



Commission for  
**Communications Regulation**

## Briefing Note

### Unlicensed Mobile Access (UMA)

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## **1 Executive Summary**

This briefing note is on the topic of UMA (unlicensed mobile access) which is a technology that potentially allows users to access lower cost calls while in certain places (e.g. at home, in the office, at a wireless hotspot) using the same handset that they use while out and about for their mobile GSM communications. This is a particular type of convergence between fixed and mobile technologies which is an emerging trend in telecoms services.

This document introduces UMA and other fixed mobile convergence technologies and identifies some of the potential benefits of this type of convergence to competition in the telecoms sector and to individual consumers. At ComReg we are pleased to see the emergence of innovative new telecommunications products and services in Ireland to take advantage of the opportunities that fixed mobile convergence technologies create.

### **The Briefing Note Series**

One of ComReg's key roles is to encourage innovation in the Irish telecommunications industry. The Forward Looking Programme (FLP) is used to help achieve this aim by making people aware of various technology developments and trends in the ICT sector. This goal is primarily achieved through the release of Briefing Notes. These are documents that typically cover technical topics for non-technical people, although some basic background knowledge of communications technology is helpful. This Briefing Note re-launches the briefing note series, and will be followed by other notes later in the year.

## 2 Comments on this Briefing Note

ComReg welcomes any comments or views on this Briefing Note. Comments should be sent to:

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to arrive on or before Friday 13<sup>th</sup> October, 2006.

Comments will be reviewed by ComReg when carrying any out further work on issues covered in this Briefing Note. In submitting comments, respondents are requested to reference the relevant section of this document. Responses will be available for inspection by the public on request, subject to the provisions of ComReg's guidelines on the treatment of confidential information – ComReg 05/24.

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### 3 Introduction

New services and technologies are expanding the scope of traditional fixed and mobile services into each other's territory, bringing users added convenience and choice. Unlicensed Mobile Access (UMA), or Generic Access Networks (GAN) as it is sometimes known, is a form of convergence between fixed and mobile services, and is the topic of this briefing note.

UMA potentially allows users to access low cost VoIP<sup>1</sup> calling while in certain places (e.g. at home, in the office, at a wireless hotspot) using the same handset that they use while out and about for their mobile GSM communications. A special base-station is needed on the customer's premises (or wherever the UMA coverage is needed), that is attached to a broadband connection (typically fixed line) for backhaul. UMA base-stations are readily available from equipment manufacturers, and because they are exempt from licensing they can be easily installed by consumers once they already have a broadband connection.

The convenience of having a single handset for low cost 'home' calls and mobile calls, with a single bill<sup>2</sup>, is desirable for business users and home consumers alike. This form of fixed and mobile convergence (FMC) can be viewed as both an opportunity and a threat to mobile and fixed operators, depending on their position and outlook in the competitive environment. UMA and other FMC technologies have the potential to stimulate the competitive environment through a new range of converged services. Handsets are already available by major vendors such as Nokia and Motorola, and systems are being deployed by operators in Europe (e.g. BT "Fusion" (UK), TeliaSonera (Denmark)) and the US (T-mobile).

This type of convergence will eventually be available in advanced 3G systems in combination with fixed next generation networks, utilising IMS (IP Multimedia Service) systems which are at an earlier stage of development. UMA could be considered a predecessor of IMS in some ways<sup>3</sup>.

#### 3.1 Value Proposition

Fixed and mobile convergence, like that possible with UMA, brings numerous benefits in terms of cost and convenience to consumers. Customers who can avail of VoIP calls over their fixed broadband network are likely to make cost savings over using a mobile network. Being able to use a single handset for low cost 'fixed-line' calls as well as mobile calls, with the same number<sup>4</sup> would be a significant benefit in

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<sup>1</sup> Voice over IP – See ComReg docs. Voice over Internet Protocol – Briefing Note (ComReg doc. 03/21), and Voice over Internet Protocol (VoIP): A Guide (ComReg doc. 04/103a).

<sup>2</sup> A single bill could come from a mobile network operator or from a broadband operator with a mobile virtual network operator (MVNO) arrangement.

