Simple Economic Management Approaches of Overlay Traffic in Heterogeneous Internet Topologies

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Extended Abstract

SmoothIT [1] addresses innovatively the detailed economic and technical mechanisms for a flexible, secure, and scalable traffic management of overlay networks in tomorrow's ISPs and telecommunication operators networking infrastructure.

Motivation — The Internet traffic stemming from overlay-based applications, *e.g.*, Peer-to-Peer applications, increases rapidly with the increase of available bandwidth of end-nodes. For today's Telecommunication Service Providers (telco) and Internet Service Providers (ISP) the issue arising is: how to control and manage network traffic stemming from overlay-based applications? Since the structure of overlays determines the traffic flows in ISP networks, it is highly efficient for an ISP to influence overlay configuration based on information on their structure. Overlays have to be managed to maximize the benefit for multiple operators/ISPs involved, and to increase the capability to withstand faults, and balance the network load. Therefore, the new FP7 project SmoothIT [1] has been started in January 2008.

Major Objectives — SmoothIT is in the process to structure overlays in a way that is efficient or optimal, both for user communities (customer) and for ISPs (provider). This is to be attained by means of incentive mechanisms. Furthermore, SmoothIT started to study and define key requirements for a commercial application of Economic Traffic Management (ETM) schemes for ISPs and telcos. In order to advance traffic management beyond traditional limits, specialized economic theory is in the process of being applied and developed for building in a fully decentralized way network efficient Internet-based overlay services in multi-domain scenarios, solving the information asymmetry problem.

To be able to show that those approaches are practical, SmoothIT will design, prototype, and validate the necessary networking infrastructure and their components for an efficient implementation of such economic traffic management mechanisms in an IP test-bed and trial network. The SmoothIT incentive-driven signaling approach for defining (theory) and delivering (technology) economic signals across domain boundaries is intended to support co-operating and competing providers in an interconnected heterogeneous network environment, which stresses the operator-orientation by verifying key results of the work through ISP and telco requirements as well as its supporting technology.

Architecture — SmoothIT covers theory and modelling of the new ETM mechanism within an open architecture as well as the technical aspects of its implementation and evaluation.

This includes the fine design of flexible, secure, and scalable economic management mechanisms to enable ISPs to reduce their service provisioning and maintenance costs, thus, leading towards a highly competitive market advantage. It stretches beyond the definition of appropriate incentives schemes to motivate collaboration among ISPs (which may also be competing ones at the same time) and between ISPs and overlay networks. Furthermore, the provisioning of security, privacy, and trust for economic management schemes will happen, backed by their implementation in a fully decentralized and competitive multi-provider domain. This SmoohtIT architecture is supported by the exploitation of network-related and management protocosl, traffic measurement schemes, AAA (Authentication, Authorization, and Accounting), QoS (Quality-of-Service), and network management systems, based on existing infrastructure in order to support the widest possible range of inter-domain and inter-provider solutions.
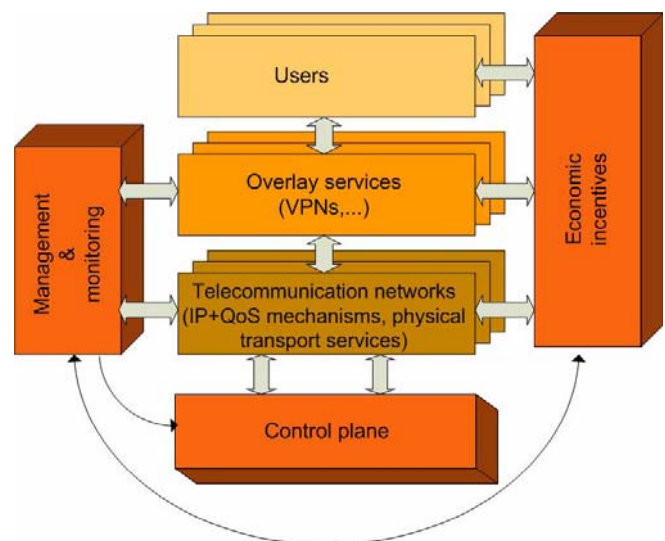

Figure 1: Interactions between Roles and Technical as well as Economic Mechanisms

Interactions between SmoothIT roles are depicted in Figure 1. The key advance beyond traditional network management approaches is determined by the fact that economic incentives are utilized to stimulate management and monitoring decisions, while those stimuli are received from users, overlay services, and networks in operation supporting overlay traffic.

References

[1]   *SmoothIT: Simple Economic Management* Approaches of Overlay Traffic in Heterogeneous Internet Topologies*; European Seventh Framework Project FP7-2008-ICT-216259-STREP, January 2008.