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Mobile MIMO: Disruptive Technology For Tablets And Super Phones

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The Rise of the Tablet

With the rapid ascent of mobile devices—such as the iPad™, Galaxy™, Xoom™, Playbook™ and Cius™—to the forefront of the mobile technology scene, tablets becoming the new personal computing device of choice for students, travelers, gamers and professionals alike.

End user expectations are high for the next revolution in mobile computing, but in order to further stimulate demand in the market, system designers are tasked with enabling new features and potential uses while delivering a PC-like experience on a sleek, handheld device.

Applications for high-definition video, 3D gaming and streaming media are already commonplace on today's bulkier notebooks, and an increasingly mobile lifestyle dictates that the consumption of such content will continue to grow exponentially. At the same time, consumers are hungry for a more connected mobile experience integrating with other devices that are critical to their everyday lives. Creators of handheld devices and the chips that power them are moving aggressively to address these demands, recognizing that the ability to truly "mobilize" these experiences is essential to the success of the tablet.

This appetite for a richer, more flexible computing experience has already bred a generation of multi-core Gigahertz mobile processors. With broad multimedia capabilities and support for multitasking operating systems, these sophisticated processors are the brains behind today's tablets and smart phones. However, these processing platforms must be paired with connectivity technologies that deliver a reliable, high-bandwidth wireless link that can also satisfy the battery life and space constraints unique to handhelds.

Introducing Mobile MIMO

Multiple-Input Multiple Output (MIMO) radio architectures have been available in Wi-Fi 802.11n products for most of the last decade. When introduced, they dramatically increased the performance and range of existing Wi-Fi networks by taking advantage of principals unique to multi-transceiver RF systems. But, system designers paid a price for performance with an increase in solution size and power consumption. Because of its larger footprint and power-hungry nature, today's MIMO technology is used primarily in wall-powered wireless infrastructure products such as Hot Spots, home routers or larger portables such as notebooks.

Makers of first-generation tablets were therefore compelled to borrow their Wi-Fi solution from smartphones, which use single-antenna combination radios that include Wi-Fi, Bluetooth and FM in a small, integrated system on chip (SoC). While these solutions fit their power profile and industrial design (ID) constraints, they fail in delivering PC performance to a tablet.

Fortunately, a new generation of wireless products addresses both requirements. With the introduction of Mobile MIMO, which adds a second transceiver in a true MIMO configuration, next-generation tablets can finally deliver the PC experience to a mobile device.

Below are five key enabling factors:

1. Performance: Mobile MIMO means Wi-Fi connectivity with extended range is finally available for smaller form factor devices. Designers can now realize 300Mbps wireless performance in a handheld product without a significant impact on battery life. This is two to three times faster than what is available with today's products and enables reliable video streaming, live gaming and a host of other exciting features.

2. Multiple Antennas: Tablet ID gives rise to antenna challenges. Wi-Fi performance and reliability issues in first-generation products were widely attributed to the use and placement of a single antenna. An antenna positioned behind the display or on one edge of the product can be obstructed by a flat surface or a user's hand. With two antennas that can be routed away from where the tablet is likely to be placed or handled, a MIMO Wi-Fi radio offers increased link robustness and considerably diminishes the likelihood of signal obstruction.

3. Radio Integration: To fit the wireless subsystem inside the available board space, the marriage of 802.11n Mobile MIMO with Bluetooth and FM is essential. It is also critical in optimizing radio co-existence for simultaneous operation and reliably sharing antennas between Wi-Fi and Bluetooth to reduce cost.

4. Low Power Technology: The addition of Bluetooth 4.0 Low Energy technology in Mobile MIMO combinations will further increase demand for tablets, as it enables new features and uses without impacting battery life. End users want their mobile devices to be seamlessly connected to other products that are (or will be) integral to their everyday lives, whether it's body-worn sensors for personal health monitoring or home media and automation devices.

5. I/O Interfaces: This class of combo radio is now equipped with new high-speed, low power I/O interfaces, which alleviates any potential performance bottlenecks that arise when pairing a MIMO radio with an application processor. Look for High Speed Inter-Connect (HSIC) and SDIO 3.0 as a standard offering on any connectivity SoC for tablets.

Closing Thought

As dozens of new tablets and super phones flood the market over the next few years, designers will continue to push the performance envelope as they race to enable features that uniquely differentiate their offering. With Marvell's currently sampling Avastar™ 8797 802.11n 2x2 + Bluetooth 4.0 + FM Tx/Rx single chip, they have a unique connectivity solutions available today which will ensure their success in creating a PC connectivity experience on mobile platforms.
Link to product announcement: [Marvell Unveils Industry's First 'Mobile MIMO' Wi-Fi Solution]

Figure 1: Mobile MIMO configuration with flexible antenna placement options reduce the likelihood of signal obstruction (i.e. user's hand)

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Bart Giordano is a Director of Product Marketing, EEBU Wireless, Marvell Semiconductor, Inc. Bart is a technology professional with more than a decade of experience across the network security, wireless and fables semiconductor industries. After receiving his Bachelor of Science in Computer Engineering from California Polytechnic State University, San Luis Obispo, Bart worked for six years at Cisco Systems, where he was a senior engineer focused on the implementation of advanced security technologies for virtual private network (VPN) routers and switches. Currently, Bart is responsible for product definition, technical marketing and business development across Marvell's complimentary wireless product line.

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Mobile_MIMO-001_white_paper 5/11