<sup>3</sup> IMS is an advanced access-independent platform for converging different networks and services (i.e. voice, video and data) – see Section 4.3.

<sup>4</sup> For some applications it is convenient to retain more than one number; this is possible with UMA also.

terms of convenience<sup>5</sup>. This essentially combines a home cordless phone with a regular mobile phone. Walkie-talkie type applications where the UMA system is integrated with other business communications (e.g. a computer network that supports VoIP between several office branches) could also develop as an important application (e.g. simplifying and converging networks in an office environment).

For operators, fixed and mobile convergence can provide a means of reaching new markets, adding value to existing offerings and decreasing the cost of acquiring new customers. In particular, fixed operators may view UMA as a way of offsetting the revenue impacts of VoIP and fixed mobile substitution (FMS), as it can provide lower cost calls and mobility under their own brand (although it is dependent on the fixed operator either having a mobile arm or reaching an MVNO agreement with a mobile operator). For a mobile operator, UMA offers a way to increase and improve mobile coverage into users' homes with limited additional cost per user. UMA also provides opportunities to new entrants looking to deploy infrastructure and enter into partnership with existing operators. Convergence of this kind can have positive impacts in the market by delivering greater choice to users through a healthy competitive environment.

### **3.2 UMA Background**

Following on from research carried out independently by a number of organisations, the UMA initiative was formed in January 2004 by 14 operators and vendors. Its aim was to create an open standard that would allow the use of equipment and devices on an unlicensed basis (e.g. Bluetooth and WiFi) to complement existing mobile platforms (i.e. GSM and GPRS). The group included system vendors such as Alcatel, Ericsson, Nokia, and Kineto Wireless among others. Operators included BT, Cingular Wireless, T-Mobile, O2 and Rodgers Wireless. A specification for UMA was released in September 2004. This work was then taken on by the 3GPP (3<sup>rd</sup> Generation Partnership Project<sup>6</sup>) – where it was renamed Generic Access Networks (GAN). The standard has been approved and included in 3GPP release 6, which is the most up-to-date 3G standards set.

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<sup>5</sup> Readers should also see the current ComReg consultation on “home-zone” type services: – “ComReg Consultation paper – ‘Geographic Number Allocations for Hybrid Fixed-Mobile Telecoms Services’, document number 06/33”.

<sup>6</sup> The 3GPP is a key 3G industry and standards forum that formed in 1998. See [www.3gpp.org](http://www.3gpp.org)

#### 4 What is UMA and how does it work?

Unlicensed mobile access uses license-exempt radio technology, which means that operators can easily access particular blocks of spectrum without having to pay fees for their right of use following comparative selection competitions or auctions. With readily available and relatively low-cost equipment in the market, there are few barriers to operators seeking to provide wireless access within users' premises.

Key elements in the UMA reference diagram are listed below:

**The UMA enabled Handset:** Special dual mode handset that can operate on UMA (e.g. Wi-Fi) and on traditional cellular networks (e.g. GSM) – see Section 4.2 below.

**Mobile base-station:** This delivers a standard GSM or GPRS end user mobile connection provided by a mobile network operator. This would be used while the user is outside the range of a UMA base-station.

**Mobile backhaul:** This connects mobile base-stations to the core mobile network and beyond. It consists of private network links between base-stations (BTS) and base-station controllers (BSC) that are only used by the mobile operator for mobile traffic.

**Base-station controllers:** These manage the traffic on a group of base-stations and connect the mobile access network to the core mobile network.

**Core Mobile Network:** This includes mobile switches, interconnection to other networks, billing systems, core infrastructure links, and network management.

**UMA base-station:** This gives users UMA wireless coverage (e.g. Wi-Fi). It typically takes the form of a small box that a user must connect to their broadband connection.

**Broadband backhaul:** The broadband connection (typically fixed line e.g. DSL) that connects the UMA base-station to the outside world.

**The UMA network controller:** This is a new element which must be implemented by the UMA operator. It connects with the core mobile network using standard mobile network interfaces, and it tells the mobile network when UMA devices have joined a UMA portion of the network so that they can be reached.

