The SmartenIT STREP Project: Socially-Aware Management of New Overlay Application Traffic Combined with Energy Efficiency in the Internet

Burkhard Stiller

University of Zürich, Department of Informatics, Communication Systems Group CSG
On behalf of the project partners: Athens University of Economics and Business,
University of Würzburg, Technische Universität Darmstadt, AGH University of Science and
Technology, Intracom S.A. Telecom, Solutions, Alcatel Lucent Bell Labs France
Instytut Chemii Bioorganicznej PAN, Interoute Spa, Telekom Deutschland GmbH

1 Main Objectives

The Internet has seen a strong move to support overlay applications, which demand a coherent and integrated control in the underlying heterogeneous networks in a scalable, resilient, and energy-efficient manner. A tighter integration of network management and overlay service functionality can lead to cross-layer optimization of operations and management, thus, being a promising approach to offer a large business potential in operational perspectives for all players involved.

Therefore, SmartenIT [1] targets an incentive-compatible cross-layer network management for providers of overlay-based applications (*e.g.*, cloud applications, content delivery networks, and social networks), for network providers, and for end-users to ensure QoE-awareness (Quality-of-Experience), by accordingly addressing load and traffic patterns or special application requirements, and exploiting at the same time social awareness (in terms of user relations and interests). Moreover, the energy efficiency with respect to both end-user devices and underlying networking infrastructure is tackled to ensure an operationally efficient management. Incentive-compatible network management mechanisms for improving metrics in all layers and on an inter-domain basis for internet service and telecommunication providers serve as the major means to deal with real-life scenarios. Such metrics and mechanisms encompass:

- 1) Inter-cloud communication through many operators where applications demand for dedicated Quality-of-Service (QoS) levels.
- 2) An integrated and energy-aware traffic management considering limited energy resources of mobile devices accessing the cloud.
- 3) The exploitation of meta-information by network operators for the purpose of socially aware traffic management.

Selected scenarios are ported into test-beds, in which the effectiveness of appropriate traffic management mechanisms, integrated in an innovative architecture, is demonstrated. This will lead to benefits in cost and service quality for various stakeholders, including network, overlay application providers, and end-users – all of which are relevant players in Europe and world-wide.

2 SmartenIT Requirements and Goals

The three SmartenIT requirements encompass:

- 1) Detailed understanding of overlay-based applications' management demands in terms of traffic, QoE, and user behavior.
- 2) Network management support for cloud-based applications being seamlessly integrated into heterogeneous network management approaches of existing networks.
- 3) Cross-layer, operational, incentive-compatible, and efficient network management mechanisms for dealing with inter-domain ISPs functionality.

The design, implementation, and evaluation of networking functionality for improving this management support of massively adopted applications generating large traffic volume, *e.g.*, content delivery, can be achieved by exploiting cloud computing and social networking principles. In turn, key SmartenIT requirements have led to the SmartenIT key design goals:

- 1) Incentive-compatible network management mechanisms for end-users, overlay service providers, and network providers, being based on an open protocol like ALTO and support an operational framework for agile connectivity, distributed management, and a better control of heterogeneous networks.
- 2) QoE-awareness by monitoring key influence factors like end-user equipment capabilities or traffic load (including bursty traffic situations, congestion cases) and social awareness, especially awareness of user relations and interests.
- 3) Energy efficiency with respect to networking infrastructure as well as wireless and wired end-user devices, including flexibility in terms of adaptability to changing application requirements.

SmartenIT starts with major scenarios, which are driven by technology demands: (a) Energy-aware Traffic Management — by addressing the trade-off between energy efficient computation in the cloud and energy consumption on mobile end-user devices; (b) Social-aware Traffic Management — by exploiting meta-information extracted from online social networks by network operators; (c) Inter-cloud Communications — through many operators, where applications demand for dedicated traffic quality levels.

3 Expected Outcomes

The set of outcomes SmartenIT plans to develop include appropriate management mechanisms to qualify and quantify the selected use cases, which will be dependent on those scenarios as outlined above. They will be demonstrated as an implemented prototype for the proof-of-concept.

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Reference

1. EU ICT STREP SmartenIT Project: FP7-ICT-2011-317846,
<http://www.smartenit.eu>