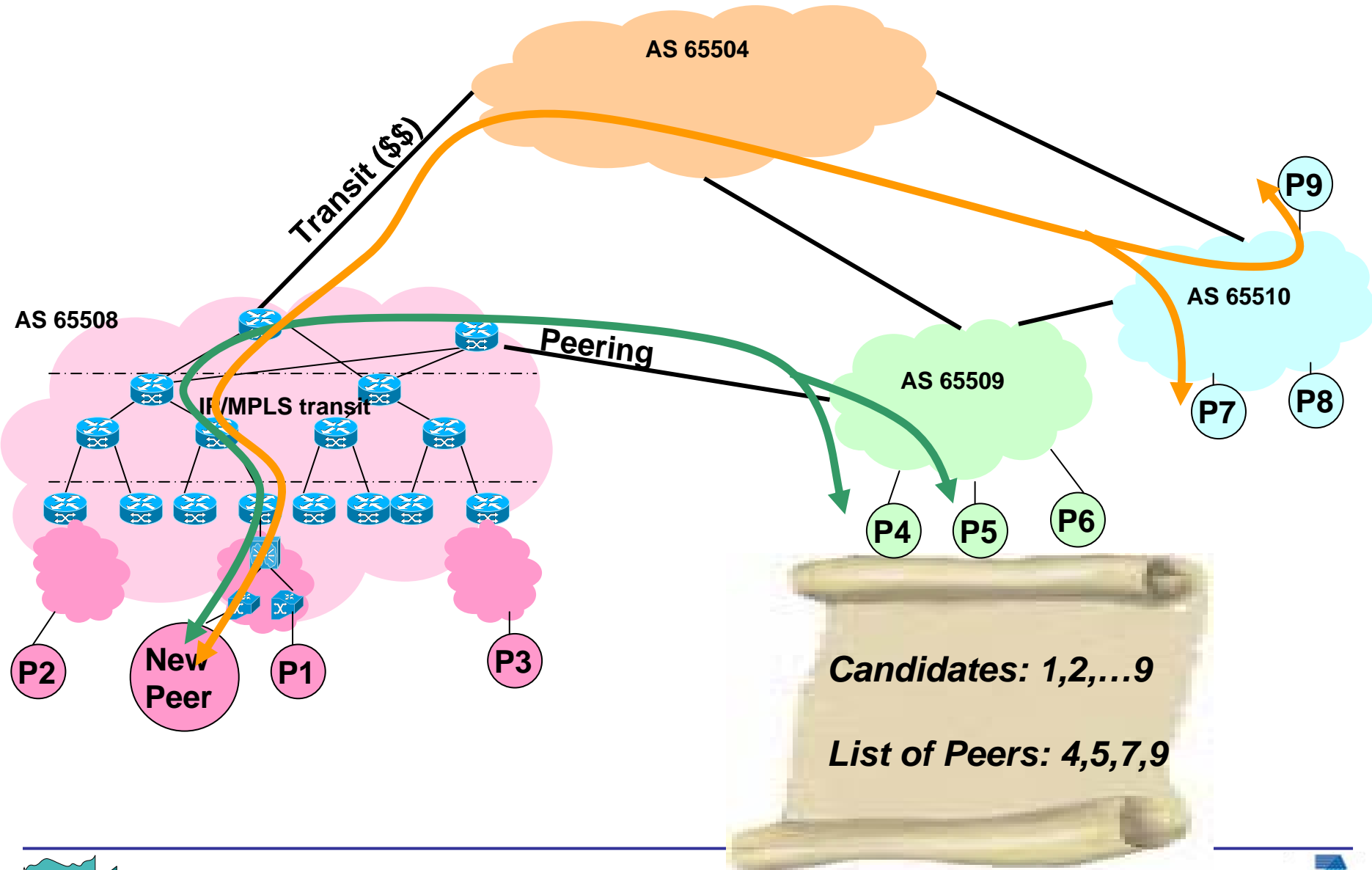
# Outline

- ❑ Motivation and Example Scenario
- ❑ Incentives to Participate in ETM
- ❑ Solution Concepts
- ❑ SmoothIT Information Service
- ❑ Summary

