Open broadband access networks

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JOHN CHARLES FRANCIS **The Open Broadband Access Network is a wireless concept whereby privately owned indoor WLAN access points are made available for public use. Consequently, indoor WLAN access points are effectively used to provide outdoor broadband radio coverage. The concept is elaborated through the European Union 6th Framework project, OBAN.**

The Open Broadband Access Network (OBAN) project addresses an innovative approach to establish a broadband mobile network in line with present Beyond-3G (B3G) visions. The concept leverages WLAN technology in the home and corporate environment to make available to the public the broadband capacity of the access line (ADSL, CATV etc.). Residential users, for example, continue to use their WLAN as before, while public users utilise the signal that propagates outside the building (figure 1).

The market assumption is that in future the majority of private homes will have access to a broadband network over ADSL, VDSL, CATV, fibre, and that WLAN will be the dominant technology for inhouse communication. In urban areas, the signal "leaking" into the public environment from residential WLAN access points can offer near-continuous radio coverage, potentially allowing users to roam seamlessly through a landscape of homespots and hotspots. Compared to conventional cellular mobile networks consisting of a limited number of optimally located outdoor base stations and antenna masts, the OBAN network will consist of a much higher number of micro base stations (i.e., WLAN Access Points), which are randomly located in urban environments (figure 2).

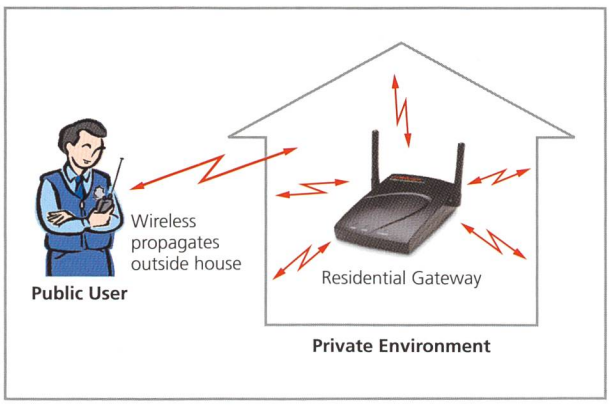

Fig. 1. A wireless residential gateway based on WLAN-technology and connected to the fixed-network allows a public mobile user to communicate using the surplus capacity of the fixed-line.

OBAN Objectives

To achieve this ambitious vision, existing protocols and mechanisms will have to undergo fundamental improvements to reconcile the conflicting goals of seamless mobility, security and quality of service. Accordingly, the broad scope of the EU-funded OBAN project addresses the following areas of innovation over the period 2004–2006:

- Adaptation of WLAN access control and security mechanisms to the needs of open access. It will be necessary to protect the integrity and privacy of the residential user from the public, while at the same time protecting the public user from snooping or hacking by residential users.
- Advanced mobility functionalities enabling fast, seamless handover between heterogeneous access technologies, and across feeder lines. Wireless access technologies include WiFi and other emerging WLAN technologies, while feeder lines of potential relevance include DSL, fibre and CATV. Interworking with the GSM/EDGE and UMTS cellular networks will be an essential feature to ensure universal coverage.
- QoS mechanisms are needed to guarantee the integrity of the service for the home user, while allowing surplus capacity to be utilised by public users. Conversational services like VoIP will need guaranteed bandwidth to run, to avoid annoying interruptions in service. On the other hand, best-effort services may transmit packets whenever surplus capacity becomes available because of the statistical properties of residential traffic. With some fixed-line subscriptions the residential subscriber will have signed up for less capacity than the fixed network access can support, allowing the surplus capacity to be guaranteed to public users. In other cases, the subscribed capacity may not be in use or used intermittently (e. g. for Web browsing), and in this case surplus capacity can be offered to the public on a best effort basis, where the residential user is given priority. Another issue to address is the integrity of the residential network: a local inhouse spooling between a wireless PC and a wireless print server should not be degraded by public users.
- Relevant legal and regulatory issues also need to be addressed, including external antenna placement, unbundling and competition. Currently, the OBAN concept is seen to operate in public spectrum, but potentially newer technologies such as WiMAX may use spectrum owned by the operator.
- Wireless technology enhancements will appear in the future, extending range and bit rate. Solutions will also be needed to mitigate against interference resulting

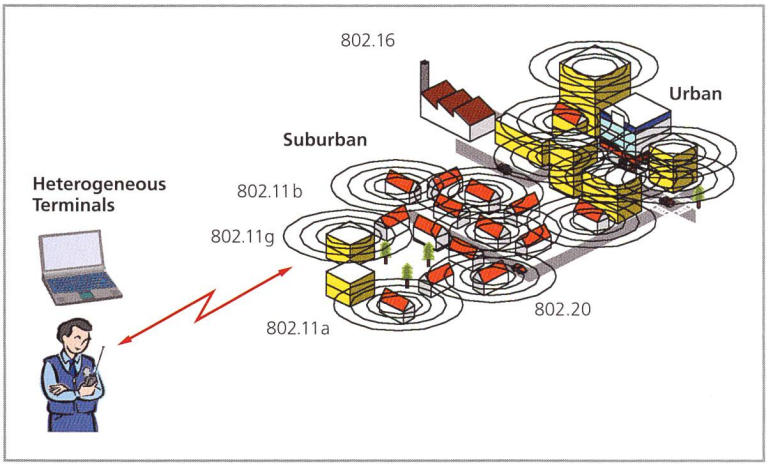

Fig. 2. The OBAN network will consist of a high number of micro-base stations based on WLAN-technology and randomly located in urban environments.

