

# The 4G report

Table 2: Comparative specifications, WiMAX and WLAN technologies

	Frequency	Range	Data transfer	Number of
<b>802.16a</b> <b>(WiMAX)</b>	2-11GHz	3-10km	Fixed: up to 40Mbps per channel Mobile: up to 15 Mbps per channel	Business: hundreds Residential: thousands
<b>802.11</b> <b>(WLAN)</b>	2.4GHz	100m	11 Mbps to 55 Mbps	Dozens
<b>802.15</b> <b>(Bluetooth)</b>	Varies	~10m	20Kbps to 55 Mbps	Dozens

Source: visiongain

## 2.3.6 Overlay Networks

An overlay network is a virtual network that is implemented "on top of" another network, typically for the purpose of performing a specific function. Examples of overlay networks in the Internet include virtual private networks (VPNs) and Peer-to-Peer networks. The purpose of an overlay-network approach in 4G is to integrate the variety of network access methods, providing seamless communications access to users.

### 2.3.6.1 UAPs

Universal access points (UAPs) make up the primary point-of-presence of an overlay network. When a user accesses a UAP, the user's device selects a wireless network based on availability, QoS specifications, and any other user-defined choices if required. The UAP may store user, network, and device information, capabilities, and preferences, and performs protocol and frequency translation, content adaptation, and QoS negotiation-renegotiation on behalf of the user. The overlay network also performs handoffs as the user moves from one UAP to another. Because UAPs can track resource usage by user, this architecture provides one way of enabling single-source billing and subscription.

Figure 3, on next page, provides an outline of an overlay network.

# The 4G report

network, such as Wi-Fi, other 802.11 methods, Bluetooth and other access methods yet to be developed. As long as the access method in question supports addressable devices, it can be used to access the network.

## 2.4.2 IPv6 Enables Wide Variety of Access Devices

The adoption of IPv6 will allow the acceptance of a wide variety of devices onto the network. Devices will be developed for an unlimited variety of tasks, of which voice-related applications will be but one variant.

These heterogeneous devices will provide specialized functions - that is, future mobile devices may perform only some of the roles that today's mobile devices perform and several devices (some mobile, some not) will work in concert to the benefit of the user. For example, a stationary large-screen device may be designed to sense the presence of a nearby mobile terminal (known today as a "cell phone") and serve as its display on an ad-hoc basis - depending on the preferences, capabilities, and pre-existing business arrangements associated with the owner of the mobile terminal.

**Table 3: Possible types of Access Devices in a 4G Environment**

Type Of Device	Architecture	Application
<b>General-purpose mobile computer</b>	CPU, RAM, media and/or ports for loading software	Many possible applications enabled by loaded software
<b>Communications Device (phone)</b>	Baseband processor and DSP, with FPGA and/or ASIC. Optimized for voice and data communications. Advanced SDR for roaming.	Telephony
<b>Application - Specialized Device</b>	Lowest-cost processor and circuitry designed for specific application. Software possibly burned in ROM.	Used in the delivery of a specific service, such as health monitoring.
<b>Component</b>	SDR and logic required to provide connectivity and data transfer	Addition of communications capabilities to other devices, such as consumer electronics, machinery, automotive.

Source: visiongain

# The 4G report

Wireless Business Solutions (WBS), a South Africa mobile data solutions provider, announced during July 2004 that it plans to deploy ArrayComm's iBurst broadband wireless system throughout the country. WBS expects to cover more than 80% of the 45 million population of South Africa within three years, through a phased deployment of iBurst base stations being manufactured by Kyocera Corporation. WBS expects to begin service during 2005 in Johannesburg, Pretoria, Cape Town and Durban, with expansion to other urban areas soon thereafter.

## 3.1.3 NTT DoCoMo

DoCoMo, NEC and Fujitsu have proposed a technology for an orthogonal frequency and code division multiplexing (OFCDM) system as a candidate for 4G which increases throughput to 1Gbps at a bandwidth of 100MHz. DoCoMo is also currently experimenting with Variable Spreading Factor-Orthogonal Frequency and Code Division Multiplexing (VSF-OFCDM). DoCoMo expects VSF-OFCDM to enable transmission at up to 100Mbps outdoors and up to 1Gbps indoors.

