



A case of need*

*with apologies to Michael Crichton

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For those of us that follow the wireless industry closely (that's you, Incisor reader!), we are in the midst of some very interesting times when it comes to the Wireless Personal Area Networking (WPAN) segment. In March, the WiMedia Alliance, the standards organization responsible for developing and promoting Ultra Wideband (UWB) technology, announced that it would transfer the technology specifications and development to the Wireless USB Promoters Group and to the Bluetooth Special Interest Group. This was intended to streamline the standardization process within the industry groups that own the "brand" to the end user. In late April, the Bluetooth SIG officially [released](#) the much-anticipated Bluetooth 3.0 specification, which included support for 802.11 as a high-speed transport. Support for Ultra Wideband technology was notably omitted leaving many to speculate that adoption would not come for several years, if at all. On the heels of that announcement, the Wireless Gigabit Alliance (WiGig) had their [coming out party](#) in May, with the stated goal of establishing and promoting a unified specification for 60 GHz wireless technologies. Many of the use cases being touted are specifically targeted at high-speed Wireless PAN. This leads many to believe (and perhaps logically so) that four technologies are essentially vying for the emerging high-speed Wireless PAN space – Wi-Fi (and its various flavors), Bluetooth 3.0, WiGig and Wireless USB (or UWB). This has caused much conjecture about the viability of each of these technologies in addressing the use cases associated with high-speed Wireless PAN. Some have gone as far to hand down an indictment on UWB that the technology will be "[dead by 2013](#)" and the dominance and ubiquity of Wi-Fi will be difficult to overcome. However, it's

important to analyze the evidence of this case before we can issue a clear verdict.

The case for high-speed Wireless PAN

Driven by innovations in mobility, power, and storage capacity, users continue to have a voracious appetite for the latest and greatest in consumer electronic gadgets. Add to that a new world of high definition content and social networking, and it's no wonder that there is no end in sight to the potential growth of digital electronics, and high-speed Wireless PANs will play a key role in how people access, share and enjoy this content rich environment.

A high-speed Wireless PAN has a typical range of ~10 meters, and enables simple, secure connections to allow digital devices to communicate with one another at increasingly high datarates. These connections may be mobile as in the scenario where a friend shares his latest digital photos with another friend via their handsets. Or they may be fixed connections as in a home office scenario where all of the peripherals (printer, speakers, monitor, etc...) maintain a wireless connection with the PC. Or perhaps a hybrid case where mobile devices (such as handsets, netbooks, PMPs, DSCs and DVCs) want to simply "supersize" the content to a digital TV.

Whatever the usage scenario, there is a true need for a high-performance, low-power wireless solution that can also achieve the price points to enable high volume applications such as PCs and consumer electronics.

So let's assume for a moment that we buy into all of the hype that has passed

through the ether over the past couple of months. It is safe to say that UWB (or Wireless USB) at this point is the clear underdog in the jury of public perception. However, let's take a closer look at the evidence before handing down a verdict of the clear winner for high-speed Wireless PAN technology.

Plaintiff #1: Wi-Fi *One Size Does Not Fit All*

Wi-Fi is a great technology for Wireless Local Area Networking (LAN) applications. That is, wireless connectivity to the internet or a local network. However, positioning it as a Wireless PAN technology is like trying to fit a square peg into a round hole. Wi-Fi is to Ethernet as Wireless USB is to USB. They are complementary technologies. Now, of course you can create an ad hoc peer-to-peer connection over Wi-Fi.

However, it will be at the expense of the primary use case, which is the infrastructure connection. Wi-Fi also operates in an increasingly crowded spectrum in the 2.4GHz ISM band or the 5GHz UNII band, making it prone to interference and congestion. Adding multiple Wireless PAN connections in close proximity will only make matters worse. On top of that, Wi-Fi is also an inferior technology when it comes to throughput and power efficiency, at least when compared to the other technologies in this case. High resolution HD content encoded with H.264 technology already exceeds the performance requirements of Wi-Fi today ([see Wikipedia table](#)). "One Size Fits All" is a great concept, but it's just not practical in a real-world environment. The Wi-Fi "bubble" will inevitably burst.