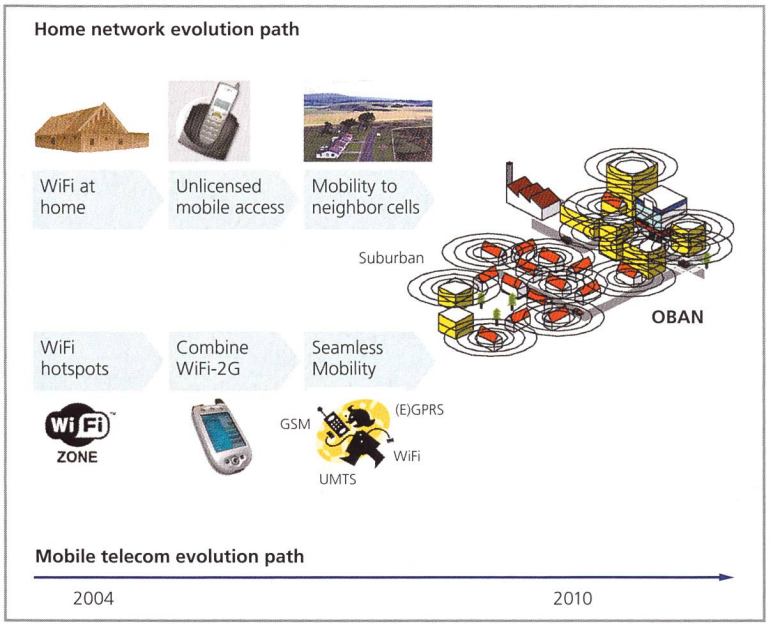

Fig. 3. Two main evolution paths lead to the OBAN vision.

from a high density of WLAN access points. Relevant technologies include multiple antenna techniques such as MIMO.

- Social and business aspects which relate to the adoption of the OBAN service will need to be addressed. Residential users will be understandably reluctant to open their home network resources to public users unless there is some benefit. Realistic business models must therefore be defined by benefit to the involved parties (OBAN users, residential users, network operators, service providers). For example, the residential user may join a community of OBAN users allowing cheaper telephone calls and hotspot access. Alternatively, residential users may be remunerated for opening their home network to OBAN customers via revenue sharing. Subsidising access line costs may also provide an incentive, as may subsidy of residential gateway or home networking equipment. Suitable charging algorithms are also needed to support the various schemes.

The OBAN concept may be looked upon as a way to provide wireless (mobile) broadband services over the existing fixed broadband network, instead of trying to make the narrowband mobile network broadband.

The long-term vision of the OBAN project is a future network that enables people to roam through the urban landscape maintaining their communication sessions with agreed Quality of Service, while avoiding any issues such as repeatedly typing in passwords. This requires seamless mobility and hand-over functionalities, so that users will not notice when they are leaving and entering each wireless zone. Interworking with the GSM/EDGE and UMTS networks will be essential to guarantee coverage outside of densely populated urban areas. The OBAN vision also includes terminals that are adaptable to different radio interfaces (frequency, coding and modulation method) or, alternatively, base stations (WLAN Access Points) that are able to communicate using different radio technologies. Currently, two main evolution paths are seen to lead towards OBAN, as depicted in figure 3.

The wireless LAN technology used in the future OBAN field trials will be based on leading market technologies. The minimum functionality needed will consist of WiFi, with other relevant WLAN and cellular technologies taken into account. Interworking with UMTS and EDGE will be essential to cover potential gaps in coverage.

The scientific and technical objectives of the OBAN project cover research subjects which must be explored, evaluated, and eventually integrated to answer the fundamental questions as to whether the concept is realistic in terms of non-technical as well as technical criteria, how well it performs in practice and how it may be accepted by the various actors.

The 14 participants in the OBAN consortium form a rich and creative mix from the R&D milieus of industry, telecom companies and independent research. The Swiss dimension is represented by the participation of Swisscom Innovations who leads a key work package in the project. The other participating operators are France Telecom, Telefónica and Telenor, who lead the OBAN consortium, with regulatory aspect addressed through the participation of the Norwegian telecom regulator. The manufactures in the project include Motorola and Lucent Bell Laboratories, as well as several SMEs such as Birdstep and Obexcode.

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