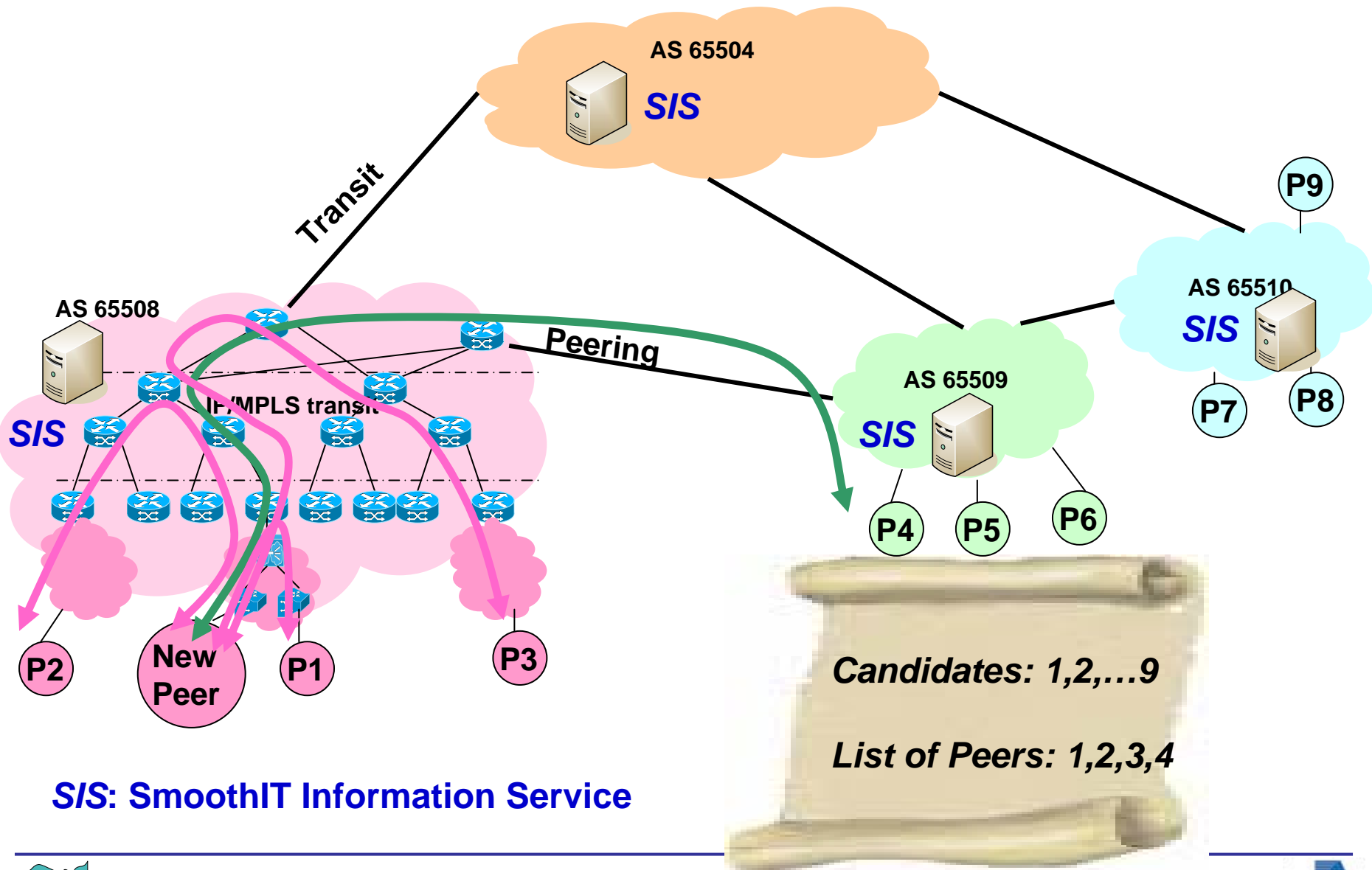
# Motivation

- ❑ P2P applications and traffic
  - Significant and increasing amount of P2P traffic
  - Suboptimal peer selection due to information asymmetry
    - Underlay *topology*, incl. *routing metrics and values*, unknown to overlay
    - Overlay *requirements*, incl. traffic characteristics, unknown to underlay
- ❑ Consequence
  - Non-optimized overlay traffic in the underlay
    - Higher costs in underlay
    - Lower QoS in overlay
  - Conventional traffic management techniques not suitable
- ❑ Goal of the SmoothIT project
  - Bridge overlay with underlay
  - Apply Economic Traffic Management (ETM)
  - Optimize traffic and achieve win-win situation for all parties