Plaintiff #2: Bluetooth 3.0

A Good Start

It is hard to argue with the Bluetooth SIG's decision to initially support 802.11 as the high-speed transport for Bluetooth 3.0, given the maturity criteria imposed upon UWB. However, as with the comments associated with Wi-Fi above, the technology will soon run out of steam. BT 3.0 only provides a minor incremental improvement in throughput over legacy Bluetooth (from 3Mbps to 10-20Mbps). By contrast, UWB today has achieved throughputs in excess of 200Mbps, though in a handset would more likely be limited by the baseband processor to ~100Mbps. The low barrier to entry of Bluetooth over 802.11 provides a nice tailwind for UWB. If the use cases are successful, then natural selection has historically proven to drive technologies to higher performance and lower power – the sweet spot for UWB. And now there is multiple GHz of unlicensed spectrum to operate in. The Bluetooth SIG has a unique opportunity to become to video what it is today for audio. Let's hope they embrace it.

Plaintiff #3: WiGig Alliance

Wireless Infiniband?

Reading through the technology claims of the WiGig Alliance would lead one to believe that this is the end-all be-all cable replacement technology for everything but the power cord (and I'm not so sure they aren't going after that either). This reminds me of the early claims of Infiniband. Yes, remember Infiniband? It was the end-all be-all switched fabric system area network to replace just about every datacenter I/O standard including PCI, Fibre Channel,

and various networks like Ethernet. And where is Infiniband today? Mainly as a connectivity solution for high performance computing applications, a far cry from the original aspirations of the technology. So where did Infiniband go wrong? It attempted to do too much, a similar path that the WiGig Alliance is going down. Technologies historically have been successful by focusing on doing only one or two things well. USB focused on simplifying connectivity on the PC. Firewire by contrast, even though PC connectivity was one targeted use case, also attempted to do too many things and therefore is not as ubiquitous as originally intended. So I struggle with where WiGig fits in the world. If transporting uncompressed video content is the key use case, then the technology is nearly obsolete before it even leaves the gate. Higher definition standards beyond 1080p/60 (such as 2k) are already beyond the reach of the datarates advertised by 60GHz. And with compression technologies essentially following Moore's Law both in performance and cost, it seems that uncompressed schemes are just not practical. WiGig has many other significant hurdles. The standardization effort is just getting underway, which most insiders would agree means a few years from any meaningful commercial deployment. In addition, 60GHz is in the oxygen absorption spectrum, so line-of-sight is an issue that requires MIMO and beam-forming techniques to accommodate. This all adds cost and size to a system. And one last comment – it is assumed that WiGig will re-use the TCP/IP protocol stack, which has a heavy processor load for one, but also lacks the infrastructure of

applications that USB has already enabled. Will OEMs really commit to investing more money to rewrite much of the software that they have already developed?

Defendant: Wireless USB

Plug N Play

Wireless USB simply takes a UWB radio and layers on top a USB protocol stack. All of the existing USB infrastructure is preserved – from device drivers to middle ware to end user applications. Since the topology is single host to multiple devices, Wireless USB devices are not burdened with the overhead associated with heavier stacks like TCP/IP. And with performance 5-10x faster than Wi-Fi and 10-20x more power efficient, there is no better fit for high-speed Wireless PAN applications. Wireless USB also provides for superior user density versus other technologies, so interference and congestion issues are not of major concern. Wireless USB is intended to be a complementary technology to some of the technologies mentioned above. Take the use case where you are sitting on your couch accessing video content through the cloud on your smart phone via Wi-Fi, and would like to display that video on your DTV. Wi-Fi would be unable to sustain the throughput and QoS for both connections. And WiGig is unlikely to find its way into a handset anytime soon (if ever) given the power and line-of-sight issues. However, Wireless USB can easily send the video over without breaking a sweat and without significantly taxing the battery. In addition, Wireless USB will not interfere with any of the other services and will not disrupt the link if you turn on a microwave oven. →

