

# Chapter XLI

## Ubiquitous Communication via Residential Gateways

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### ABSTRACT

*This chapter focuses on the equipment in the home, providing broadband access to the users into the home, called residential gateway. The chapter shows how such a device evolves from a simple modem to an advanced gateway system that contributes to:*

- *The access inside the home of any data on any compatible device*
- *The ubiquity of access points for the broadband network*
- *The ubiquity of media data in the home from remote devices*
- *The communication of mobile handsets via the fixed network.*

*The objective of this chapter is to give the reader a technical insight into the enabling mechanisms and technologies dealing with such functionalities. The text indicates particular technical solutions, but explanations are kept high-level in order to allow nontechnical readers to understand the basics and concepts of the solutions. A number of references show that the technical exposé is becoming a reality.*

### INTRODUCTION

In modern countries, the evolution of a simple xDSL modem to a residential gateway system (RGW) for broadband access offers new features which probably will speed up introduction of broadband services.

A multiservice residential gateway is a key element in the home towards integration of media (documents, mail, telephony, radio, video, TV, and so forth), which are carried over a single access

line to the RGW. All home devices are connected to the rest of the world via this single access box in the home. Some home devices are storing family data (photos, video, recordings, and so forth). An important step is that devices may communicate wirelessly to the RGW, which allows access to the outside world from anywhere in the home. A next step is that the RGW allows access to home devices from outside so that the family can show media (photos, etc.) to friends when they are visiting them. A further step is the integration of RGW with mobile devices and portable equipment, so

that it is possible to use broadband network access anywhere where there is a hotspot facility or guest access supported by a RGW.

The following sections start with a background and then show a technical evolution, starting from a simple home modem to a complex residential gateway, adding respectively multiple LAN interfaces (wireless, Powerline), mobility in the home, integration with public mobility networks, roaming and public access via hotspot in the homes and guest access, and remote access capabilities for home automation and remote metering purposes. This chapter is focusing on technology, but references show that this is an evolution becoming reality.

## **BACKGROUND**

The broadband IP based fixed networks are taking their place in the communication networks landscape (Home Gateway Initiative, 2005). The success of the broadband network are services and in particular the data services like Web, mail, and so forth (De Smedt, 2004). These services are now also being offered via the mobile networks. There is a convergence of both worlds. The fixed networks are providing functionality to allow more mobility to the user. The mobile communication is also using the fixed access lines in order to profit of their bigger bandwidths. The real-time services (telephony, video, TV, etc.) are getting more and more important in this communication area. Also, wireless communication is of greater interest to users. There is a growing communication need to access some home stored media data by remote users, in particular the traveling user who wants to access his home data. Residential gateways may play twice a role in such communication. At home, the user needs to get access to the broadband network and for the traveler the residential gateway at home needs to give access to his home data.

## **USER NEEDS AND USE CASES**

The original aim of a residential gateway is to provide access to the Internet broadband services in

the home for a single personal computer (PC). The users need or will need more extensive capabilities, which can be offered by a residential gateway, and which is still reasonably cheap in relation to the monthly fee to be paid for the broadband access. The home user, with regard to the aspect ubiquity, will gradually require more and more the following capabilities (De Smedt, 2004; HGI, 2005; IST European Project, 2005):

- Use of more PCs in the home which are communicating with each other
- Use of home laptops with wireless access, and telephony and other devices with wireless access, or at least solutions not providing additional cabling
- The ability to use the mobile phones for communication over the fixed network or for communication in the home at reduced calling prices
- The ability use the wireless (and wireline) devices at places outside the home, for example, in station, airports, pubs, or even anywhere on a parking place
- The ability to have broadband access in homes of family or friends
- The ability to access photos, movies, files which are on storage devices in the home, from remote locations (e.g., from public places or home of family or friends)
- The ability to check security in the home (doors closed? oven off? who is ringing the doorbell? motion detecting in the home, etc.)
- The ability to give utility companies access for remote metering.

All these needs will have to be fulfilled by technical solutions that are technically, at high-level, described in the following sections.

## **THE EVOLUTION FROM A SIMPLE MODEM TO A RESIDENTIAL GATEWAY**

A few years ago, it was only necessary to connect one single personal computer to the Internet.

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