Chapter 1
Introduction

Sasan Adibi
Research In Motion (RIM), Canada

Raj Jain
Washington University in St. Louis, USA

Shyam Parekh
Bell Labs, Alcatel-Lucent, USA

Mostafa Tofighbakhsh
AT&T Bell Labs, USA

OVERVIEW

Emergence of all IP based wired and wireless networks for mobile services, calls for new innovations and architectural approaches. 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 Experience (QoE) 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 experience.

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. We 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

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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 supporting differentiated QoS. 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 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.

Standardization Bodies

International standardization bodies are responsible to develop new standards and maintain existing ones. The following standardization bodies are just examples of that operate within the various areas of communications, including Quality of Service (QoS) for the current and next generation networks.

Institute of Electrical and Electronics Engineers (IEEE) – IEEE is an international and professional organization that hosts many high caliber research and development activities in various fields of electrical engineering, including IEEE 802.11 standards representing Wireless Local Area Networks (WLAN) or Wi-Fi standards and IEEE 802.16 standards representing Wireless and Wired Wide Area Networks or WiMAX (Worldwide Interoperability for Microwave Access) standards. Both Wi-Fi Alliance and WiMAX Forum are global non-profit industry associated organizations promoting the advancements for Wi-Fi and WiMAX technologies through various certifications programs, certifying products that pass minimum conformance and performance tests.

Internet Engineering Task Force (IETF) – IETF is responsible for the development of Internet Standards through Request for Comments (RFCs). IETF and IEEE collaborate on different levels and once a standard is proposed through IEEE publications, further higher layer protocols related advancements may be carried out through various IETF RFCs.

The 3rd Generation Partnership Project (3GPP) Roadmap – 3GPP is a collaboration among various telecommunications association groups promoting a globally applicable third generation (3G) mobile systems. 3GPP's specifications are within the scope of the International Telecommunication Union (ITU)'s International Mobile Telecommunications (ITU-2000) project, which are based on Global System for Mobile Communications (GSM) specifications evolutions, including Universal Mobile Telecommunications System (UMTS), High Speed Packet Access (HSPA), Long Term Evolution (LTE), and LTE-Advanced (LTE-A). Another variation of 3GPP also exists: 3GPP2, which should not be confused with 3GPP. 3GPP2 specifies standards for another 3G technology based on Code Division Multiple Access (CDMA or IS-95), also known CDMA2000.

Book Organization

The contributed chapters are categorized in the following six broad areas: (1) Broadband Wireless Networks, (2) Resource Management, (3) Mobility, (4) Multimedia, (5) Ad Hoc and Mesh