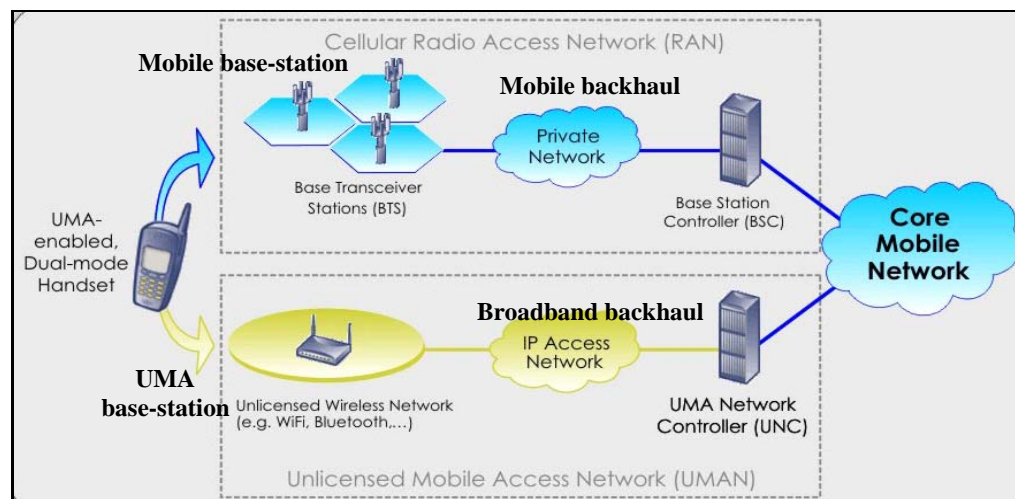


Figure 1. UMA system diagram.

Source: [www.umatechnology.org](http://www.umatechnology.org)

#### 4.1 Radio Spectrum

UMA makes use of radio spectrum in the 2.4GHz band<sup>7</sup> where Wi-Fi and Bluetooth operate<sup>8</sup>. Low powered wireless devices operating in this special band do not require a wireless license from ComReg, or the relevant spectrum management authority in most other countries. However, the devices are restricted to operating within certain power limits<sup>10</sup>, and must be designed to co-exist in a harsh (i.e. un-coordinated) radio environment. These types of parameters are already accounted for in technologies such as Wi-Fi and Bluetooth, and do not need to be specially redesigned for UMA. Using license-exempt wireless technology such as Wi-Fi and Bluetooth limits the range and capacity of a UMA base-station in comparison to a GSM base-station. A range of 10 to 20 metres would be expected for a UMA base-station in a typical home or office building, whereas a GSM base-station would typically have a range of several kilometres<sup>11</sup>.

#### 4.2 Handsets

A key technology issue is the availability of handsets for UMA. Handsets need to be dual mode, in that they can operate as standard GSM/GPRS/3G handsets as well as UMA (i.e. Wi-Fi or Bluetooth etc.) devices. Semiconductor producers are already offering chipsets for UMA handsets (e.g. Siemens, Philips) and a larger selection of handsets is expected on the market in the second half of 2006. Currently UMA handsets are available from manufacturers such as LG, Motorola (a UMA version of the RAZR handset), Nokia, and Samsung. Convergence with other technologies such as Wi-Max is also likely (e.g. Nokia<sup>12</sup>)

#### 4.3 Alternative Solutions

Other technologies are under development such as mobile (GSM and 3G) pico-cells<sup>13</sup> that consumers could potentially install in their own premises, or in offices, using fixed-line broadband for backhaul (e.g. nanoBTS from ip.access). Such pico-cells

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<sup>7</sup> 2.4-2.5GHz – Known as Industrial Scientific and Medical (ISM) band

<sup>8</sup> Although other frequencies could also be used if license-exempt equipment was manufactured.

<sup>9</sup> Licence exempt arrangements are in place for the 2.4GHz band (which UMA uses) in most countries worldwide.

<sup>10</sup> Devices operating in this band must still conform to certain standards that control or limit their emissions. These details are listed in ComReg doc. 02/71 "Permitted Short Range Devices in Ireland" - <http://www.comreg.ie/fileupload/publications/odtr0271.pdf>

<sup>11</sup> Up to 35km in some rural installations.

