

Chapter 2

Review of Advanced Mobility Solutions for Multimedia Networking in IPv6

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ABSTRACT

IPv6 is the new version of the Internet Protocol (IP) that is expected to be introduced for a wide audience in the forthcoming years. IPv6 comes with a huge amount of improvements compared to the currently widespread IP version (IPv4), while it keeps the same conceptual basics. For instance, IPv6 has a comprehensive and built-in scheme for mobility management with a great set of additional functionality, while IPv4 has only an extension for this purpose (and it is usually not implemented). Considering the evolution of telecommunication architectures toward a heterogeneous all-IP fixed-mobile convergent multimedia-provisioning system, it is now obvious that only the appearance of IPv6 could extend the infrastructure to cope with the emerging scenarios and use-cases. This chapter provides a broad introduction of the advanced IPv6 features and guides the readers from the basics of the new IP protocol family to its complex feature set and power to support multimedia communications in the mobility-centric Future Internet. Optimization techniques to further increase the adequacy of IPv6 for mobile multimedia are also presented along with the description of several research directions.

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INTRODUCTION

The vision of “anytime and anywhere” has become a powerful concept for voice telephony, where it has been widespread as a global phenomenon and an essential infrastructure. However, nowadays mobile telecommunications aim to emerge beyond individualized voice services and converge to a much more complex system by having mass media content (text, voice, sound, images, video, etc.) within integrated service platforms such creating the phenomenon of mobile multimedia. Newspapers, magazines, books, Internet radio and TV channels, websites, portable music (e.g., in MP3 format) or portable/on-line electronic games, text and rich (incorporating voice/picture/video material) messages, real-time and on-demand video materials (e.g., video phone) and photos are taking part from the emerging new medium of ubiquitous mobile networking. Such mobile networking continuously creates new types of content, initiates new technologies and allows people to interact in novel ways. In order to make all the above advanced mobile media applications available for the wide audience, network operators are taking the challenge of combining mobile communications and the Internet. The convergence is not only observable in networks but also in devices and services, and also amplifies the essential need of networked information provisioning for users anytime and anywhere. Current trends place mobile Internet architectures into the focus point of the whole technological progress. With the development of various wireless network technologies such as WiFi, WiMAX, UMTS, HSPA, LTE, LTE-A, more and more users want to enjoy the benefits of seamless connectivity and ubiquitous Internet access. Vendors prognosticate that mobile networks will suffer an immense multimedia traffic explosion in the packet switched domain up to year 2020 (UMTS Forum, 2010; Cisco VNI, 2011). In order to accommodate the Future Internet to the anticipated demands and requirements, technologies applied in the radio

access and core networks must become scalable and appropriate to advanced future use cases. Network operators not only have to take care of the growing traffic volumes and mass of users, the heterogeneous, overlapping wireless access, and secure communication, but they have also to enforce certain policies in order to provide the necessary *Quality of Service* (QoS) to consumers, all considering the fact that majority of mobile traffic consists of multimedia content (Bokor, Faigl, & Imre, 2011).

The increasing number of consumers, the complexity of mobility scenarios, the technological convergence in telecommunication and information technology present a great challenge for the architecture of the Internet we use today, as such things were not envisioned in the 70s, when the still used IP protocol was designed: IPv4 does not allow the mobility of hosts, works with relatively small address space and lacks support for QoS. To address all these problems and serve the evolving trends of mobile communication, IPv6, a new version of the protocol was developed (Hinden & Deering, 2006; Deering & Hinden, 1998). In terms of multimedia requirements, IPv6 has a number of features that not only optimize current networking techniques for multimedia content transmission, but tries to keep up with the growing demand for services, especially in mobile environments.

Future generations of mobile and wireless technologies will provide virtually unlimited possibilities to the community of multimedia users to all over the world. Network technology innovations and architecture evolution will create the convergent environment in which every media is available, and networked resources are accessible anytime and anywhere, via any kind of connected device in any number. IPv6—as the common language of the Future Internet both in the fixed and mobile domains—could be one of the most important tools for mobile content service delivery, in which enlarged address space, advanced security, multicast and QoS capabilities are naturally integrated with efficient and extend-

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