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Future Internet services: tiered or neutral
Zukünftige Internet-Dienste: gestuft oder neutral

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From the issue entitled "Frauen in der Elektrotechnik und Informationstechnik"

Abstract

Novel Internet applications not only demand more capacity, but also their prevalent request for near-to-real-time transmission requires to increasingly provision high levels of delivered quality of service (QoS). Bandwidth and end-to-end delay of connections across the Internet vary by several orders of magnitude, therefore unequal data handling per node is commonly applied to achieve differentiated QoS. This practice contradicts Internet neutrality if it is not restricted to pure application awareness. A strict separation of network operation from service provisioning would perfectly fit to achieve Internet neutrality. But this may lack economic business models for network operators, especially in a flat-rate world. Differentiated charging offers a solution to achieve fair, autonomous, and cost-related revenue distribution among stakeholders.

Moderne Internet-Dienste bedürfen nicht nur höherer Datenraten, sondern auch einer Übertragung nahezu in Echtzeit, was eine vermehrte Bereitstellung von hohen Übertragungsqualitäten (QoS) bedingt. Die momentane Bandbreite und Ende-zu-Ende-Latenzzeit von Internetverbindungen schwankt allerdings um mehrere Größenordnungen, so dass zum Erreichen unterschiedlicher QoS eine ungleiche Weiterleitung der Daten an den Netzknoten eingesetzt wird. Wenn nicht auf reine Dienstgüte limitiert, widerspricht diese Praxis der Neutralität des Internets. Eine strikte Trennung von Netzbetrieb und Dinestebereitstellung würde perfekt zur Internet-Neutralität passen. Allerdings könnte das den Netzbetreibern wirtschaftliche Geschäftsprozesse verwehren, insbesondere in Bezug auf Pauschalangebote. Eine leistungsbezogene Vergütung kann eine faire, selbstregulierende und kostendeckende Verteilung der Umsätze erreichen.

Keywords Quality of service – Internet neutrality – Application aware networks – Differentiated charging

Schlüsselwörter Dienstgüte – Internet-Neutralität – Anwendungsbewusste Netze – Differenzierte Abrechnung

Fulltext Preview

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Schlüsselwörter: Dienstgüte; Internet-Neutralität; anwendungsbewusste Netze; differenzierte Abrechnung

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1. Introduction

The Internet has become the backbone of modern society. Its transformation into a commercial infrastructure, and the introduction of time sensitive applications including IP-TV, video on demand (VoD), and real-time communication (for instance VoIP or on-line gaming), has launched new challenges regarding the requirements on available network capacity and service quality. In this context, supporting reliable end-to-end transmission is a common problem of access networks (access bottleneck) and potentially overloaded core routers and links. The US national Broadband Plan (*FCC, 2010*) has launched access broadband goals of 50 Mbit/s download speed and 20 Mbit/s upload speed to be achieved by 2015 for 100 million US homes, and 100 Mbit/s download speed and 50 Mbit/s upload speed to be provided by 2020. One can presume that similar goals will be approved for Europe as well.

Also the support of a converged communications framework including fixed, wireless and mobile services implies challenging requirements for an Internet of the future. Large research projects and initiatives, such as the EU's "Future Internet research and experimentation" (FIRE) initiative or the US national science foundation's project "Global environment for network innovations" (GENI), have dealt since years with the investigation and experimental validation of new networking and service paradigms (*Pan, 2011*). Their primal mission is to promote and integrate concepts of experiment-driven research, combining visionary academic research with industry-based testing and experimentation in order to catalyze groundbreaking discoveries and innovations.

Novel applications not only demand more capacity, their prevalent request for near-to-real-time transmission requires to provision high levels of delivered quality of service (QoS). The traditional approach to achieve acceptable transmission performance for all services is overprovisioning. Nevertheless, this response to the ever growing traffic demands is not well grounded, since it is difficult to reliably predict the real capacity requirements of the future and the particular overprovisioning factors required for different service qualities. Overprovisioning is not a satisfactory solution for operators considering current business models where pricing is largely independent from traffic volume (*Roberts, 2009*; *Medeb, 2010*). This is an economic challenge that the network operators try to solve by providing better quality exclusively for demanding applications. Operators negotiate service level agreements (SLA) among each other and route critical traffic across privileged (pricy) interdomain tunnels, thereby creating a two-tiered, meaning privileged versus general, Internet. It is evident that the existence of privileged traffic endangers the average quality of general traffic, and this provoked the discussion whether a two-tiered Internet should be welcomed or prohibited. Internet neutrality has become a big issue and forces a reaction from regulation bodies. The art and the challenge lies on providing reliable broadband transport to everyone while enabling stringent quality grants for special requirements.

In recent years, many network operators are migrating voice services from PSTN to IP networks. The current trend promotes to include fixed-mobile convergence, which has already been realized by some network operators. For this purpose, IP multimedia

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