<sup>12</sup> At 3GSM 2006, Nokia, who already have mobile devices supporting cellular and Wi-Fi, announced that they are willing to sell their devices to Internet VoIP brands (e.g. Google, Skype, Vonage, Yahoo etc.). Nokia also announced that they will incorporate Wi-Max into mobile devices.

<sup>13</sup> A pico-cell is a small mobile transmitter and receiver device that is connected to the mobile network via a broadband link (e.g. DSL). It acts as a localised mobile base-station (e.g. coverage within a house).



can additionally help solve localised problems of weak mobile coverage. This is similar to a UMA solution except that a special dual-mode handset is not required. IP Access and Siemens are vendors of pico-cells. Ofcom in the UK recently auctioned spectrum in the 1700MHz to 1800MHz range (former DECT<sup>14</sup> guard bands), that is likely to be used for this application. Although pico-cell technology would be more easily adopted by existing mobile operators, partnering with mobile operators would enable new entrants or other non-mobile operators to provide these services. Pico-cell technology would not require end users to have special handsets.

Another emerging platform is IMS (IP Multimedia System), which is an advanced access-independent platform for converging different networks and services. This is a core part of future 3G releases, and will likely form the basis of future converged services, whether they are provided by an operator with fixed or mobile origins. IMS is also described as an enabler of Next Generation Networks. Although some features of IMS, and some of its related systems (e.g. SIP<sup>15</sup>-based VoIP) are already in the market, it is generally still under development. Deutsche Telecom is due to launch a SIP-based Wi-Fi/Cellular phone which can operate over ISDN or broadband. BT is trialling an IMS solution for business FMC services called Enterprise FMC, which it is expecting to launch in early 2007. From a consumer's perspective, IMS would appear the same as UMA type services, except that IMS would allow enhanced features such as device independence (i.e. a user could log into their service from any terminal or handset).

Other solutions that provide the consumer with some of the benefits of a UMA system (or other FMC systems) - but use existing technology - are already being deployed throughout Europe and are likely to be strong competitors to UMA. These are typically mobile-only solutions that do not have an element of fixed and mobile convergence, but deliver the cost savings that end users expect from a fixed phone over their mobile. Mobile operators are able to alter their billing systems so that a customer is charged a discounted rate while attached to their 'home' base-station (i.e. in the vicinity of their house) – e.g. Genion (O<sub>2</sub>), zu Hause (Vodafone)<sup>16</sup>. These are often known generically as 'home-zone' services. ComReg is currently consulting on the potential introduction of such home-zone services to the Irish market. Other mobile-only solutions such as flat-rate tariffs and special 'family and friends' tariffs (or their business equivalents) are likely to play an important role in this area.

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<sup>14</sup> DECT (Digital Enhanced Cordless Telephony) is a standard for home cordless phones. Most cordless phones now available in Ireland would be DECT.

<sup>15</sup> Session Initiation Protocol – This is an emerging standard for managing multimedia sessions on IP networks. It is one of the driving technologies behind many VoIP implementations.

<sup>16</sup> In the case of Vodafone zu Hause service launched in Germany, consumers were initially required to use a separate handset for their home-zone calls from their regular mobile handset.

	<b>UMA</b>	<b>Home-zone type solutions</b>
Handset	Special dual-mode handset	Typically - any mobile handset
Number	Typically a single number (fixed, mobile or VoIP)	Single mobile number or fixed and mobile number <sup>17</sup>
Technology	Wi-Fi/Broadband + GSM	GSM/GPRS/3G
Enhanced Coverage	In home-zone & hotspots	No
Range	~ 10 to 20 metres around home-zone or other hotspot	~ 2km on average <sup>18</sup>
Ability to locate users <sup>19</sup>	Good	Not as good without additional cellular geographic location technology

Table 1: Comparison of UMA and home-zone type solutions.

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<sup>17</sup> With calls to fixed number redirected to mobile

<sup>18</sup> If cell-ID alone is used for defining the home-zone

<sup>19</sup> This is an important feature for location based services.

