



Mobility & Wireless Briefings

Antennas deserve attention that's where wireless signals actually happen

November 21, 06

By Craig Mathias, Farpoint Group

Wireless telephony (or radio communications) is simple in concept but complex in implementation. There are, for example, hundreds of ways to modulate a radio signal and hundreds of other details that enter into the design of any radio in any application. Design engineers spend countless hours arguing technical fine points to make the tough decisions that will have a direct impact on the end user's experience.

There's only one part of a radio that touches the medium upon which the radio operates, and that's the antenna. We tend to pay little attention to antennas, but they are the component responsible for putting a signal on the air at the transmitter and getting it back off the air at the receiving end. Radios are like the tyres on a car: The tyre is the only part of the car that touches the road, the medium upon which the rest of the vehicle operates. And, as any driving enthusiast knows, picking the right tyre can have a profound impact on how the car handles. Great tyres, great ride. Great antenna, and there's a much better chance that the rest of the radio can meet specifications under a wide variety of operating conditions.

In fact, many of the innovations that in recent years have enabled wireless to push the performance envelope have been the result of improvements in antenna technologies. MIMO, or multiple-input, multiple-output, which is now perhaps the most important technology in WLANs, uses multiple antennas (and a lot of signal processing) to improve throughput and range, and we'll eventually see MIMO in WiMax and cellular implementations as well.

Of course, there are a few issues yet to be resolved in the broad adoption of MIMO. Among these are cost, power consumption and the physical real estate required in a product using MIMO. But I think MIMO will be so valuable that engineers will quickly address these concerns. Even in more traditional radio implementations, antenna innovations abound, with many coming from formerly military applications. For an example, visit [Skycross](#).

Distributed antennas One of the more interesting directions for antennas has been in what are known as distributed antenna systems (DAS). These are of particular interest in larger enterprises, and especially to those with larger buildings. The idea is to centralise the radios themselves, whether they are in the form of cellular base stations, public safety systems, wireless LANs or almost any other wireless system. The DAS then extends the antennas for these systems potentially quite far away from the radio itself. This can be done over a fibre connection, but the idea is to run just one wire in various parts of the building and thus support multiple radios with minimal installation expense.

This technique can be a bit controversial when it comes to wireless LAN access points. After all, isn't it simpler to just plug the APs into spare RJ45 connectors and avoid the whole installation effort altogether? While this approach can work well in most open-plan offices, there are other venues - in fact, any that have fundamentally public access - where it just isn't appropriate to leave an AP out and exposed. And, assuming that one wants to bring cellular or other wireless coverage to these areas as well, a DAS can make a lot of sense.

The most visible DAS suppliers include InnerWireless, LGC Wireless and MobileAccess. Each has a different approach to implementing a DAS, and there are options. One that attracts a good deal of attention is leaky coax, which is just that - a coaxial cable that quite literally "leaks" radio energy along its length (for an example, see Trilogy Communications' wireless products). While these can be useful for venues such as subway tunnels and elevator shafts, they are not in general very efficient and actually make RF planning more difficult in systems that use discrete channels - and that's most modern systems. Nonetheless, leaky coax can be quite valuable in otherwise difficult-to-provision applications.

Looking ahead, I'm expecting that the rate of innovation in antennas will match that of the rest of the wireless industry. While the antenna is, again, conceptually simple and usually just a piece of metal in a particular shape and size, it is an integral component in a complex machine. The proper choice of antenna by product designers can be the determining factor in whether a call goes through, or you'll be wondering once again why wireless isn't as reliable as it could be.

Craig J. Mathias is a principal at Farpoint Group, an advisory firm specialising in wireless networking and mobile computing. This article appeared in Computerworld.