

MOTOwi⁴

Leading WiMAX Technology

A New Standard, A New Way to Extend Your Service Reach



Motorola intends to make the Internet more accessible, more mobile, and more available through the introduction of MOTOwi4 – Wireless Broadband for fixed, nomadic and mobile networks.

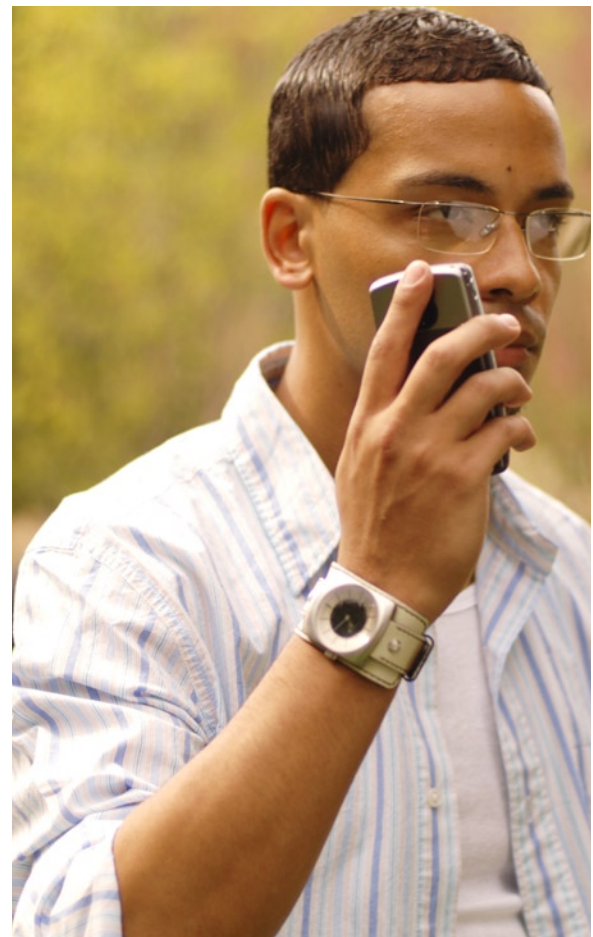
Think how the world has changed in the last 25 years. We now assume that anyone can be reached instantly through the power of mobile wireless technology. Since Motorola introduced the world's first mobile handset in 1983, mobile devices have become smaller, lighter, cheaper and far more capable than we ever imagined.

During the same period, dramatic reductions in processing power cost led to personal computers so small and cheap that almost anyone can own one ... or more. Next, the Internet grew from a network for a small, backwater community of academics into a tool that makes information accessible to millions of people around the globe.

The Internet has also made new telecommunications models workable; for example, all-packet voice communication based on Voice over IP (VoIP) technology is now available. Multimedia applications, such as video, music sharing and downloads make up almost half of all Internet traffic and instant text messaging has become the preferred way of communication for many of the Internet's newest users.

Today, the Internet is mostly a static experience. A user is bound to a desk or at best, to a laptop at a WiFi hot spot in a coffee shop or a home. However, it's mostly an experience limited to a small segment of the world where broadband connectivity is readily available. Many more people around the globe have yet to make a telephone call, use a computer, or surf the web.

Motorola intends to change that, by making the Internet more accessible, more mobile, and more available through the introduction of Wireless Broadband for fixed, nomadic and mobile networks.



WiMAX

The most revolutionary new service will be mobility.

IEEE 802.16 is a series of standards for wireless broadband. WiMAX forum is an industry initiative establishing a set of product guidelines or profiles that will lead to the development of revolutionary new products. Motorola is a leader in both defining the new standards and in developing products to address this new market.