## 5 Market & Commercial Issues

The core UMA technology is well defined and is now commercially available. Trials and early commercial deployments are underway and more handsets with UMA capabilities are expected to reach the market soon. However, the availability of good technology alone is not enough to ensure its success. Commercial offers that deliver customers the same value using existing technologies (i.e. home-zone services, family and friends, etc) are already developing the market for fixed and mobile convergence solutions, which could make it difficult for UMA solutions to gain a foot hold. In other cases, operators are waiting for more advanced, longer term solutions to become widely available – i.e. IMS-based solutions. The types of business cases that operators can build around FMC are key to its success. With high-value offers (as perceived by consumers), delivered in a competitive environment, combined with the availability of technology (i.e. handsets), UMA could potentially achieve widespread adoption, appealing to the majority of broadband users. UMA could also be an important driver of increased competition in the areas of infrastructure and services.

### 5.1 Mobile Operators

A major reason for mobile operators to adopt fixed and mobile convergence solutions is to add value to their data offerings with high speeds at lower cost. This is facilitated already in the data card market where multimode cards, or a combination of cards and internal hardware, can accommodate 3G, Wi-Fi, GPRS etc. However UMA is primarily about voice, which has limited stand-alone value to a mobile operator who already has a complete voice solution. Nevertheless, UMA offers mobile operators a low cost alternative for enhancing mobile coverage in particular small areas (e.g. individual homes or offices) - i.e. by allowing users to route their mobile calls via a Wi-Fi UMA base-station, which they may already have as part of their fixed broadband service. UMA also offers mobile operators the chance to retain voice minutes, which might otherwise migrate to VoIP with other service providers. This enhances the fixed to mobile substitution opportunities for mobile operators<sup>20</sup>. However, mobile operators have other mobile-only strategies such as home-zone tariffs to increase FMS (e.g. cheap rate when attached to ‘home’ base-station – see Section 4.3). Furthermore, operators with 3G networks - that are engineered to be more economical for providing voice - will be seeking to maximise their utilisation, and low cost voice deals is one way to achieve this.

A factor in the success of a healthy UMA market is the ability of fixed operators to form partnerships with mobile operators, possibly through MVNOs, since the mobile element is essential. Otherwise, UMA is only an option to operators that own both mobile and fixed networks, and mobile operators with access to fixed networks. The general lack of this kind of partnership in Ireland is challenging to the development of this type of converged service.

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<sup>20</sup> In terms of customer ownership at least.

## 5.2 Fixed Operators

For fixed operators UMA, and an associated partnership with a mobile network, provides an opportunity to offset the potential loss of subscribers to mobile operators. It enables them to package a mobile voice element in with their broadband offerings. With the added value of mobile, fixed operators could hope to also offset the loss of voice traffic to third party VoIP services over broadband. In many cases fixed operators already have some experience with Wi-Fi, either through the provision of Wi-Fi equipment to residential broadband users (e.g. eircom), or through public hot spot initiatives (e.g. BT Ireland, eircom).

Of the fixed operators in Ireland only eircom, with both a fixed and a mobile network (i.e. through Meteor), currently has the potential to offer UMA services without needing to partner with another operator.

## 5.3 Other Operators

The open nature of IP and license-exempt equipment creates many opportunities for new entrants. There is scope for new operators to enter into the market with UMA technology, as long as they can partner with a mobile operator. These could be Fixed Wireless Access operators, already with a growing presence in the broadband access market, for example. Similarly, any provider of fixed broadband would be in a good potential position to offer UMA services. This could also be a possible way for existing traditional resellers to evolve their businesses in an increasingly difficult environment. A key competence for new UMA entrants will be in billing systems, as interaction has to be managed between the various service elements and business partners involved.

## 5.4 Early Deployments and Recent Developments

### Early Deployments:

BT in the UK was an early adopter of UMA-type technology through their Bluephone/Fusion initiative, launched in June 2005. Although this initially used a Bluetooth solution, the availability of good quality dual mode Wi-Fi handsets is likely to give BT better prospects of expanding this service. Wi-Fi integration is important for market appeal because it will enable users to roam ('rove') onto public Wi-Fi hotspot networks (which are increasingly available) while away from home or out of the office.

France Telecom is reported to be expecting to be the first European customer for Nokia's UMA phones<sup>21</sup>. Telia Sonera in Denmark has been trialling Motorola's UMA solution for the past year, and plans on launching services in 2006<sup>22</sup>. In the US T-mobile is expected to launch a UMA service in 2006/2007.