# Example: Locality-unaware Overlay



# Example: Locality-aware Overlay



**S/S: SmoothIT Information Service**

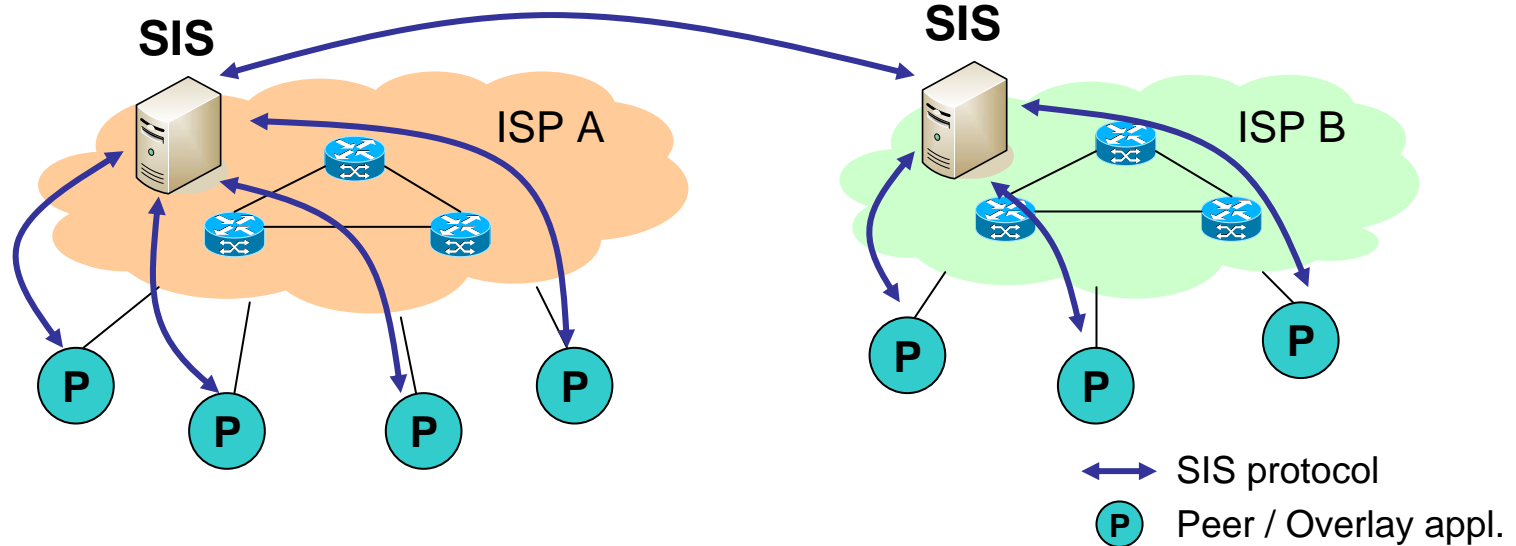
# Triple Win in Detail

- ❑ Management of **overlay networks** based on a collaboration between the overlay provider and the network (underlay) provider in support of the user
  - Cost and investment recovery for operators
- ❑ Incentives for **operators**
  - Monetary: reduce overlay traffic and inter-domain traffic
  - Traffic management: less congested links, better performance
  - Reputation: keep customers, distinguish from other operators
- ❑ Incentives for **overlay providers**
  - Performance: Active role in traffic mgmt increases service quality
  - Reputation: increased user base due to better performing services
- ❑ Incentives for **user**
  - Performance: Increased service quality, e.g., reliability, RTT, BW
  - Monetary: lower price for network access