The WiMAX Forum focuses on Broadband Wireless Access (BWA), operating in non-cellular frequencies above 2 GHz. That spectrum encompasses 2.3 GHz and 2.5 GHz [including the Mobile Data Service (MDS) band, the Wireless Communication Service (WCS) band and the Broadband Radio Services (BRS) band]; the international Fixed Wireless Access (FWA) bands between 3.3 and 3.8 GHz; and unlicensed frequencies such as 2.4 GHz and 5.8 GHz which are typically used for WiFi and cordless telephony.

Broadband Wireless access (BWA) is used today for:

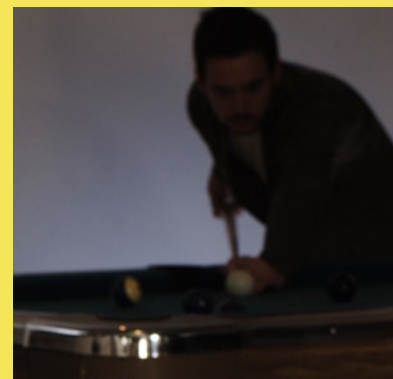
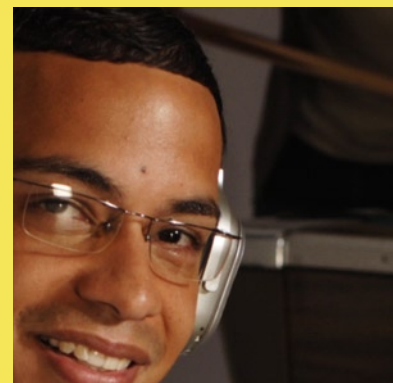
- Last mile access to residences for basic telephony services when wire line infrastructure doesn't already exist, such as in developing countries and rural areas
- T1/E1 service for small businesses and enterprises
- Provision of Wireless Internet Service Provider (ISP or WISP) services
- Competitive access backhaul for businesses and cell sites
- Temporary backhaul for sporting events and tradeshow
- Provision of broadband backhaul for 3G cell sites

However, these BWA technologies use proprietary radio technologies. This leads to higher manufacturing costs and no interoperability between networks. The introduction of WiMAX standards will reduce the cost of subscriber devices and facilitate new applications.

The most revolutionary broadband service on WiMAX will be mobility. With mobility based on 802.16 revision E, WiMAX can also be used for:

- Mobile telephony services using Voice over IP
- Mobile multi-media services based on IP, including video, IP radio, and access to information on the move.
- Low cost data downloads through "Hot Zones", rather than "Hot Spots"

Systems standards will lead to the development of affordable equipment and new mobile services. These new mobile services will lead to a new way of life by enabling expanded access to affordable global information and services, available at any time, from anywhere.¹



