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The Cost Impact of Application and Context Aware Networks

Egea

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1 Introduction

Application-oriented networking represents a first step towards the integration between software, hardware and networks. The benefits of application-oriented networking lie in sharing application components among communicating users. This enables scale economies, since common application components are shared and their services are accessed by a higher number of users. The most straightforward example of these advantages is protocol translation, which shifts middleware functionalities into routers that can be crossed by application-level messages originating from any user site.

Both servers and network hardware can experience a decrease in their load. In some cases, user requests do not need to reach a server to be managed, but may hit their answer along the way inside a router equipped with an application-level card. For example, application-level caching can significantly decrease network traffic and server load. Furthermore, it can improve performance by providing users with faster responses.

The range of application components that can be moved to the network is vast, including application-level message routing, security, visibility, application optimization and extensibility. This breadth indicates that current implementations of application-oriented networking represent the tip of the iceberg. Any shared application component can be moved to network processing. In this way, the burden of developing, installing, managing and maintaining shared components can be alleviated and the quality of service can increase accordingly, by outsourcing common services to external providers. However, these changes must be justified by corresponding economic benefits. To what extent applications should be shifted to the network? What is the magnitude of savings? Who reaps the benefits of application-oriented networking? Application-oriented networking provides additional degrees of freedom to the design of the overall ICT (Information and Communication Technology) infrastructure. Servers and routers compete for the allocation of application components. Routers can be expected to win a share of application processing only when system requirements allow sufficient scale economies.

The purpose of this research is to investigate the results of an overall optmization of ICT design by leveraging the additional degrees of freedom offered by the application-oriented abilities of networks. The book tackles these design issues with a comprehensive approach. An overall model of the ICT infrastructure and corresponding design methodology are provided to face the overall optimization. Costs are modelled as an empirical design variable that drives the identification of the optimum.

Analyses cover multiple scenarios with application-level caching and format translation. The optimization goal is to decide whether to allocate these application components to router cards and to evaluate corresponding savings with respect to the traditional card-free scenario. Specifically, we assess the Total Cost of Ownership (TCO) of the ICT infrastructure, which includes both acquisition and management costs of technology components. Percent TCO savings represent the indicator measuring the benefits of application-oriented networking.

The presentation is structured as follows. Chapter 2 discusses the state of the art of application-oriented networking. Chapters 3, 4 and 5 present the formal model and optimization algorithm used in this book's empirical analyses. Chapter 6 reports optimization results in a broad range of scenarios and provides an assessment of the economic benefits of application-oriented networking.