

FINDING MIMO- THE WIRELESS WAY

Following the adoption of 3G services, where video, audio and data can be transmitted and received, telecomms service providers have been looking for ways to deliver more content to phones to increase their revenue streams.

The dilemma is to increase the available spectrum, which comes at a cost, or to use the available bandwidth more effectively, to cram more data, at faster data rates over the same spectrum. Without that, the triple play services of audio, video and data will not be adopted by consumers. For Ken Hansen, director of technology, Freescale it would be a backward step and he posed the question 'Who would go back to dial-up modems after having broadband internet?' Instead, the spectrum efficiency has to be maintained to stream three or four times the present data rates to enable these services.

Multimedia push

At the Era of Convergence summit (www.globalpresspr.com), Dr Greg Raleigh, President and CEO, Airgo Networks (www.airgonetworks.com), predicted that in 10 years every market will use MIMO

Spectrum efficiency in wireless networks can be increased with multiple in, multiple out (MIMO) technology, reports CAROLINE HAYES



Raleigh : MIMO will be in every market in 10 years

Airgo's patented multi-antenna technology is claimed to provide up to 10 times the data rates of other WLAN products

technology in networks, whether PAN (personal area networks) or MAN (metropolitan area networks). He believes that MIMO will push multimedia services via wi-fi into home. He also believes that only MIMO has the ability to stream multimedia and the I/O channels that this will require.

MIMO is an antenna-based technology that increases speed, range and speech efficiency. By pushing more than one data stream of the same frequency, no more bandwidth is required. The simultaneous transmission and receiving of more than one signal in the same channel, goes against all radio sense, but Raleigh explains MIMO as akin to bundling wires, sending more data

without increasing the spectrum required, and over longer distances. MIMO is compatible with wi-fi as it only uses one channel. As an extension of the 802.11 standard, this 802.11n standard is due to be ratified in the middle of next year. Can this multi-path signal improve radio transmission and bring about home networking, streaming HDTV (high definition TV) quality video while inter-operating with other wi-fi products?

Multiplication

MIMO is uncompressed signals, transmitted and received in a single radio channel using multiple antennae on both sides of the

wireless link. The antennae are 'smart' in that they use digital processing techniques to send and receive wireless signals, using multiple transmitters and/or receivers.

Multiple antennae with signal processing at both ends and algorithms at both ends of the link use the wireless signal reflections to strengthen the signals, instead of degrading them, which can be the case with other radio systems.

Some examples of data compression do not significantly increase the data rate in real-world networking. With MIMO, the multi-path system with simultaneous transmission of multiple data streams through a single radio channel increases translation speeds up to 108Mbit/sec, with simultaneous standard operation in a single 20MHz channel, without data compression.

This overcomes the problem caused by other techniques where frequency channels



to see which emerges triumphant. Maybe so, but even without standards, there is a choice of different technologies available to meet the triple play, bandwidth intense services. He pointed out that 3G was adopted because the multimedia services it can provide made it an attractive option.

Similarly with wi-fi, the US-centric adoption of home theatre, created its market identity and accelerated its take-up. Dr Chris Dick, manager Signal Processing Group, Xilinx, sounds a note of caution, pointing out that the physical layer processing of technologies like MIMO needs new computing technology with which to build services. The problem he envisages is that the volume of instructions will not be fetched at the hardware level making that layer unable to deliver the services. Naturally, he believes that FPGAs will be used to build the future computing power in a different way, to deliver the services at the right speeds.

Harmony

There is a school of thought that with the base of installed 802.11 products, ultra wideband is poised to be adapted and adopted. He believes that WLAN (wireless local area networks) will support the data rates and he foresees MIMO becoming the means for enhanced wi-fi across the home. Hansen agrees, citing that while ultra wideband has lower power consumption, it has a limited range of around 10m. However, as the technology can consume 50 to 100 times less power, nodes can be added to extend the network, making MIMO and ultra wideband combinations a workable partnership.

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are combined for better throughput but at the cost of less available, non-overlapping channels for other networks.

Key elements

MIMO OFDM (orthogonal frequency division multiplex) has been described as the key ingredient in every 802.11n proposal. Airgo claims to be the first company to deliver a MIMO/OFDM chipset solution that can enable products to achieve up to five times the range of existing 802.11a, b and g modes. It has branded its MIMO products TrueMIMO and these are compatible and interoperable with 802.11a/b/g standards. The company's patented multi-antenna technology is claimed to provide up to 10 times the data rates of other WLAN products. Its AGN100 chipset, a AGN1100BB baseband/MAC IC and AGN100RF dual-band transceiver, supports 802.11b/a/g standards.

Airgo's MIMO technology provides speeds up to 108Mbit/sec in a single 20MHz channel and supports wi-fi multimedia enhancements (WME) and wi-fi scheduled multimedia (WSM). The company claims that the chipset sets the standard for the WLAN industry to deliver increased data.

Wi-fi alternatives

Not everyone agrees. Jeff Abramowitz, director WLAN, Broadcom does not believe that wi-fi is capable of handling the capacity at the speeds required. Instead, he believes

that embedded devices and software solutions will deliver the content swiftly.

He warned that the software has to be seamless, especially from the end user's perspective with IP (Internet Protocol) used as the internal layer for connectivity. He advocates IP as the common language for these systems and he insists that it is critical that there is a common standard.

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ubiquitous in the future, is the differentiation made by Abramowitz. However, he does not see a single, heterogeneous pipe will deliver different types of data at different rates. To stay connected, the platforms must be improved, which is where software plays a part, for example, to set up the home network. This connectivity must be seamless, pervasive and simple to use for the end user, Abramowitz said.

Standards or not?

Hansen is not a fan of standards, believing they will slow the market take-off. As standards are established, too many could confound consumers who will put off investing in technology choices while waiting

The panel did agree, however, that wireless is the way forward and one suggestion was to follow the model established by basestations, which use configurable logic to upgrade and refine capabilities.

With all the options for wireless, Raleigh put forward the idea that ASICS will be the means to achieve the expected roll-out of products to enable these services. So the ASIC is not dead? Ahh, now that is another debate altogether..... [EPD](#)