¹ Anywhere service is available

MOTO ⁴wi

Offers New Revenue Opportunities



- Wireless carriers can use WiMAX to provide fixed telecommunications services to businesses and residences, using seamless mobility applications to offer unified service and billing. These services include T1/E1 or faster services using IPSec and Quality of Service to maintain secure connections and service level agreements (SLA) for businesses. Additionally wireless carriers can target residences offering competitive alternatives to Digital Service Line (DSL) and Cable broadband Internet Service Providers (ISP). Wireless carriers are very well positioned to offer this type of service, thanks to their extensive portfolio of cell sites and existing customer marketing relationships.
- Wireless carriers can use WiMAX as a less expensive way to backhaul cell sites, especially 3G cell sites which will rapidly require multiple T1 or E1 links as 3G data traffic increases. This backhaul can be carried in either licensed or unlicensed spectrum and, since it is fixed at both ends, can use WiMAX standards in licensed bands or proprietary airlinks.
- Wireless and wireline carriers can use WiMAX to backhaul public WiFi (802.11) hot spots, and to extend coverage. The business case for public WiFi has not been highly successful because it is very costly to backhaul the many sites required due to WiFi's poor coverage. The only successful carrier models so far have used private hot spots (in coffee houses for example), where the backhaul costs are covered by private operational requirements and excess capacity is leased to a carrier. Using inexpensive wireless backhaul on WiMAX has the potential to change the WiFi business model.
- Existing wireless carriers can use WiMAX revision E as an alternative to cellular 3G deployments, especially where 3G spectrum has not been allocated, or has not been won by a 2G operator. WiMAX telephone devices that support Voice over IP are being developed by Motorola Mobile Devices and other device vendors. Laptop personal computers will begin to incorporate WiMAX technology during 2006 or 2007, and handsets for mobility will be available by 2007 or 2008. The superlative RF performance and low cost of deployment make WiMAX a viable, lower cost alternative to range limited WiFi hot spots or data downloads in the 3G spectrum.
- Greenfield carriers can use WiMAX revision E to deploy competitive wireless mobility networks using high frequency spectrum. The superior link budget performance of Smart Antenna technologies introduced through WiMAX allows operators in higher spectrum bands such as 3.5 GHz to compete well with those in traditional 2G and 3G spectrum, and VoIP WiMAX devices will support voice telephony as well as data centric multimedia applications.
- Cable and DSL operators can use WiMAX to add mobility to fixed broadband service as well as service difficult-to-reach segments for additional revenue opportunities. WiMAX offers an alternative to laying additional copper lines, while making use of existing IP core networks. These operators can also extend their service areas to hard-to-reach areas, such as rural areas, or into other territories where wireline is not present. For example, in many countries cable companies and telephone operators enjoy a monopoly in one territory, but are locked out of others because competing companies own wireline operating rights there. WiMAX offers a way to offer broadband services in these other territories using wireless.

The Motorola Solution

MOTOMAX

Cost of Ownership

WiMAX is an all-IP, all packet technology. As a result, this lowers the operational expenses (OPEX) due to the transport efficiency of Internet Protocol (IP) for data traffic (including voice). The use of an all-IP solution means that an operator can direct their CAPEX and OPEX to a single unified technology solution, eliminating the expense of maintaining both packet and circuit core networks.

A further benefit of all-IP is that it places the network on the performance growth curve of general purpose processors and computing devices, often termed "Moore's Law." Computer equipment advances much faster than telecommunications equipment because general purpose hardware is not limited to telecommunications equipment cycles, which tend to be long and cumbersome. The end result is a network that continually performs at ever higher capital and operational efficiency, and takes advantage of third party development from the Internet community.

Motorola believes that WiMAX will be used by diverse operators and private owners for many different applications. Motorola is developing a portfolio of end-to-end WiMAX networks, subscriber device solutions and services to offer the flexibility that our customers demand.

MOTOWi4 Product Family for WiMAX

MOTOWi4 ULTRA LIGHT ACCESS POINT

MOTOWi4 Ultra Light Access Point, a "light infrastructure" solution for low cost, speedy deployment of fixed wireless broadband, significantly reduces operator OPEX and CAPEX. It is based on the Canopy™ product line that has been creating operator revenue from service since 2002, and is deployed in more than 100 countries worldwide. MOTOWi4 Ultra Light Access Point will initially support the international Fixed Wireless Access (FWA) bands at 3.5 GHz with additional frequency bands to be supported based upon market demand.

MOTOWi4 Ultra Light Access Point can be deployed for point to point backhaul, in cellular-like clusters for point to multipoint fixed and nomadic applications, or in conjunction with 2G and 3G cellular systems for "Hot Zone" applications, providing inexpensive capacity relief in high density areas such as airports, office buildings and high density residential areas.

MOTOWi4 DIVERSITY AND SMART ANTENNA ACCESS POINTS

Many public and private carriers require the ruggedness and reliability of a carrier class network. Motorola's MOTOWi4 Diversity and Smart Antenna Access Point portfolio addresses this need for 2.5GHz and 3.5 GHz frequency bands.

