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A Little Cheerleading for Creative Wireless Design Solutions

Gary Breed
Editorial Director

Last month, I offered my comments on convergence—the migration of many communications uses into a single broadband pipe—which would not be possible without a highly-capable wireless portion. This month, it seems appropriate to point out some of my favorite engineering achievements that have enabled these wireless capabilities.

Two things share the top of my list—networking schemes and low cost products. Achievements in networking include the original cellular idea of re-using frequencies in a grid of short-range radio links. More recently, advances in peer-to-peer and mesh networking are allowing WiFi wireless networks to reach farther and be more flexible than most of us thought possible just a few years ago.

Network theory and practice needs even more creative work, now that we have more multi-platform systems. Creative solutions are needed to make sure that WiFi, WiMax, DSL, cable modem, 3G and all the other means of data transmission will work together. Fortunately, there some really smart people working on networking issues.

I am impressed by the way component and equipment manufacturers have steadily increased performance and features while lowering the cost. Wireless phones, WLAN equipment, satellite TV receivers and other consumer goods are excellent examples of price-driven engineering with the desired results. However, lowering the cost of wireless (and computing) devices has been a double-edged sword—giving more consumers access to the technology, but creating new challenges for business management.

This cost-sensitive segment of the market has widened the gap between "commodity" RF/microwave devices and those that do not fit the mass production model. Consumer products have always been handled differently than laboratory, military and commercial equipment with higher performance and/or lower quantities. Over the past 15 to 20 years, however, the balance has shifted dramatically toward the consumer side, causing problems as the industry adapted to the changes in cost and pricing.

The next frontier for dramatic cost-reduction is in higher microwave and mm-wave frequencies. WiMax, automotive radar, ultra wideband (UWB) and other technologies are getting ready for volume production. They will need creative techniques to get the job done simpler, easier and cheaper—fortunately, the talent is out there to make it happen.

Modulation techniques are also on my list, only slightly behind networking and cost-sensitive engineering. When I started out, there was AM,

FM, pulse and BPSK—and not much else. QAM was mainly in the lab and spread-spectrum was a classified technology.

Now we have cheap-and-easy frequency-hopping spread spectrum (FHSS) and orthogonal frequency division multiplexing (OFDM), as well as UWB, which is still mysterious to anyone who does not study it in some depth. I'm sure there are other time/frequency domain modulation techniques in the works. We'll let you know when we hear about them!

Further down the list, but still important, are linearization techniques, methods for increased receiver dynamic range, plus propagation analysis and modeling. There's not enough room to give kudos to everyone who had a valuable new idea, but I want our readers to know that keeping track of these ideas keeps my job interesting and enjoyable!

Broadband and Big Brother

Here are a few thoughts on a different subject:

When we think of security for our Internet access, we usually think of viruses, spyware, hackers and other intentional invasions of our computer systems. Most of us ignore other aspects of privacy, except for a small number of concerned citizens—and more than a few conspiracy theorists. I'm not the paranoid type, but there are some things to consider.

As new communications technologies are implemented, we get closer to having a full-time connection to nearly everything in our homes and businesses—phone, Internet and entertainment, plus environmental and security monitoring. We even hear promises of refrigerators that check the RFID tags of the contents and automatically order groceries for us. It is not much of a stretch to imagine Big Brother monitoring activities from afar—whether as simple as telling your TV to send its time and channel data to the ratings companies, or something more sinister.

Like I said, I'm not paranoid about it (yet). Digging into my private life will result in extreme boredom for whomever is doing the analysis! Also, there are similar issues elsewhere in our lives, such as credit card fraud and other forms of identity theft.

We are constantly making tradeoffs between convenience and privacy, but access to our private lives is becoming easier, so it's good to stop and think about it once in a while.

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