

SmoothIT - Incentive-based Models for Peer-to-peer Networks

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The largest share of data traffic on the Internet is attributable to peer-to-peer networks which are independent of defined Internet Service Providers. The EU project SmoothIT under the leadership of Burkhard Stiller from the University of Zurich now aims to develop economic incentive schemes with which providers should more efficiently adapt their networks to peer-to-peer use and therefore be able to offer cheaper and simultaneously better services. Data traffic on the Internet doubles every 18 months. The weight of so much data is borne by networks of telecommunication companies and Internet Service Providers (ISP). They are orientated to a type of data traffic in which the end-user pays for services - and thus also the corresponding data traffic - from a central service provider.

However, most of the data traffic on the Internet - namely 80 percent - is attributable to so-called peer-to-peer applications. These are applications such as the download network BitTorrent, with which computers belonging to end-users exchange huge volumes of data between each other without the flow of data being steered by the central server of a service provider. With the increasing bandwidth of Internet connections, the significance of peer-to-peer applications is going to increase even more strongly.

The peer-to-peer networks, also known as "overlay networks", overlay those network infrastructures made available and maintained by ISPs. This means for operators that the distribution of data and data flows on their networks is being defined more and more by applications of that kind, over which ISPs no longer have any direct influence. Therefore, a decisive question for ISPs is how, on one hand, they influence the structure of such overlay networks and, on the other hand, how they can adapt their own network better to them.

The SmoothIT project (Simple Economic Management Approaches of Overlay Traffic in Heterogeneous Internet Topologies) from Professor Burkhard Stiller, Communication Systems, from the University of Zurich now aims at developing suitable mechanisms which enable overlay networks to be structured in such a way that they are as efficient and thus as inexpensive as possible for users, overlay providers, and for ISPs. This should be achieved by means of economic incentives which encourage cooperation between ISPs and operators of overlay networks.

An example is that ISPs could provide the user of an overlay network with a list of peer computers which offer a specific file for downloading. The list would be structured by distances. The user has a vested interest in downloading the file from the nearest peer because that would mean lowest delay times. For the ISP, it means that the data would reach the user in the most efficient way. In order to gather information on the distances between peers, the ISP would have to work together with operators of overlay networks and with other ISPs too, because the overlay networks stretch over networks of various ISPs.

In order to conceptualise suitable economic incentive systems for this cooperation, Professor Stiller and his team initially want to measure data traffic in existing overlay networks. The effect of incentive systems will be examined in simulation models. On the basis of resulting findings, network protocols will be designed and tested in two different field trials. For the implementation of incentive systems, it

will also be necessary to create suitable protocols for signalling which enable the measurement, calculation, and partial control of the data traffic generated by overlay networks.

In order to ensure the practicability in today's networks, ISPs and telecommunication providers also take part in this research project. The research department of Telefonica in Spain, the European research laboratory of DOCOMO in Germany, and the ISP PrimeTel in Cyprus have formulated requirements of the solution to be developed from the point of view of industry.

SmoothIT, which is being financed by the 7th framework programme of the EU, should enable ISPs to better attune their networks to peer-to-peer data flows and thus to reduce infrastructure investments and maintenance costs. "SmoothIT will enable ISPs to manage most of the peer-to-peer data traffic more precisely than in the past and to charge for it financially in an appropriate manner", says Burkhard Stiller. "This will mean that they will be able to plan their capacities more efficiently and inexpensively, and maximise their income for minimised data traffic." As the data traffic will also be more efficiently localised and transported over the right ISP data lines, users will also benefit simultaneously from more reliable and qualitatively improved services.

Apart from the University of Zurich, the following institutions are participating in SmoothIT (Simple Economic Management Approaches of Overlay Traffic in Heterogeneous Internet Topologies):

- Technical University of Darmstadt
- DOCOMO Communications Laboratories Europe GmbH
- Athens University of Economics and Business
- Julius-Maximilians Universität Würzburg
- AGH University of Science and Technology
- PrimeTel Limited
- Intracom S.A Telecom Solutions
- Télefonica Investigación y Desarrollo

The programme is being financed by 3 million Euro from the 7th framework programme of the EU and is running until the end of 2010.

For further information: <http://www.smoothit.org>

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