MOTOWi4 Diversity and Smart Antenna Access Points offer carriers the opportunity to provide mobile wireless broadband service over wide areas. Cellular operators can use Diversity and Smart Antenna Access Points to provide a universal or partial overlay of their cellular network, providing the ability to offer rich multimedia service offerings at a far lower operational cost than is possible through today's networks.

CARRIER ACCESS POINT NETWORK

Carrier Access Point (CAP) software adds full mobility to a carrier network. It operates on the MOTOWi4 Diversity and Smart Antenna Access Point portfolio. CAP is also an innovative architecture for all-IP mobile networks that flattens the Radio Access Network (RAN) and reduces capital and operational costs.

Using the CAP architecture, Motorola has eliminated many of the costly hierarchical network elements of 2G and 3G networks. CAP also leverages multimedia developments of recent years, such as the IP Multimedia Subsystem (IMS), a next generation core switch that provides mobile access to broadband content, and interfaces to circuit-based networks.

FIXED AND NOMADIC SUBSCRIBER DEVICES

The MOTOWi4 portfolio also includes outdoor CPE (Customer Premise Equipment) devices, which can be mounted on rooftops, on poles or on the sides of buildings, as well as indoor "desktop" modems and WiFi gateways.

MOBILE SUBSCRIBER DEVICES

Motorola is developing WiMAX devices for mobile telephony, access to information, and rich multimedia applications such as video, gaming, music and more. Devices and networks supporting a common set of WiMAX profiles, based on the 802.16 revision E standard will interoperate, just as today's cellular telephones will work with access networks from any standards compliant manufacturer.

Motorola expects to offer a variety of devices, from fixed and portable computer modems, to telephone style multimode devices (supporting WiMAX and cellular) and smart phone systems with PDA form factors.

NETWORK SERVICES

Motorola offers a complete suite of services to help operators ensure, enable, enrich and enhance WiMAX networks for maximum efficiency and increased revenue. Our capability is unique in the wireless industry, with extensive experience in multi-vendor networks and multiple access technologies, as well as being a dominant global mobile handset supplier. This expertise enables Motorola to provide a suite of integrated services that allow operators with WiMAX to offer seamless mobility experiences to their consumers.

MOTOWi4 Services are comprehensive, allowing operators to focus on their customers while Motorola takes care of the network. To further enhance an operators' seamless mobility experience for its customers, Motorola provides a robust suite of network efficiency solutions and revenue generating end-user applications with the opportunity to have such solutions fully managed. Keeping secured networks running at optimal efficiency requires the assistance of a vendor who understands the technical aspects of the network as well as the competitive business landscape. These fundamental values are inherent in the MOTOWi4 Services portfolio.



WiMOTO

Motorola is one of few major vendors having assets in all of the critical product and service line areas as well as offering necessary global span and market presence. Having long recognized the market need for high performing and cost effective broadband wireless solutions, Motorola leverages over a decade of investment to deliver our best of class MOTOwi4 products.

Motorola has proven experience in broadband wireless. The highly successful Canopy line of fixed wireless broadband systems is currently in service in more than 100 countries around the world, and addresses the need for low cost broadband communications through innovative software defined radios, integrated solutions, and advanced radio techniques that provide excellent signal-to-noise performance.

Motorola is committed to providing a comprehensive and competitive portfolio of WiMAX solutions that enable operators to realize new revenue and cost saving opportunities.

WiMAX offers benefits for wireline operators who want to provide last mile access to residences and businesses, either to reduce costs in their operating areas, or as a way to enter new markets. 802.16 revision E offers cost reductions to mobile operators who wish to offer broadband IP services in addition to 2G or 3G voice services, and allows greenfield operators to enter new markets with competitive services.

With new fixed and mobile services based on WiMAX, users in rural markets and developing countries will finally have broadband services that they can afford, while mobile users will benefit from access to new mobile multimedia services and instant access to the whole of the Internet from wherever they are and whenever they want it.



Motorola, Inc.

www.motorola.com/Wi4

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