

The WiWiGW BR3000 Series WiMAX Wi-Fi Gateway

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A need for the benefits of high-speed internet access in the mobile environment has been increasing lately, with growing expectations for the implementation of Broadband Wireless Access (BWA) to exceed the transmission speeds of third generation mobile phone communications (3G).

Since July 2009 mobile WiMAX^{TM*1)} services have been made available for a fee by UQ Communications Inc., in Japan, beginning with Tokyo Metropolitan, Keihanshin (Kyoto, Osaka and Kobe) and Nagoya regions followed by sequential launches nationwide. Many Mobile Virtual Network Operator (MVNO) services, which utilize the wireless access infrastructure provided by UQ Communications Inc., are also starting. OKI Networks developed gateway equipment for connecting Wi-Fi^{®*2)} terminals to mobile WiMAX networks. This paper introduces the positioning and use of mobile WiMAX, as well as the functions and features of the WiWiGW BR3000 series, WiMAX Wi-Fi gateway (**Photo 1**).



Photo 1 WiWiGW BR3000

Positioning of mobile WiMAX

WiMAX services are provided based on the IEEE802.16-2004 standard, stipulated for fixed line wireless access, as well as the IEEE802.16e-2005 (mobile WiMAX) standard, which is the former standard extended to accommodate mobile communications.

Mobile WiMAX has a faster transmission rate in comparison with existing mobile communication methods (such as 3G) and because of this it offers lower per bit communication costs, making it extremely cost effective. It can therefore be considered to have characteristics

suitable for data-oriented services. Mobile data communication services using mobile WiMAX are now available for a fixed charge. Furthermore, communications made while traveling at a high speed (120 km/h) are also possible, due to handovers (switching between base stations). Since the transmission speed of mobile WiMAX is faster than 3G data communication and mobile WiMAX has a longer maximum communication range than WiFi (wireless LAN), the mobile WiMAX complements the region where the 3G data communication has a high mobility but is lacking a bandwidth, and the region where the wireless LAN has a fast transmission speed but is lacking a mobility, as shown in **Fig. 1**¹⁾.

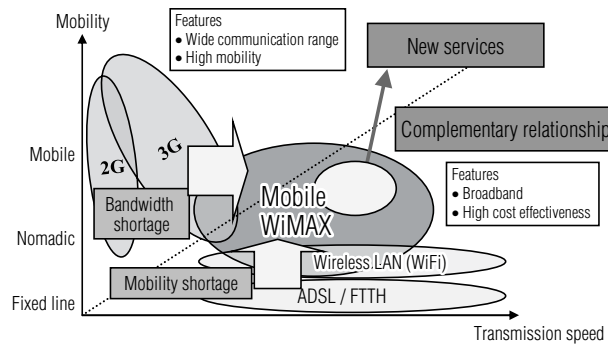


Fig. 1 Features of mobile WiMAX

*1) WiMAX is a trademark or registered trademark of WiMAX Forum.

*2) Wi-Fi is a registered trademark of Wi-Fi Alliance. Other company names and product names mentioned in this paper are, in general, the trademarks or registered trademarks of the respective companies.

Use and issues of mobile WiMAX

Mobile services as seen with regards to market and mobility aspects, as well as mobile terminals used for the respective purposes, are depicted in Fig. 2.

(1) Mobile service market

Services for providing large volumes of multimedia contents, such as video, music and games, directly as well as real-time to mobile terminals, are expected to become the main stream services provided to consumers. For example, mobile internet access using mobile phones or personal computers with a mobile WiMAX card terminal (USB dongle, a PC card, etc.) mounted or built-in, online gaming using mobile game machines, video and music streaming for viewing and listening using mobile players, voice communications using a PDA or Smartphone, or the distribution of map contents to car navigational systems, etc. As for mobile phones, it is an effective means to eradicate the shortage of bandwidth for data communications provided by existing mobile phone services. Due to the transmission speed features provided by mobile WiMAX during high-speed movements, public wireless LAN spot services are being considered for onboard public transportations.