# Solution Concepts

- ❑ ISP-owned peer
  - **Agreements** between overlay provider and operator
    - *E.g.*, active caching: the ISP provides explicit local caches for content
  - **No change** in the overlay application
  - Overlay application dependent and **legality** issues
- ❑ ISP-managed information service
  - **Locality promotion** and **QoS/QoE differentiation**
    - Operator provides information about how to achieve best quality in overlay, *e.g.*, operator prioritizes alternative peer interconnections
    - Application-aware traffic management
  - **Wide range** of incentives
  - Requires **changes** in the overlay application
- ❑ Distributed ETM
  - Routers perform ETM autonomously
  - Scalability, robustness but **very difficult** to deploy

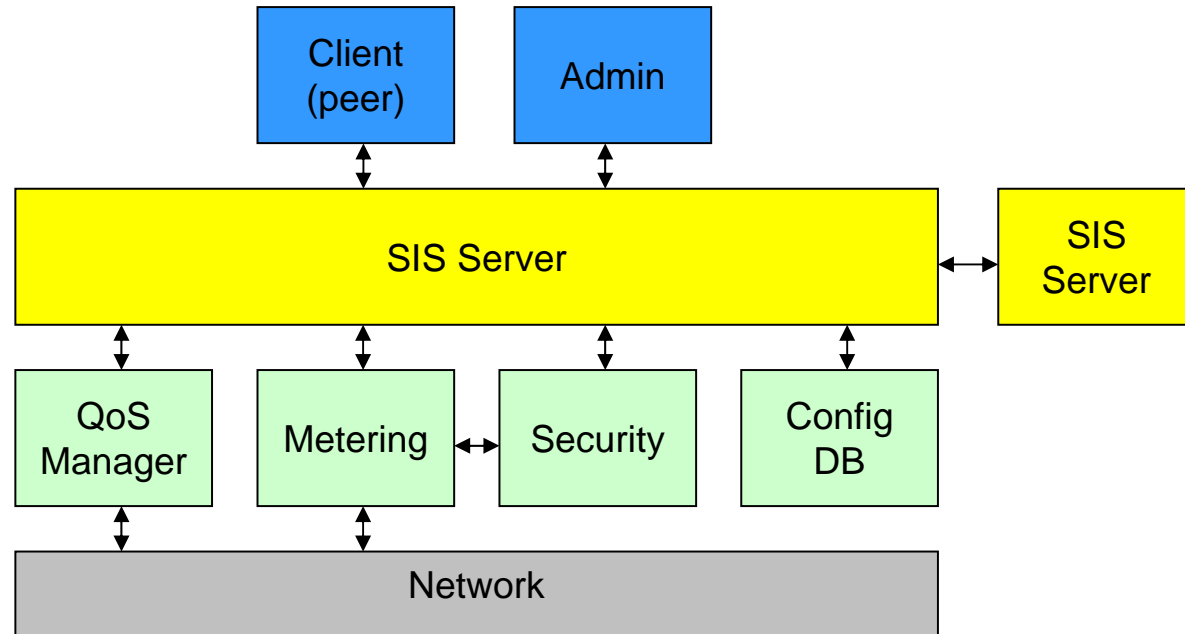
# SmoothIT Information Service (SIS)



- ❑ Deployment of SIS components in the ISPs' network
  - To convey information between overlay and underlay
- ❑ Client-Server architecture
- ❑ Overlay applications interact with SIS in order to select „better“ peers
  - Reducing costs of ISPs
  - Improving QoE of users

