Preface

This book provides design considerations and guidelines for implementing Quality of Service (QoS) within emerging 4G networks. QoS best practices are recommended by the contributing authors, and new innovative concepts, solutions, and research results are presented in depth.

The editors originally came together about four years ago as the core team of the Application Architecture Task Group of the WiMAX Forum (which later became the Application Working Group) to facilitate various applications over the mobile broadband access networks. We pursued development of best practices and guidelines to encourage the industry towards unified solutions for better interoperability and performance. Given that there was not a good reference that looked at the performance requirements of the existing and emerging voice, video and data applications in the context of the architectural constraints of the mobile broadband networks, we decided to pull together the present book to fill that void.

A recurring subtext in this book is that the wired and wireless networks have a key difference in how the QoS required for different applications can be supported over them. Although a number of intelligent solutions have been developed to manage QoS over the wired networks, because of the commoditization of the underlying resources, we find that more often than not the service providers resort to “throwing bandwidth” at the QoS issues for resolving them. Wireless networks cannot afford such a luxury. These networks not only have tight limits on how much bandwidth they can offer due to the spectrum scarcity, they need to manage interference and congestion dynamics in presence of mobility. This accompanied with the explosion of new applications over the mobile broadband networks (e.g., plethora of new Blackberry and iPhone applications) has made it critical that efficient QoS management solutions are implemented to ensure widespread success of the mobile broadband networks. The ongoing debate on net neutrality necessitates that the QoS management solutions continue to provide open access while supporting and encouraging adoption of new QoS intensive services.

Emergence of all IP based wired and wireless networks for mobile services calls for new innovations and architectural approach. Coexistence of legacy and emerging networks such as different generations of networks based on 3GPP and 3GPP2 specifications, Wi-Fi and WiMAX, have posed new challenges to guarantee acceptable quality of experiences to the users. Different user environments such as fixed, nomadic, and vehicular have brought about new Quality of Service (QoS) practices and have introduced policies to best optimize the network resources and enhance user experiences.

Additional challenges come from emergence of complementary technologies such as ad hoc and cellular networks. The demand for heterogeneous access increases the difficulty in providing consistent end-to-end QoS control mechanisms. The authors believe new and innovative QoS mechanisms must include convergence of multi-radio and multi access solutions with the state-of-the-art QoS control capabilities. The focus also needs to be on standardization of common practices to unify and provide consistent experience when users move from one network to another. Seamless roaming, seamless handoff, and selective session persistence may be the subject of discussion over the next few years. New
QoS architectures for heterogeneous access will need to make certain assumptions with respect to end devices capabilities. New industry standards may be required to accommodate source as well as network initiated requests, including the ones for QoS renegotiations. Solutions may include location, behavior and resource aware admission control, policy-based management and cross-layer optimization.

The Internet is transforming from a network with the fixed best-effort packet delivery architecture to the mobile services architecture. The recent trend shows wide deployment of networked business applications with specific QoS requirements. In current mobile Internet, traffic flows are typically supported on the Best Effort basis while relying on upper layer protocols like TCP for resource sharing. This approach does not account for the diverse QoS requirements for different applications, time varying availability of radio resources and differentiation among the users. Many proposals, including the ones presented in this book, are being evaluated by the industry. For example, dynamic QoS support and intelligent controls including adaptive traffic prioritizations are proposed to be injected into the networks, applications and end devices to enable increased Quality of Experience (QoE) and lower usage of the radio resources. Application adaptation roll-out is expected from the developers of the emerging mobile intelligent applications, while network adaptation is expected through the mechanisms provided by the service providers.

The contributed chapters are categorized in following broad areas: (1) Broadband Networks, (2) Resource Management, (3) Mobility, (4) Multimedia, (5) Ad Hoc and Mesh Networks, and (6) Future. The Broadband Networks area considers the QoS architectures of representative networks. Next, the Resource Management and Mobility areas consider management of the scarce radio resources as well as handover controls in mobile scenarios for satisfying the QoS requirements. The Multimedia area considers various applications, including most demanding real-time voice and video applications that drive the QoS management expected from the new generation of mobile networks. Finally, Ad Hoc and Mesh Networks as well as Future areas focus on the promising evolution of the wireless technologies and include discussion on the QoS issues in the networks based on such technologies.

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