The miniaturization and reduction in the electric power consumption of mobile WiMAX cards however, are issues that must be dealt with in order for mobile WiMAX terminal functions to be installed on mobile phones, mobile game machines, mobile players, PDAs and Smartphones. Since many of these types of equipment already have integrated Wi-Fi functions, a combination of Wi-Fi functions with WiMAX is anticipated.

Additionally, the real-time updating of video contents on advertising display equipment, such as video advertising on buses and taxi cabs or mobile digital

posters, can be conceived as services intended for enterprises.

It can also be used for the transmission of video images, for example to monitor activities and send data while in motion, perform surveillance using cameras set up temporarily or to relay television broadcasts.

(2) Fixed line service market

Broadband services, offered by Customer Premises Equipment (CPE) using WiMAX as a backhaul, are expected to replace ADSL or optical lines for fixed line services.

Broadband services could become available to homes and businesses, to which ADSL lines are currently not connected because of problems, such as the sheer distance from a station or optical cables used in only a portion of the connection to such destinations. This can also benefit people who frequently relocate, such as students and single persons, as well as people who are assigned to duties in remote areas and frequently relocate without their families. These people will be able to continue the use of their services at their new locations without having to change or cancel their current contracts or sign up for a new contract. Furthermore, businesses operating many stores or branches will be able to open and relocate stores and branches in a short period of time.

In terms of the services intended for business, on the other hand, considerations are under way for the utilization of mobile WiMAX to provide access services, such as temporary outdoor network access, as well as digital signage.

(3) Public service market

The conceivable use of mobile WiMAX by local governments includes the making of announcements to

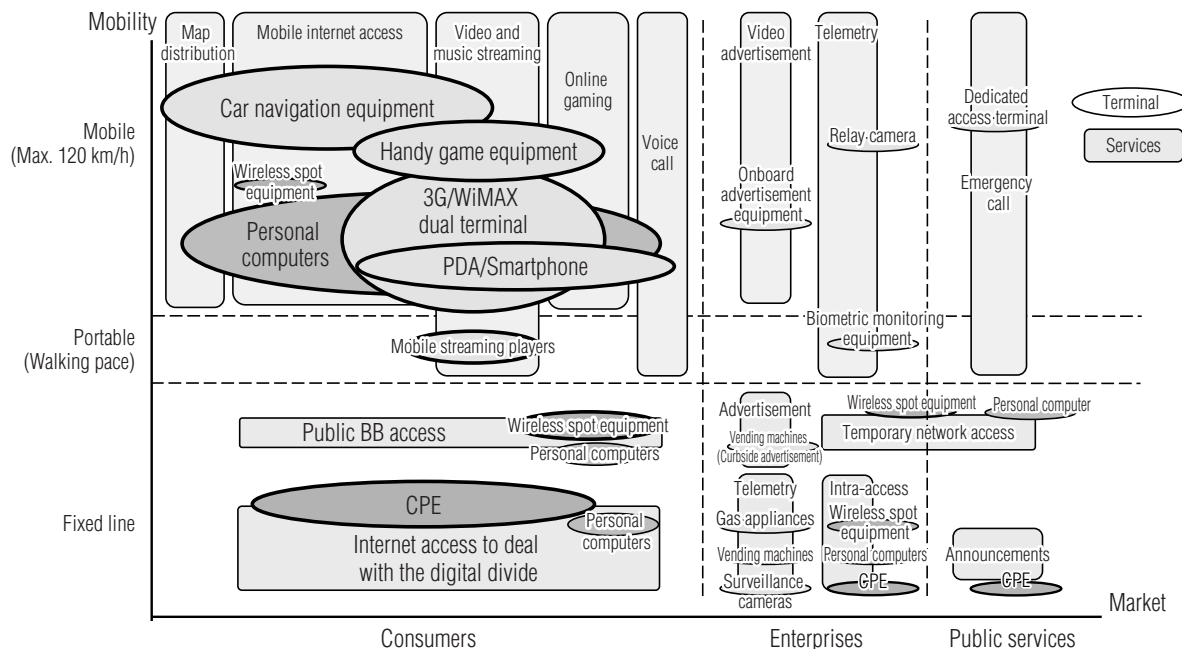


Fig. 2 Features of mobile WiMAX

residents, providing information pertaining to health and welfare services, making rounds for the purpose of preventing disasters as well as for gaining an understanding on the extent of damage when a disaster strikes, as well as emergency communications using video images between the mobile terminals of residents when a disaster occurs, etc.

