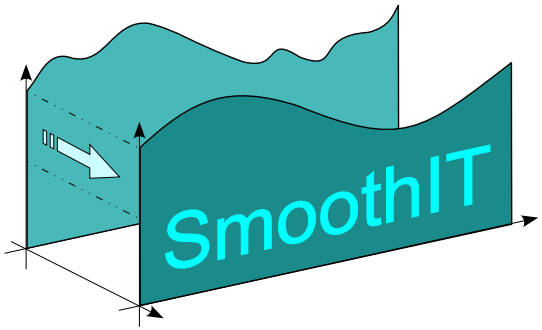

Simple Economic Management Approaches of Overlay Traffic in Heterogeneous Internet Topologies

ICT STREP SmoothIT, FP7, Call 1, ICT-1.1.1-Network of the Future

Dagstuhl Workshop on Benchmarking of Future Content Distribution
Dagstuhl, Germany
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David Hausheer, UZH

Basics and Motivation

- Today, use of economic mechanisms for controlling, managing network traffic of overlays at early stages
- Initial results show that such mechanisms:
  - Lead to a more efficient network operation, for wireless access networks and wire-line backbones
  - Generate higher value for its customers
  - Do have the important property of scalability
- In managing the traffic created and routed through their networks, today's ISPs employ methodologies suitable for conventional traffic/service profiles
  - *E.g.*, peer-to-peer traffic is treated according to traditional techniques

SmoothIT Objectives

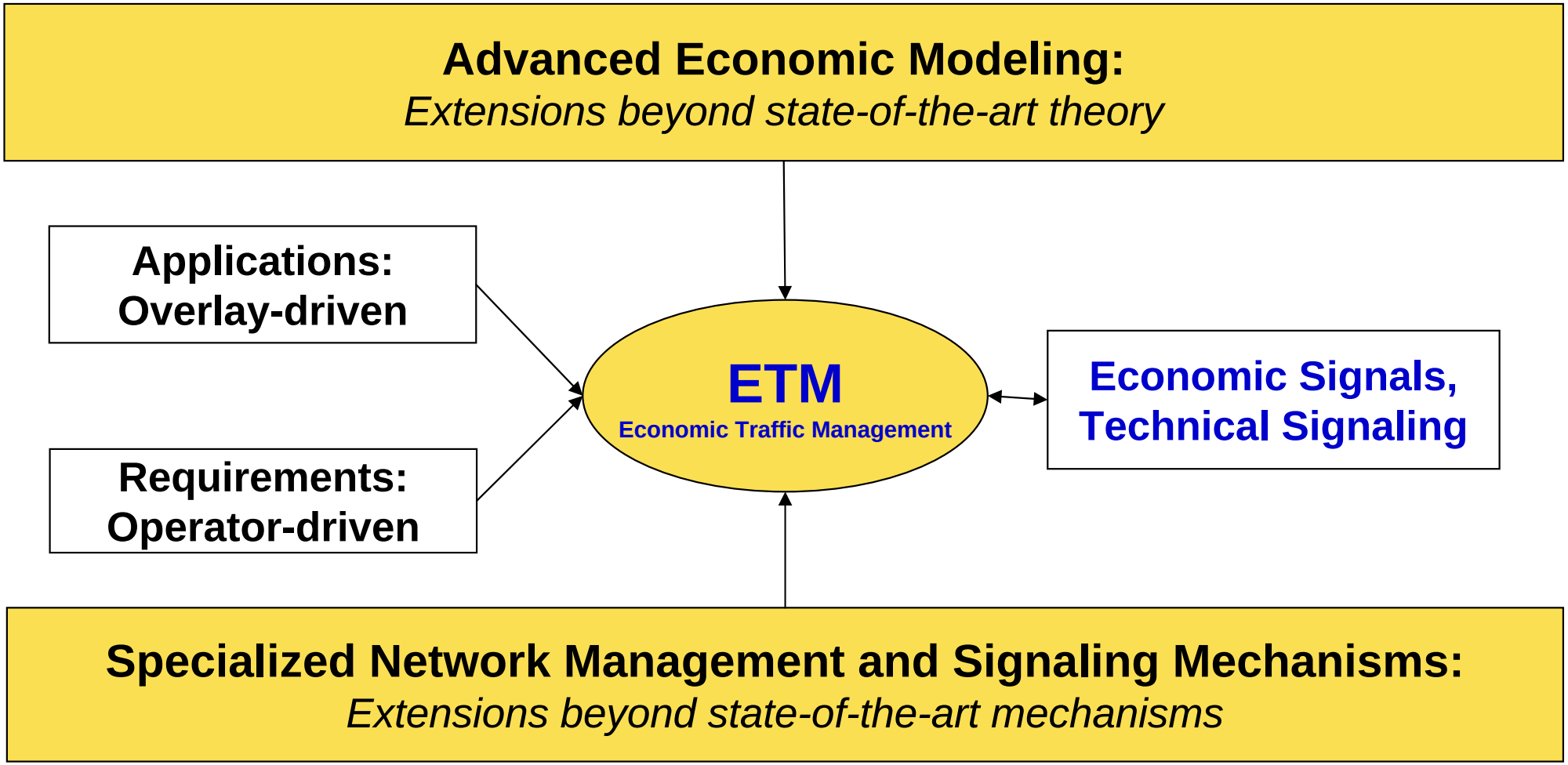
- **Structure Internet-based overlay networks** to be efficient and optimal for **users, overlay providers**, and **ISPs (*win-win-win* situation)**
  - Investigate, design, and apply specialized **economic theory** for **decentralized network efficient Internet-based overlay services in multi-domain scenarios,** including wireless access
  - **Develop** an optimized **incentive-driven signaling approach** for defining (theory) and delivering (technology) economic signals in support of cooperating and competing providers

