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Leveraging ultrawideband for mobile applications

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In today's highly competitive and evolving wireless communications market, carriers face an ever-shifting mix of opportunities and challenges. The enormous number of subscribers carrying mobile phone handsets represents a huge unused asset base. Over the past few years, applications from the Internet world, such as e-mail, Web browsing and instant messaging, migrated into the current generation of mobile handsets. However, carriers have only scratched the surface of their potential revenue-generating possibilities.

Virtually everywhere at the recent 3GSM World Congress in Barcelona, attendees, presenters and exhibitors discussed the emergence of multimedia handsets. Connecting mobile video phones to larger displays and the importance of viral content sharing between handsets were other key themes at 3GSM.

The ability to pack additional performance, memory and functionality into such a ubiquitous item creates a ready-made opportunity for handsets to emerge as the single device that integrates everything. A key element for realizing the full potential of next-generation handsets will be the integration of short-range, high-speed wireless capabilities that can seamlessly connect with a variety of existing and emerging communications methods. This is where ultra-wideband (UWB) wireless comes into play. UWB provides standards-based, high-bandwidth, multi-protocol capabilities, with the flexibility for auto-discovery and connection to a variety of peer-to-peer and/or local server- based networks.

Market researchers claim that approximately 70.2 percent of the U.S. population--nearly 208 million people--have mobile phones. That total is expected to grow by almost 90 million over the next four years. With mobile handset possession nearing universal market penetration, the stage is set for implementing relatively straightforward technology changes to enable handset-centric applications.

Carriers can leverage the short-range, auto-discovery and high-bandwidth capabilities of UWB to create shared-experience, community-building applications. These can be used to connect users as well as to build compelling "walled-garden" environments in which carriers and their partners can offer value-added services. For carriers, the rise of handset-centric applications will mean greater value for their subscribers, improved subscriber retention levels, and incremental revenue and partnering opportunities.

UWB technology
UWB wireless has its roots in work that began in the 1960s and was generally referred to as impulse radio, baseband or carrier-free communications. Later efforts in the 1980s focused on U.S. Department of Defense applications, such as ground-penetrating radar. As the technology's potential advantages for communications in public safety, enterprise and consumer applications became more apparent, the FCC allocated unlicensed radio frequency spectrum for UWB use. Using unlicensed spectrum in the 3.1- to 10.6-GHz range, UWB delivers very high bandwidths (up to 480 Mbits/s) over short distances (3 to 10 meters), with excellent power efficiency and low-noise characteristics.

UWB technology from the WiMedia Alliance industry consortium has been adopted by both the Bluetooth SIG for Bluetooth 3.0 and the USB Implementer's Forum for Certified Wireless USB. This offers a globally recognized, industry-wide standard that can be leveraged by carriers and handset manufacturers to embed short-range, high-performance wireless capabilities.

Because UWB wireless provides a standard physical layer (PHY) and Media Access (MAC) layer across various protocols,

including Bluetooth, Certified Wireless USB and WiNET IP, handset manufacturers can easily pack multi-protocol functionality into a single device, while holding down overall complexity and costs.

In effect, UWB allows every handset owner to activate a constant 20-meter-diameter bubble of flexible, auto-discovery wireless, ready to connect with applications in their immediate proximity based upon their user-defined security and auto-connect settings. Users can be alerted whenever they come near services offered by carriers or their partners. Based on the carriers' or service providers' specific revenue and service models, the underlying UWB technology can be used with multiple protocols to either connect users to other users or users to services.

By routinely including UWB-based wireless capabilities in their next-generation handsets, carriers can offer Bluetooth 3.0, Certified Wireless USB and IP-based LAN connectivity from a single low-cost, low-power embedded UWB function.

This allows the handset to "talk" with virtually any local devices that come within the 10-meter-radius proximity envelope, enabling a range of innovative new service models.

Phone-to-PC integration
With Certified Wireless USB already built into WiMedia-based UWB, many of the immediate applications will use mobile phones within existing PC ecosystems. For example, the handset can be used to synchronize files between PCs, print photos or documents directly on wireless USB printers, or interface with hard drives for external storage.

This capability also is driving a shift in perspective of wireless carriers toward integration of USB interfaces. In the past, some carriers have seen USB as something that just opened the door for other applications not offered by the carrier. However, with the increasing power of handsets and the flexibility of Certified Wireless USB, carriers are now seeing wireless USB more as an opportunity to put their handsets in the center of their users' application environments.

Universal backhaul device
The ability of UWB to simultaneously support wireless USB, Bluetooth and IP traffic will enable handsets to act as mobile intermediaries between the traditional USB-oriented PC ecosystems and other communication environments. Furthermore, the integration of wireless USB into devices such as digital cameras and personal media players will make handsets the access points for a whole range of consumer-oriented applications. In fact, the much higher bandwidth capabilities of UWB will allow carriers to position next-generation handsets as the universal back-haul device for interfacing various applications to the Internet, resulting in greater value for users and higher data usage rates for carriers.

