

# The complete wireless alphabet from 802.16a to ZigBee

From 802.16a to 802.11x, there are at least 57 confusing varieties of the alphabet soup that represents wireless standards in the narrow spectrum of Wi-Fi and WLAN alone.

Any A to Z of explanation should start at the end – with ZigBee or 802.15.4, as the Institute of Electrical and Electronics Engineers (IEEE) likes to classify it.

ZigBee has come to prominence in the past six months and has avoided the hype of similar technologies such as Bluetooth. It sits at the bottom of the wireless food chain, being low power and supporting data rates of only around 250 kilobits per second over 30 metres. It is likely to be used in fairly dumb devices – such as lighting and heating systems, turning illumination and power off when its network senses it is not needed.

Better known Bluetooth (802.15.1) comes next, a maturing technology with chips becoming plentiful and cheap. It provides speeds of up to 720kb/s over 10 metres, linking mobile phones with headsets and in-car systems and laptops with printers.

Then there is Ultra Wide-band (802.15.3a), which offers high speeds of 100Mb/s to over 2Gb/s with ranges of up to 10m.

Stepping up in range and adoption rate, we move to what is commonly known as wi-fi – the 802.11 family of standards. 802.11b was the original – offering computer and peripherals connections at 10mb/sec over home networks and in internet ‘hotspots’, then came g – 54mb/s and next will come n – 100mb-320mb/s.

The foundation for n is MIMO (Multiple-in, Multiple Out) technology, developed by Greg Raleigh, chief executive of MIMO chip provider Airgo Networks. It went against the conventional wisdom that multipath – the reflection of different radio signal off objects – was a problem. ‘My [PhD] paper proved that, if used correctly, multipath could bring the largest improvement in wireless capability in 100 years,’ he says. Simply put, MIMO uses multiple antennae to transmit and receive more information and cuts through the interference to recombine the signal on the receiving end.

To cover wider areas, we move up to 802.16, better known as Wimax or Worldwide Interoperability for Microwave Access, and providing fixed wireless broadband access with a range of over 30 miles. 802.16e should be completed as a standard next month making Wimax mobile and enabling it to be included in regular handheld devices from 2007.

Wimax could undermine mobile operators’ investments in 3G/UMTS licences and networks - it boasts superior speeds averaging 1mb/s up to a theoretical 70mb/s, but, on the downside, requires a fresh infrastructure to implement it.

Wireless carriers are bolstering UMTS with higher-speed technologies such as EV-Do and HSDPA, which significantly enhance the speed that data can be transmitted.



**WWAN: UMTS/GPRS**  
Around country and world



**WWAN: 802.16/WiMAX**  
Metropolitan areas

**WLAN: 802.11**  
Campus/  
Public/  
Home



**WPAN: Bluetooth and UWB**  
Living room/In-cubicle