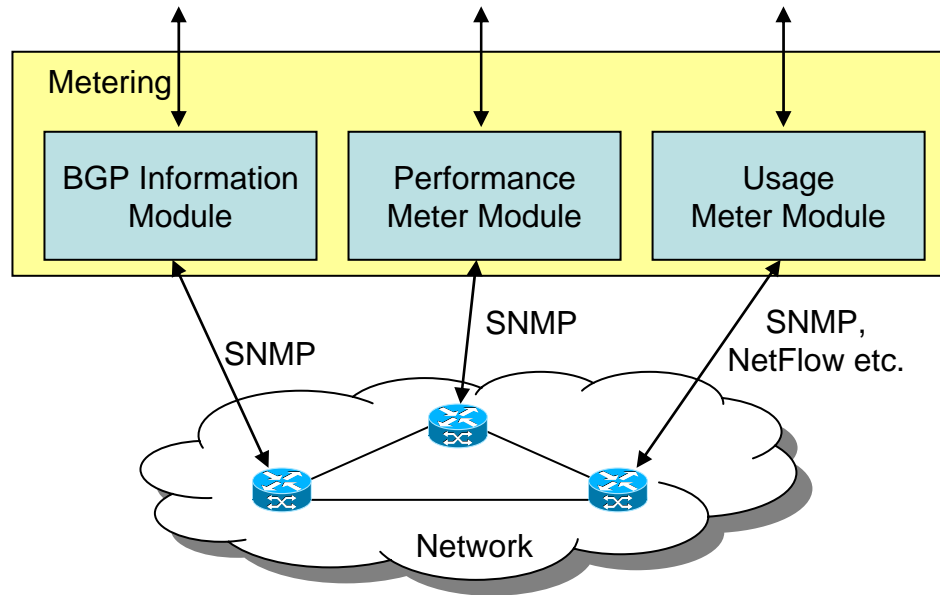


# SIS Architecture



- ❑ SIS Server
  - Contains ETM logic
  - Aggregates information and calculates preference values
- ❑ Metering
  - Collects information from the network, e.g., BGP routing, topology
- ❑ QoS Manager
  - Performs QoS provisioning
  - Support of QoE schemes
- ❑ Security
  - Authentication and authorization
- ❑ Config DB
  - ISP policies and information about the network, e.g., topology, capacity

# Metering



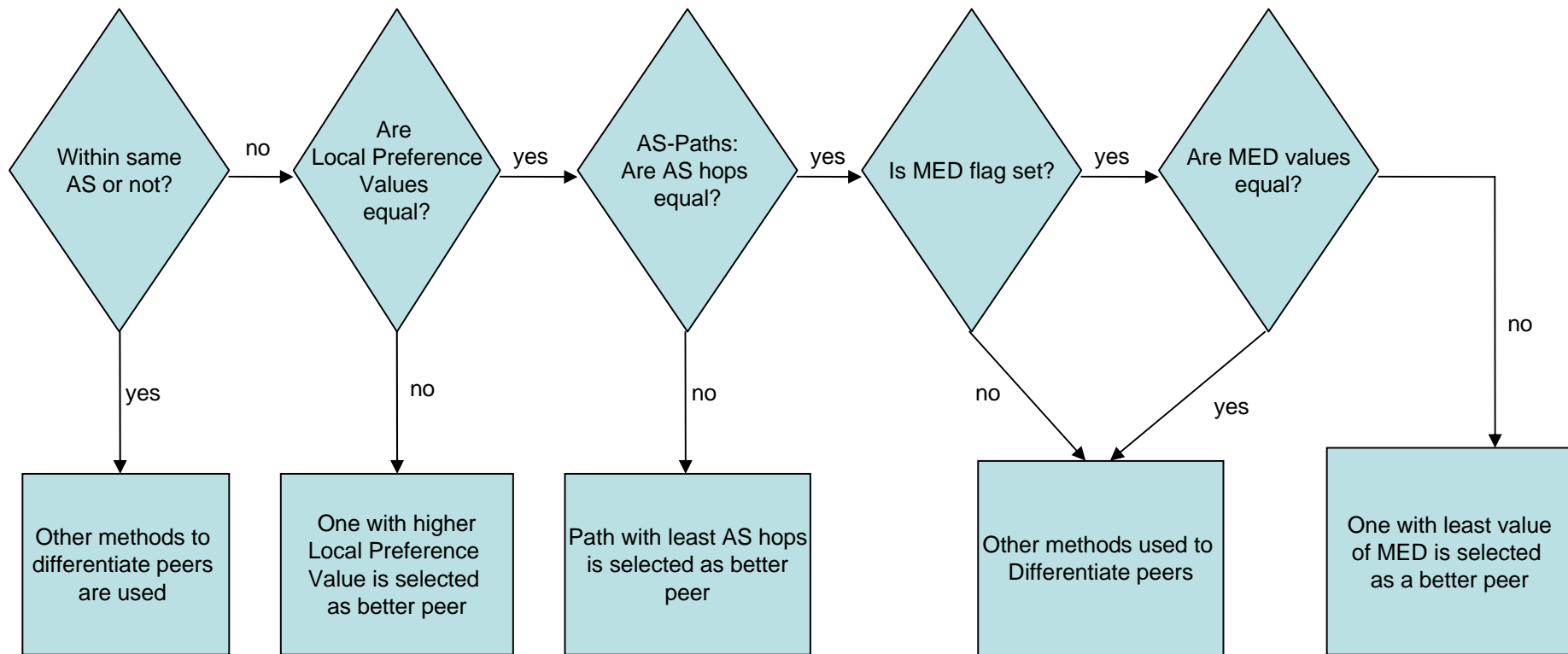
- ❑ BGP information module
  - Gather locality information for inter-domain connections
- ❑ Performance meter module
  - Passive or active measurement
  - E.g., load on links, packet loss, latency
- ❑ Usage meter module
  - Network resource usage metering (data volume)