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<sup>21</sup> Source – Fierce WiFi, 'UMA is coming', April 2006.

<sup>22</sup> Source – Telia Sonera quarterly report Jan-March 06.

**Companies involved in UMA development:**

A number of major equipment vendors from both the fixed and wireless sectors, as well as telecoms operators have been involved in the development of UMA, which can be viewed as an indication of its potential importance. Companies include:

Alcatel, British Telecom, Cingular, Cisco, Ericsson, Kineto Wireless, Motorola, Nokia, Nortel Networks, O2, Research in Motion, Rogers Wireless, Siemens, Sony Ericsson, T-Mobile US.

## **6 Regulatory Implications**

### **6.1 Regulatory Environment**

The emergence of UMA forms part of a more general trend in fixed and mobile convergence, which may eventually lead to a convergence in the regulatory environment for fixed and mobile services. UMA-type services could fall into a variety of possible market definitions, and, if the product develops further, consideration will need to be given to it during the relevant market analysis processes.

Regulatory inputs to facilitate UMA such as wholesale broadband access will play an important role in the development of these types of services. The availability of access to mobile networks either through resale offers or MVNO access is a key component in the development of competitive UMA services. Without sufficient access to a mobile network, competitive UMA services are unlikely to develop in Ireland. ComReg would welcome the development of innovative services like UMA, and is keen to ensure that such developments are facilitated.

In terms of telephone numbering resources, converged fixed and mobile services can lead to fixed operators requiring mobile numbers and mobile operators requiring fixed numbers. These types of services could also require VoIP numbering resources.

### **6.2 Radio Spectrum**

As UMA services operate in spectrum with license-exempt equipment, delays surrounding access to spectrum cannot be caused by regulatory factors. Furthermore, UMA equipment is emerging for a highly standardised sector (i.e. Wi-Fi) in a frequency band with a high degree of regulatory certainty. However, this is a harsh radio environment and it is possible that congestion will become a greater problem as deployments of these and other license-exempt systems increase. The end result for users could be lower quality voice calls while using UMA, or the unavailability of UMA resources. This could potentially limit the growth of UMA in the long term, by which time 3G with IMS and other portable wireless solutions will be readily available.

## 7 Conclusion

Fixed and mobile convergence is now becoming a reality with the launch of services such as homezone and others (e.g. BT 'Fusion' in the UK) in some countries. UMA and other advanced converged fixed and mobile solutions can potentially offer new levels of value and convenience for end-users. UMA can deliver a combination of multiple services into a single account with a single bill and point of contact, paired with a single converged handset operating under a single number, for low cost calls at home and mobile calls while out and about. This represents a very compelling offer for the average business user and consumer alike. However, the potential market for UMA services is under threat from fixed mobile substitution offerings (e.g. home-zone type services) that provide some of the same benefits to consumers with currently deployed technology, potentially limiting the window of maximum opportunity for UMA.

UMA provides opportunities for operators and service providers to add value to their existing offerings, attract business from segments of the market that were previously out of their reach, or to retain traffic that would otherwise migrate to other systems and operators. Examples of this include fixed and mobile network operators being able to add value to the voice offerings to limit the loss of revenue through the migration of voice traffic to VoIP service providers; fixed operators slowing the migration of voice minutes to mobile. IP technology and the unlicensed wireless nature of UMA mean that there are low barriers to entry for new operators compared to some other traditionally capital-intensive technologies. Operators seeking an integrated converged network are likely to view UMA as a predecessor to IMS which is likely to eventually provide greater flexibility, and some are likely to bypass UMA and go straight to IMS.

The availability of UMA-compatible handsets has now reached a level where operators can think more seriously about UMA deployments. Other network equipment and systems needed for UMA is available and are being deployed. However, other technologies based around traditional mobile systems are also being developed to compete with UMA (e.g. cellular pico-cells).

A key ingredient of a competitive UMA environment is partnership between mobile operators and fixed broadband providers. Partnership with mobile operators would enable fixed broadband operators without their own mobile networks, and mobile operators to provide a range of valuable new converged services to Irish consumers.