Chapter 3
Convergence of Fixed and Mobile Networks

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ABSTRACT

This chapter gives overview of one of a recent trend in telecommunication convergence: fixed-mobile convergence (FMC). Its types, implications, and main challenges are identified and analyzed with special respect to the protocols employed. The future integration of fixed and mobile access to next generation networks (NGN) is investigated from several aspects, such as AAA (Authentication, Authorization, and Accounting) protocols, network and application layer mobility management solutions, and policy control. The focus is on access and core networks where the convergence is going to take place. At the end, a short outlook is given to near future mobile trends.

INTRODUCTION

Trends of the first decade of the twenty-first century point in the direction of a world of portable and personalized services. The subscribers would like to access their subscribed services from any location at any time and expect similar interfaces, similar connection quality, similar reliability and high level of security regardless of access type (mobile or fixed) they use. When subscribers can be served via multiple access technologies, for instance while on the move, they expect the network to find the best possible access type. This leads to a single user device that can access the same set of services everywhere.

The fixed-mobile convergence (FMC) has benefits for both fixed and mobile operators. Providing triple-play services to residential users has become reality by the first decade of this century. The availability of services of a fixed operator is however constrained to the subscription point; services are tied to the household. To be able to

stop losing subscribers to mobile operators fixed operators seek quadruple play, which integrates mobility into the triple play services. Mobile operators on the other hand target potential sources of growth; they seek the cost efficient provisioning of the service set familiar for subscribers from home.

When designing the architecture of the converged network several fundamental requirements must be taken into account. The key requirement is the consistent user experience that must be provided independently from the access type; a uniform service set with the same quality measures must be provided to a subscriber even while having an active service session. Therefore, the transfer of service sessions between access types and between operators must be investigated. When the subscriber is on the move, it must be checked if the subscriber has sufficient privileges to connect to an access network and it must be made sure that the network is able to meet the QoS (Quality of Service) requirements of the user's contract. Attaching to a new network connection point triggers authentication, authorization and accounting (AAA) processes where the sensitive personal data exchanged in form of the user profile must be handled with high level of security.

The chapter gives an overview of the main protocols that play role in FMC and is organized as follows. The 'Background' section summarizes FMC and its main challenges for NGN operators. In the next section, first the most important terms of FMC are defined; then the impact of FMC on the NGN architecture is discussed. The section titled 'Mobility support, nomadism, session continuity, handover' reviews network and application layer mobility management solutions that can be considered to provide nomadic services and continuous mobility. The section on policy control takes a look at the management plane functions of converged NGNs. The 'Roaming' section raises traffic routing problems and authentication issues to be solved for subscribers away from their home domain. In the section 'AAA and security', protocols and techniques that can be employed

in a converged NGN are introduced. The '3GPP Long-Term Evolution' section gives an outlook on the evolution of mobile telecommunications for the next few years. Finally, future trends and open problems are summarized.

BACKGROUND

The FMC has four driving forces: the service based interconnection of networks, the transport network convergence, the service plane convergence, and the terminal convergence. The service-based interconnection has begun to become possible with the appearance of mobile telecommunication networks. The service provided is the same: it is possible make a phone call from fixed network to mobile network and vice versa. However, this integration has not yet been achieved for all services, for instance video calls. The first real step towards FMC is the network based (transport plane) convergence, where a common IP based network infrastructure is used from different access technologies. The user centric point of view, that is the service plane convergence, means that the user can access any subscribed service from different terminals and the service is adapted to the capabilities of that terminal. The terminal based convergence is supported by high-tech terminals that can use several access technologies. The ultimate convergence, when all these four conditions are met, is an IMS (IP Multimedia Subsystem – see Chapter XIII) based NGN with hybrid terminals.

From the telecommunication operators' point of view, simultaneous fixed and mobile access leads to a competitive advantage. The mobile operator may become a fixed virtual operator. The fixed operator may become a mobile virtual operator and extends its fixed network with different types of wireless access technologies. As result integrated operators emerge that own a fixed broadband NGN infrastructure and IP service platform of high utilization and offer a large scale of access technologies as xDSL, GSM (Global

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