WiWiGW BR3000

On July 1, 2009 OKI Networks started the sale of their gateway equipment, "WiWiGW™", the gateway equipment to connect Wi-Fi terminals with mobile WiMAX networks, to MVNO mobile service operators.

This equipment is comprised of a WiWiGW main unit, which incorporates a mobile WiMAX terminal (USB dongle) as well as Wi-Fi router functions and it is capable of connecting Wi-Fi compatible devices (wireless LAN terminals, such as game machines or personal computers) to mobile WiMAX networks. The mobile WiMAX terminal (USB dongle) can be removed from the WiWiGW main unit and used as a WiMAX-USB adapter for personal computers. This makes it possible for terminals to be connected to mobile WiMAX networks via Wi-Fi when a person is at home and, via Wi-Fi or directly when a person is on the move.

Batteries are also available (sold separately) that enable benefits of mobile wireless broadband services to be utilized when they are loaded in this equipment. These batteries facilitate the use of the equipment without the worry of having to secure a power source, thereby providing an environment that allows for utilization of benefits to be maximized with mobile wireless broadband services, any time and anywhere in any of the regions WiMAX broadband communication services are provided.

An image of WiWiGW BR3000 utilization is depicted in Fig. 3.

Main features

Mobile WiMAX terminal (USB dongle):

- Connectable to a personal computer as a USB adapter.
- Part of the connector can be folded up for storage.
- CD-ROM drive not required since installation is performed automatically.
- Main specifications of the WiMAX unit:
 - Conforming to IEEE 802.16e-2005 standard.
 - Frequency bandwidth: 2.5 GHz band (2,595 to 2,625 MHz).
 - Occupied bandwidth: 10 MHz; Maximum transmission power: 23 dBm.
 - MIMO: Matrix A/B compatible.
- USB 2.0 compatible (Type-A, male).

WiWiGW main unit:

- Wi-Fi compatible devices connectable to WiMAX terminals.
- Effortlessly portable due to its miniaturization and weight reduced design.
- Wi-Fi: Conforming to IEEE 802.11b/g standard.
- Simplified setup.
 - Automatic Wi-Fi channel selection.
 - Wi-Fi Protected Setup (WPS).
- Ethernet: RJ-45 x1.
- Router functions: DHCP server, NAT, firewall, stealth function, DoS assault protection, UPnP.
- VPN connection: L2TPv3, Remote maintenance: SNMP (products of corporate customer specifications only).
- Security functions
 WEP (64/128 bit), WPA-PSK, WPA2-PSK communication encryption, MAC address filtering, concealment of SSID.

The configuration of WiWiGW is shown in Fig. 4 and the specifications are listed on Table 1.