Handsets with large displays
With the storage capacity of handsets growing and multimedia becoming a routine aspect of consumer applications, the ability to casually interface handsets with larger displays will become an important differentiator. Market research firm InfoTrends predicts that more than 860 million camera phones will be sold in 2009, comprising 89 percent of all handsets shipped. Additionally, camera phones will account for 227 billion photos captured in 2009, more than digital and film cameras combined.

Market researcher iSuppli cites a trend toward higher resolution, with an estimated 13 percent of camera phones sold this year having resolution of 3.2 megapixels or more.

Moreover, the growing trend of carriers partnering with content providers to deliver television programming, music, etc., directly to handsets is increasing exponentially the amount of multimedia streaming into handsets--and causing consumers to want better ways to get it out.

UWB provides the flexibility and high bandwidth for handsets to interface directly with larger displays, such as TVs, PCs or projectors with digital mobile video (DVB-H, MediaFLO, T-DMB and S-DMB).

Business users can deliver multimedia presentations directly from their handsets to projectors, or consumers can easily share photos or videos from their handset on virtually any available display. Handsets can even act as on-the-go audio/video tuners for interfacing with automotive infotainment systems.

Handset-to-handset applications
UWB's multi-protocol and auto-discovery capabilities also create huge new opportunities for applications based on handset-to-handset communications such as personal-area social networking (PASN). Social networking is already one of the hottest trends on the Internet, evidenced by the success of sites such as mySpace, facebook.com, YouTube, LinkedIn, Xanga.com, eHarmony, miniClip, classmates.com and many others.

Via UWB-enabled handsets, PASN injects a personal touch into existing social networking applications by allowing users to easily find and connect with one another, while ushering in a wave of innovative usage models and new revenue streams for carriers. These include a combination of subscription, transaction-based and per-advertisement revenues that boost

average revenue per user whenever consumers interact with retailers, service providers and other advertisers. In addition, carriers have the option to charge access fees for integrating with existing online social network providers.

Handset-to-handset communications also can support emerging content-sharing models, such as Microsoft's Zune music service, in which users can wirelessly transmit their purchased content to their friends' handsets. With copyright restrictions embedded into the content, purchased songs could be shared for previewing purposes by new users, thus providing a virtual marketing stream for creating new purchases. Additionally, handset-to-handset links will provide the basis for easily sharing the rapidly growing levels of user-generated content (UGC).

Handset as personal server

As handset performance rises and the above application scenarios proliferate, an increasing number of users will see their wireless handsets as mobile personal servers that become their primary computing environments. Rather than carrying a laptop everywhere, users can simply bring their UWB-enabled handset into the proximity of any UWB-enabled keyboard/mouse, display and printer to establish a fully functional environment. There is no need to synchronize files or apps between computers because everything moves right along with the user.

Because the handset-as-personal-server model can interact with any set of peripherals and leaves no residual personal footprints, it provides a natural pathway for carriers and their service partners to offer landing stations for mobile users. Whether in an airport, coffee shop, hotel room or other transient environment, users could simply sit down at a UWB-enabled peripheral station with their handset and be able to work as if they were in their own home or office. To make it even more transparent for the user (and more lucrative for the carrier), all of the usage-tracking and billing would be handled through the user's primary handset carrier.

Phone-to-access-point service

The final major application area that will be fueled by the high-bandwidth and flexibility of UWB-enabled handsets is the phone-to-access-point service model. Unlike Wi-Fi hotspots, kiosks or other models that require users to take an action to connect with the local environment, users can pre-set their UWB-enabled handsets for casual connections through auto-discovery of any information that might interest them.

For instance, during the few minutes that a user is standing in line at a coffee shop, he or she can be alerted to the latest album release from one of his or her favorite artists, make a purchase decision and have it downloaded before getting to the head of the line. With UWB's high bandwidth, he or she could even download a full-length feature film or the latest episode of a favorite TV show--all before the latte is ready.

For local business owners and service providers, the auto-connectivity, high bandwidth and short range of UWB wireless allows the creation of walled garden environments. There, transient users can access multiple channels of locally controlled content--such as streaming audio, video or other pertinent information (news, weather, events, etc.). The revenue-generation models can range from advertising to downloads to pay for access. As the primary service providers for the users' handsets, carriers are likely to play a central role in usage-tracking and billing for most point-of-access services.

The UWB-enabled convergence of functionality in mobile phone handsets is setting the stage for a new class of handset-centric apps. They will change the way users view their mobile devices and open new revenue opportunities for carriers and service providers.

As an internationally accepted wireless standard that provides high bandwidth, support for multiple protocols and casual connectivity, UWB is destined to play a key role in the implementation of these new handset-centric applications models. Embedded UWB gives handset makers and carriers the flexibility to interface their users with virtually any local environment and gives users the freedom to be at the center of their own world no matter where they are.

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