- **Operator-orientation:** demonstrating key results through a strong focus on **ISP and telecom requirements**
- **Implementation-orientation**: design, prototype, and validate the **networking infrastructure** (real-life test-bed)

Win – Win – Win

- Management of **overlay networks** based on a collaboration between the overlay provider and the network (underlay) provider (operator) in support of the user
- Incentives for operators
  - Cost and investment recovery
  - Reduce overlay traffic and inter-domain traffic
  - Keep overlay services (boost flat rate tariffs; keep customers)
  - Avoid to be on an overlay block list `http://www.azureuswiki.com/index.php/Bad_ISPs`
- Incentives for overlay providers
  - Active role in traffic management increases service quality
  - Increased user base due to better performing services
- Incentives for user
  - Increased service quality, *e.g.*, in terms of reliability, RTT, bandwidth

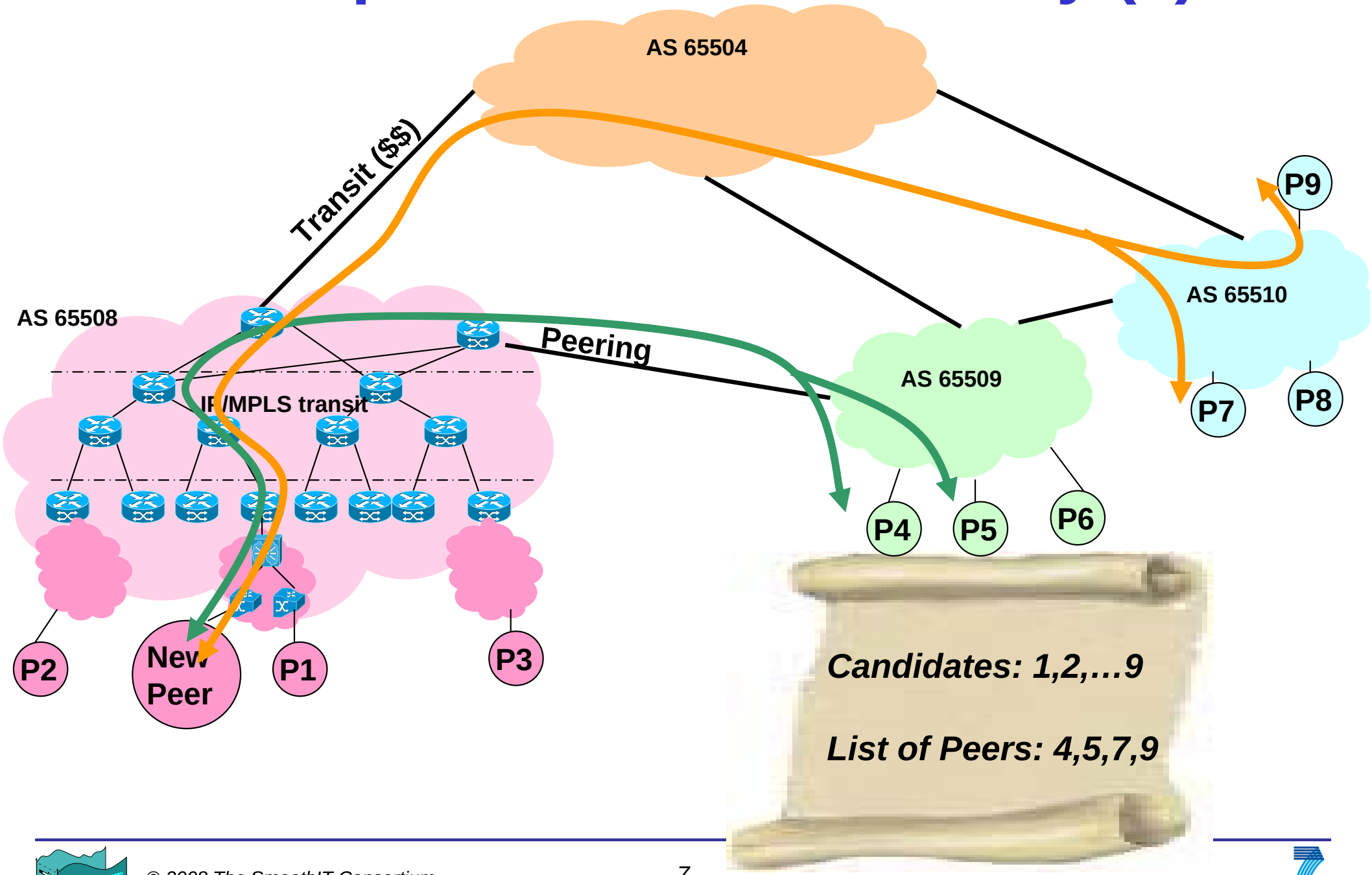
SmoothIT Conceptual Approach



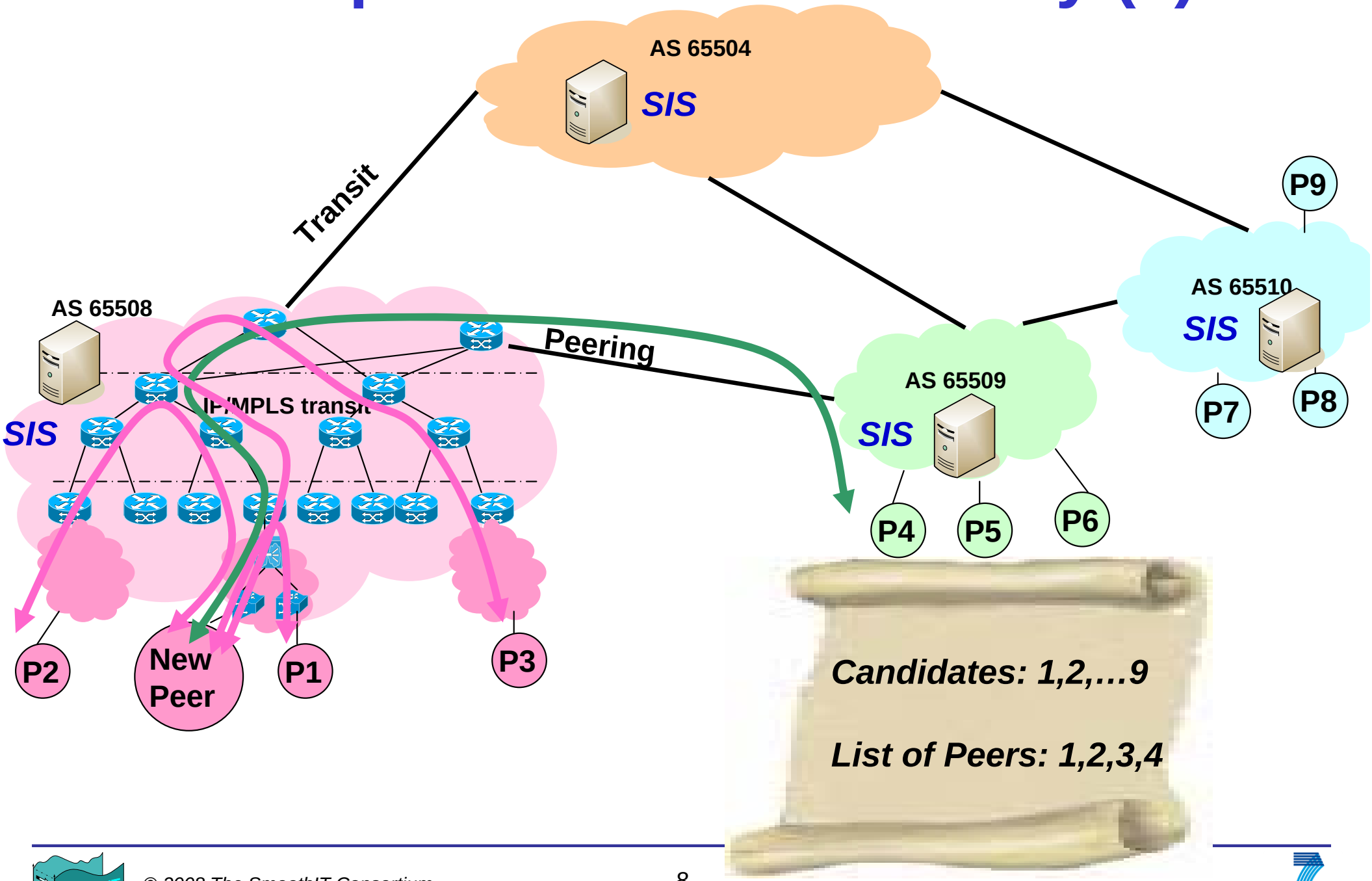
Solution Concepts