WiWiGW™ WiMAX Wi-Fi GATEWAY

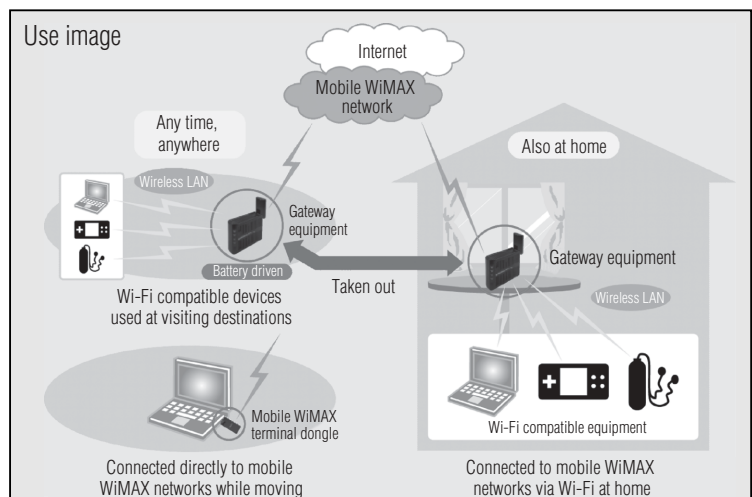


Fig. 3 Image of WiWiGW BR3000

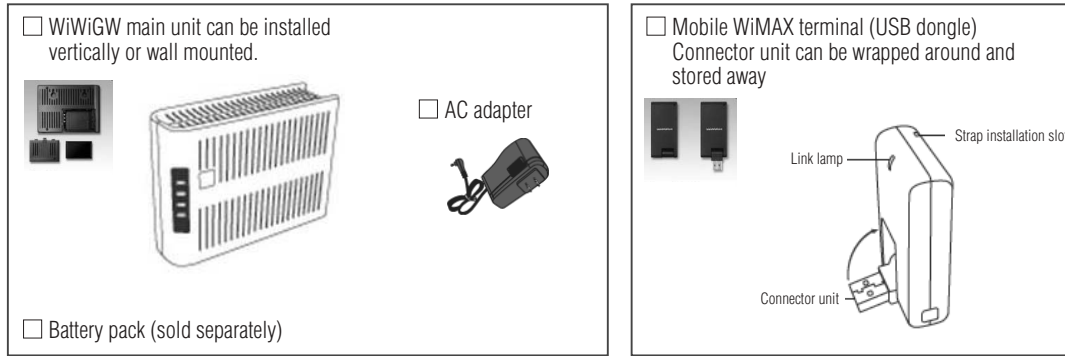


Fig. 4 WiWiGW configuration

Table 1 Specifications

WiWiGW main unit

Category	Item	Specification
Interface	WiMAX	USB 2.0 Type-A, female x1 port
	Wireless LAN	Conforming to IEEE 802.11b (13 ch)/g (13 ch) IEEE 802.11b/g can both be used simultaneously
	Wired LAN	Conforming to IEEE 802.3u (10BASE-T/100BASE-TX) RJ45 x1 port (AutoMDI/MDI-X compatible)
Environmental conditions	Operating temperature and humidity ranges	-10 to 40 °C, 5 to 90% relative humidity Without any condensation (0 to 40 °C when using AC adapter)
	Storage temperature and humidity	-20 to 60 °C, 5 to 90% relative humidity Without any condensation
Power supply	AC adapter	100 VAC, 50/60 Hz
Power consumption		7.5 W or less (when mounting mobile WiMAX terminal (USB dongle))
External dimensions		120 (W) x 90 (H) x 35 (D) mm, excluding protrusions
Weight		Approx. 150g
Battery pack (sold separately)		Lithium ion battery (3.7 V and 1,700 mAh), approx. 47g

Mobile WiMAX terminal (USB dongle)

Item	Specification	
Interface	Host	USB 2.0 Type-A male
	RF	Conforming to IEEE 802.16e-2005 Conforming to WiMAX Forum Wave2 compatible
Environmental conditions	Operating temperature and humidity	-10 to 40 °C, 5 to 90% relative humidity Without any condensation
	Storage temperature and humidity	-20 to 60 °C, 5 to 90% relative humidity Without any condensation
Power supply		5V +5%
Power consumption		2.5 W or less
External dimensions		35 (W) x 74 (H) x 15 (D) mm (with USB connector stored) excluding protrusions
Weight		Approx. 30g
Compatible operating systems		Microsoft Windows Vista, Japanese version and Microsoft Windows XP (SP2 and later), Japanese version

* External appearance and specifications of the equipment may be changed at any time without notice.

Conclusion

As described thus far, expectations are high for the mobile WiMAX to form the infrastructure for fixed charge high-speed mobile wireless access services and to facilitate new mobile services, as well as become the technology that leads to 4G communications. We intend to continue with our technical developments and product developments with the understanding of our past performances gained through this product, to make broadband communications possible any time and anywhere, in our pursuit to further broaden ubiquitous services.

References

- 1) Takashi Shono: WiMAX, Creating Wireless Broadband Era, First Edition, Impress, p. 196, December 2005.

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TIPS [Basic Terminology Descriptions]

MVNO: Mobile Virtual Network Operator

A mobile service operator who supplies services with a wireless communication infrastructure borrowed from other telecom carriers.

Dongle

A commonly used description of a small device connected to a universal interface on a personal computer.

CPE: Customer Premises Equipment

Equipment installed in the homes of customers.