**Table 7: DoCoMo details**

2004 Sales (\$ millions):	48,455.2
1-Year Sales Growth:	19.0%
2004 Net Income:	6,239.3
2004 Employees:	21,241

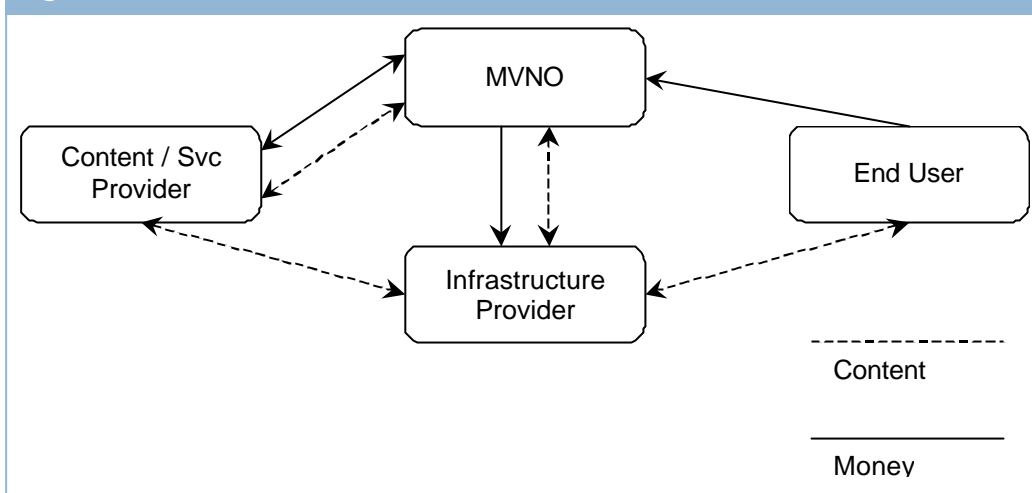
Source: NTT DoCoMo

During October 2002, DoCoMo announced the completion of indoor experiments achieving data transmission speeds of 100Mbps downstream and 20Mbps upstream. During June 2004, DoCoMo announced the results of tests in which the company had achieved an average rate of 135Mbps downstream, with a maximum data rate of 300Mbps downstream, in a car running at the speed of 30 kilometers per hour in areas 800m to 1km away from the 4G wireless base stations. The test system used VSF-OFCDM for the downstream link, and direct spread code division multiple access system (DS-CDMA) for the upstream link. DoCoMo aims to realize faster communication speeds by using MIMO technology.

The target wireless data rate is 1Gbps when in an isolated cell and 100 Mbps when in the multi-cell environment. According to DoCoMo, the companies aimed to achieve 1Gbps because the conventional throughput of 100Mbps is inadequate for base stations where there is a high concentration of communications traffic in small areas, including the hotspot environment. An

# The 4G report

Figure 5: MVNO Business Model



Source: visiongain

## 5.4 4G Services and Applications

Services uniquely enabled by 4G can be categorized into three broad classes, corresponding to the distinctive differences of 4G over 3G:

- High-Bandwidth-Based services;
- Peer-To-Peer-Based Services and
- Metadata-Based-Services.

### 5.4.1 High-Bandwidth-Based services

High-bandwidth-based are directly enabled by the increased bandwidth provided by 4G technologies.

- **Mobile Teleconferencing.** Teleconferencing services will be enhanced by the ability to hold conferences while mobile, and by the ability of each participant to select from among a variety of available transport networks as appropriate.
- **Tele-Working.** 4G will bring mobility capabilities to tele-working. This will allow workers to conduct business in a fully mobile fashion, as compared to today's nomadic usage mode (wherein users connect at remote locations but not while traveling from location to location).