

Charging and Accounting in High-speed Networks

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Extended Abstract

As current trends determine, the Internet may become a ubiquitous, global network for communications. Internet services will accommodate communications between various locations and users. Basic best-effort services as well as advanced and guaranteed services are required to support the broad range of today's multimedia and e-commerce applications. However, while enhanced service concepts emerge on the technical side, a wide-range and professional provision of Internet services is somewhat restricted due to lacking mechanisms for the efficient and usage-based charging of integrated Internet services. Prerequisites to perform such a usage-based charging are manifold. On one hand, the technology in terms of metering and accounting devices is necessary to obtain hooks for the measurement of service usage and its detailed recording. While the Network Traffic Meter (NeTraMet) represents an example for metering devices, Internet Protocol Detail Records (IPDR) define an upcoming data unit format, which deals with packet-based Internet protocol details. On the other hand, pricing models, charge calculation procedures, and customer data are required to calculate a usage-sensitive price for a utilized service, which has to be paid by the customer utilizing this service. The term charging will be used at this stage for the overall process of identifying resource usage until an invoice is presented to the customer. Accounting covers technical as well as economic areas, however, the technical accounting is the most important one to be considered at this stage.

Charging and accounting are those functions required in a commercially operated network, which allow for the support of usage-sensitive service management. While charging traditionally used to be performed on a flat-fee basis, a significant number of Internet Service Providers (ISP) went bankrupt in recent months due to this pricing scheme and its lack of incentive compatibility. Therefore, to close the gap between today's Internet communication demands and the need to gain revenue for ISPs, economic incentives and technical support are required in an integrated manner. In this sense, pricing is considered the most important management functionality future commercial networks need to offer, following actual market forces. Since the Internet is on the move to provide differentiated services, for the backbone based on the Differentiated Services Architecture (DiffServ), suitable and scalable management mechanisms are required.

For that reason, this overview discusses basic problems in the area of Internet charging, introduces a charging terminology for the Internet, and sketches the DiffServ architecture and its Quality-of-Service (QoS) model. In particular, it provides insights in the dilemma of time-scales, which arises in case of the definition of new and, at the same time, technically feasible pricing models for communication services. This leads to the design of a framework for pricing models and their application in a segmented ISP market. It is the only framework known so far defining a clear relation between different time-scales of accounting periods, measurement periods, and charging periods. Based on this new view of pricing, considered as an extension to traditional management information, the Cumulus Pricing Scheme (CPS) proposed targets particularly at DiffServ technology. Prices in this scheme are based on flat fees and, hence, are predictable and transparent. CPS solves the "Internet Feasibility Problem", the solution of a trade-off between customer demands, ISP economic optimizations, and ISP's technical efficiency. In support, a generic and modular Internet Charging System (ICS) has been designed, which offers a communication service-independent architecture and integrates price-driven, economically-controlled network management functions. The ICS may perform transport, service, and content charging, it supports accounting tasks according to transport and multi-service definitions, and is able to integrate different levels of security for charging information.