# BGP Information Module

- ❑ Collects BGP routing information
  - Reads the routing table over SNMP
- ❑ Provides locality information
  - Based on BGP attributes
- ❑ BGP attributes
  - Assigned to each route and influence the route selection
  - Local Preference
    - Defines the exit point to an AS
    - Distributed among routers in an AS
    - Route with highest local preference is selected
  - AS Path
    - Defines the AS hops to the destination
    - Route with least AS hops is selected
  - Multi Exit Discriminator (MED)
    - Defines the preference for an entry point to an AS
    - Route with lowest MED is selected

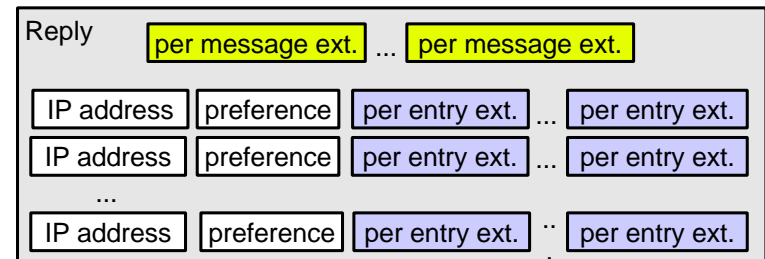
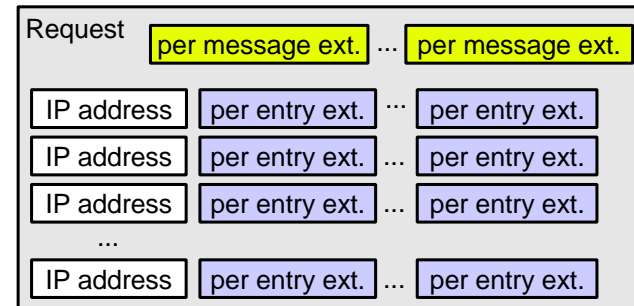
# SIS Server – Peer Ranking

- Peer ranking in the SIS server
  - Based on BGP information
  - Ordered list of peers



# SIS Protocol

- Between SIS and overlay appl.
- Stateless request-response interaction scheme
- Application-independent
- Basic preference information service
  - Request: list of identifiers/peers (IP addresses)
  - Reply: list with preference values
- Optional further parameters
  - Per message or per parameter e.g., application type, desired QoS, capacity, locality, pricing information, peer availability



# Summary

- ❑ Management of overlay traffic is necessary
  - Large amount of traffic
  - High costs for ISPs
  
- ❑ SmoothIT Information Service
  - Deployed in the network of ISPs
  - Provide information to overlay applications
  - Optimize traffic and achieve win-win situation

# Thank you for your attention!

Thanks to SmoothIT's project partners:

UZH, DOCOMO, TUD, AUEB, PrimeTel, AGH, ICOM, UniWue, TID



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Total Communication



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