Technology	Spectrum	Range	Protocol	Application Throughput	Power	Power Efficiency	User Density	Cost	WPAN Technology Showstopper(s)
	3.1GHz-10.6GHz	10m	USB				Excellent		NONE
	2.4GHz	10m	Bluetooth				Good		Low-Speed, Power Efficiency
	2.4GHz	30m	Bluetooth TCP/IP				Poor		Low-Speed, Power Efficiency, User Density, Interference
	5GHz	30m	TCP/IP				Poor		Power, Cost, MIMO, User Density, Interference
	60GHz	10m	TCP/IP				Poor (Requires Line-of-Sight)		Power, Cost, MIMO, Line-of-Sight, Immature Standards



Closing Arguments

The table below shows a comparison of the various technologies and their relative fit for high-speed Wireless PAN applications. Wireless USB/UWB has no technical showstoppers associated with addressing the requirements. Some would argue that the technology is not mature and that costs are too high, but these are easily resolved with adoption and volume, whereas the barriers associated the other technologies cannot be resolved so simply (i.e. they are constrained by the physics of their respective technologies).

The Verdict

Wireless USB is clearly the best-fit technology for high-speed Wireless PAN. It leverages the billions of dollars of infrastructure investment around USB protocol and applications providing a true ease-of-use experience. No other technology can match the balance of performance, power efficiency, user density and cost required for high-speed Wireless PAN applications. If the world is ready for the use cases enabled by high-speed Wireless PAN, then the world needs Wireless USB. It is simply a case of need.

UWB players now at interop test phase

Incisor has commented in the last couple of issues that it was hard to tell what was happening in the world of UWB because those companies that are still involved in the development of the technology have gone into PR blackout. The credit-crunch may have something to do with this, as PR and marketing activity has tailed off across the board. But the one thing that a technology that is striving to be heard in a crowded and competitive market doesn't need to do is to stop talking to the world.

Staccato has taken a lead here, but Incisor also spoke in an off the record sort of a way to a few UWB industry insiders. These stalwarts told us that although things have been a bit light on the PR front, the vendors have been extremely busy focusing on enabling customers to deploy Wireless USB products to hit store shelves in the near future. In addition to this, four vendors in particular including Alereon, Realtek, Staccato Communications and Wisair have been conducting private interoperability test sessions to ensure that each company's products work well with each other. How vital this is can't be over-stressed.

"A positive end user experience with Wireless USB products is important to meet the ease-of-use expectations of the technology", said one industry spokesperson. "These interop

sessions, in addition to the standard certification process and as a preparation for it, allow us to find and address any related issues before the products hit the streets."

The vendors have also committed to exchanging hardware so that additional issues can be resolved real-time. As seen with other technologies, this commitment to working together is important in creating a true ecosystem of interoperable products.

Another insider commented that " things are going very well, in fact, we are experiencing multiple vendor interoperability and ability to achieve high throughput between multiple vendor devices."

The aforementioned companies who have been participating in the interop events also say they will gladly open it up to other vendors with Certified Wireless USB solutions who wish to participate.

Good work, guys, and just keep the information flow going!

sponsored contribution

Snippets

Freescale loses lead in automotive semiconcs

The Strategy Analytics Automotive Electronics service report, "Automotive Semiconductor Vendor 2008 Vendor Market Shares," reveals that Freescale's previously undisputed lead in the automotive segment has disappeared. Its share now stands at 9.5%, head-to-head with its arch-rival, Infineon. Freescale's setback is because it derives more of its

revenues from the US automotive electronics market, which was the first region to feel the shock waves of the global economic crisis, than Infineon or its other competitors.

What are you doing under the duvet?

Over a quarter of UK employees are so work obsessed they can't resist using a mobile device such as a laptop in bed before they go to sleep according to a

survey released by Credant Technologies. The survey discovered that of those people who do work in bed, 57% do so for between 2 and 6 hours every week, little wonder that the survey also found that the majority of their bed companions found their partners' obsession with their mobiles "a very annoying habit". A staggering 8% of people admitted that they spend more time on their mobile devices during the evening than talking to their partners!