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Pricing and brokering services over interconnected IP networks

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Abstract

In this paper we consider an IP-based communication platform, characterized by a novel architectural model where barrier-free business and market interactions can be performed. We assume that the network is able to deliver application services which need of network service performance guarantees. In this scenario, we present the concept of the *network commodity* that is traded in the marketplace among network service providers, application service providers and customers. Moreover, we use this concept to define a new usage-based tariff model. Then, we especially focus on the activity of the so-called Network Resource Brokers, which have the goal of finding the end-to-end inter-domain path to deliver an application service that maximizes the users' benefit, in terms of price and perceived service level. In this regard, we present a QoS-and-price based inter-domain routing algorithm, analyze its computational complexity, and show its effectiveness in a selected simulation scenario.

Keywords: Business model; Brokering; Network commodity; Usage-based charging; QoS; Inter-domain routing

1. Introduction

In this paper, we introduce a new paradigm for network engineering and service distribution, which has been developed in the framework of the IST program within the Project IST-2000-25197 WHYLESS.COM. This paradigm is not to be intended

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as a substitution of the legacy telecommunication paradigms, but rather a viable alternative and an opportunity for networking and service operators to go into business within a competitive environment by means of clear and common rules. The interest in observing such rules is that they may attract customers, which are helped in accessing the telecommunication infrastructure and services through assisted procedures that help them in taking appropriate decisions. A novelty of this paradigm is given by a clear separation of the communication infrastructure from the information content, which is expected to be a consequence of the deregulation tendency of the telecommunication world. Therefore, one of the main challenges of the project is to show that it is worthy to set-up a telecommunication business activity based either on the infrastructure or on the information contents. It is expected that in the future a number of small and medium size proprietary communication networks will be deployed and offered to customers as a viable alternative to the large operated networks. Typical examples are metropolitan networks, campus networks and the plethora of wireless local area networks that will accompany different business activities. This means that potential customers will have a number of different opportunities to obtain services, and the communication arrangement will proceed according to new guidelines. Our goal is to decrease the market entrance barrier to providers and to make the use of their services easier and advantageous for customers.

In particular, we can expect the birth of new entities involved in the overall service deployment that will perform brokering activity. Given the separation of the network infrastructure from the information contents, we assume that the brokering services will be classified similarly. Therefore, our business model includes both Information Brokers (IBs) and Network Resource Brokers (NRBs). To improve the final service for customers and to stimulate competition among providers, brokers must be network entities administratively independent.

Before illustrating their roles in details, we introduce the other main players of the model. They are the Internet Service Providers (ISPs) (or, more generally, Network Service Providers, NSPs), which provide the network infrastructure, and the users, that represent both customers (or end-users) and Application Service Providers (ASPs), which are the providers of application services (browsing, e-mail service, voice and video over IP, etc.). We assume that each NSP is able to differentiate network services for supporting future multimedia applications adequately, by means of resource reservation capabilities, as suggested in Huston (2000) and Bernet (2000). The improved network service may be specified in terms of the quality of service (QoS) parameters associated with the information transmission. All these concepts will clearly have consequences on the accounting and pricing approaches. If the Internet becomes a multi service network, ISPs will expect additional incomes for providing different QoS levels, and service differentiation will probably imply a tariff differentiation and the introduction of usage-based charges, as suggested in Huston (2000). This new scenario is clearly very attractive for ISPs, since it could provide them more market space. In this sense, usage-based charging is efficient from the economic point of view. From the business point of view, if a user receives an improved network service, it means that he is obtaining something more than a user that receives a bad one, and therefore he has to pay more. In addition, some studies Altmann and Chu (2001) show that customers are willing to pay an additional