- Agreements between overlay provider and operator
  - *E.g.*, active caching:
    the operator provides explicit local caches for overlay content
- Locality promotion
  - Operator provides information about how to achieve best quality in overlay, *e.g.*, operator prioritizes alternative peer interconnections
- QoS/QoE differentiation (application-awareness)
  - Operator knows overlay application traffic (labels, deep packet inspection) and applies application-aware traffic management

Example Scenario – Locality (1)



Example Scenario – Locality (2)



Challenges

- Integration and mapping of operator-driven and overlay service requirements into effective, manageable, and viable

  economic and technical signals

  within/in a multi-domain operational environment

- Development of an efficient and scalable economic management of all overlay types (mainly control and transport overlays) so that:
  - They maximize the benefit for multiple operators/ISPs involved, independently of the underlying technology and topology
  - They can be operated autonomously, show an increasing capability to withstand faults, and balance the load in the network.

SmoothIT Benchmarking

- To assess the solutions (mainly the SIS) envisaged in SmoothIT, it will be necessary to prove that:
  - The economic signals lead indeed to an economically efficient solution with a maximal overall benefit for overlay providers, operators, and users
  - The technical signalling achieves a high technical efficiency with a maximal performance (low delay, high accuracy) at a minimum consumption of technical resources (CPU, memory, bandwidth)
  - The solution scales in different dimensions (#domains, overlays, peers, services)
- The SmoothIT benchmarking methodology includes:
  - The use of economic theory, formal analysis and simulations to evaluate the new economic overlay traffic management approach
  - The implementation and deployment of a prototype on top of a network test-bed in order to validate the solution in a real-life trial scenario

Thank you for your attention!

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