

A Technology to Consider: Ultrawideband

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Ultrawideband (UWB) modulation is beginning to take a stronger foothold in the wireless networking industry. While it has been used for a while by the military, UWB is now going through the necessary authorizations and developments for public and commercial use. Even though the advancement of UWB has been somewhat slow, there's a possibility that UWB will become the "next best" technology for all types of wireless networks, including wireless LANs.

UWB chipsets are currently under development and testing by several companies, including Intel, Time Domain, XtremeSpectrum, Texas Instruments, Motorola, and STMicroelectronics and others. Intel is bouncing around the idea of implementing UWB technology into all of its chips.

Companies such as Sony and Panasonic hope to use UWB in their flat panel video displays, eliminating the need for wires while still broadcasting the highest quality images with full stereo sound. Other heavy hitting companies buying into UWB include Cisco and AT&T.

UWB uses very low-powered, short-pulse radio signals many times in the picosecond duration range to transfer data over a very wide range of frequencies. A UWB transmission involves billions of pulses spread over several gigahertz. The corresponding receiver then translates the pulses into data by listening for a familiar pulse sequence sent by the transmitter.

In February 2002, the FCC issued a Report & Order giving users permission to deploy low powered UWB systems within the 3.1 to 10.6GHz spectrum. These guidelines make UWB suitable for use in relatively short range applications such as wireless personal area networks (WPANs), but not necessarily wireless LANs.

Pros for UWB

Initially UWB should deliver bandwidths from about 40Mbps to 600Mbps, and eventually data rates could be up to gigabits-per-second (with higher power). XtremeSpectrum, a UWB chipset maker, is predicting that its initial products will have a range of 30 feet and data rates of around 100 Mbps. Intel has dedicated itself to a loftier goal of 500 Mbps.

Besides its blazing speed, UWB offers some other benefits worth considering. Because UWB transceivers use low power short burst radio waves, they do not take as much planning to build. This makes them extremely easy and cheap to build compared to typical spread spectrum transceivers.

UWB systems also consume very little power, around one ten-thousandth of that of cell phones. This makes UWB practical for use in smaller devices, such as cell phones and PDAs, that users carry at all times.

Because UWB operates at such low power, it has very little interference impact on other systems. UWB causes less interference than conventional radio-network solutions. In addition, the relatively wide spectrum that UWB utilizes significantly minimizes the impact of interference from other systems as well. In fact, a recent demo of the Trinity UWB chipset, a single UWB transceiver provided screaming performance while simultaneously operating within close proximity to an 802.11b network, a microwave oven, a cellular/PCS phone and a cordless phone.

How will UWB impact the industry?

UWB has the potential to eventually dominate every wireless "area network," from wireless personal area networks (WPANs) to wireless wide area networks (WWANs). In its current restricted state, UWB will most likely be the preferred technology for wireless personal area networks, replacing Bluetooth's 1-2Mbps bandwidth with 400-500Mbps data rates.

As far as WLANs are concerned, UWB is not in an immediate position to take over. This has to do with the power limitations imposed by the FCC, but even if the limitations are lightened some say that it could take at least five years before UWB will become a dominant player in the wireless LAN market.

There has been discussion of using UWB to provide cheap, fast, last mile wireless access systems, which would solve the interference issues that plague current spread spectrum-based Metropolitan Area Networks (MANs). These UWB

systems could be set up in rural areas, bringing never seen before high-speed connectivity to those users.

Right now the best killer application for UWB is home multimedia networking systems, where high bandwidth is crucial. UWB can support multiple channel multimedia streaming of broadcast quality video, making it the preferred technology to use when setting up a wireless home multimedia network.

UWB could connect virtually every multimedia device in your home without using any wires. Digital cameras and camcorders could wirelessly stream images and video to your TV or PC, DVD players and TV's could stream videos throughout your home, and flat screen monitors could wirelessly connected to computers, DVD players, or any other source you desire. UWB will very likely revolutionize the home multimedia scene and eliminate the mounds of tangled wires found behind home entertainment centers.

Cons against UWB

Initially, the main concern about UWB was whether or not they would interfere with existing RF systems that provide essential military, aviation, fire, police, and rescue services. Because of this, the FCC spent two years evaluating the proposed UWB specifications and concluded that there will be no major interference. The Department of Defense reviewed the tests and issued statements that it was satisfied with the current restrictions being placed on UWB as well.

Concerns still remain, however, about the interference of higher-power UWB systems. The FCC says they will reevaluate UWB in the near future, and they will take a closer look at the issue of higher-power systems. Until then, you're limited to UWB products with somewhat short range propagation.

Wi-Fi replacement or competitor?

There are mixed opinions on this subject. Many feel that the two will complement each other rather than compete -- after all, at one time, many thought Bluetooth and 802.11 would fight it out and they now live (somewhat) in harmony. Likewise, 802.11 will most likely remain the preferred home data networking technology, with UWB covering the home multimedia networking arena.

802.11 should also remain as the most effective technology for public access and enterprise markets, where power consumption issues are less important and data is still more important than multimedia. Many people feel this could change if the FCC loosens the reigns on UWB, but nobody can really be sure.

Because of the projected growth of 802.11 systems by the time that higher-powered UWB may be available, 802.11 will represent a relatively large installed wireless LAN base. As a result, many homeowners and companies will likely continue to support 802.11. The possible introduction of UWB as a new physical layer within the 802.11 suite of standards, however, would provide another option for new wireless LAN deployments and a possible migration path from existing 802.11b/g and 802.11a systems.

As far as the release dates for UWB products go, there is some uncertainty. Many systems are already in the testing and demonstration phase, but actual consumer release dates are still sketchy. Whenever the products hit the shelves, it will definitely be interesting to watch things develop, though. Only time will tell whether UWB will totally dominate the wireless world or just play its near-term, WPAN role.

For more on UWB, visit our sister site, Ultrawideband Planet.com.

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