

Product Bulletin

Wireless Performance Optimization Solutions: Bluetooth™ and 802.11 Coexistence

TI has developed a coexistence solution for simultaneous functionality of 802.11 b/g wireless local area networking (WLAN) and Bluetooth™ personal area networking (PAN) in small form factors, including cell phones, laptop computers, personal digital assistants (PDAs), web tablets and other new types of mobile devices. Because 802.11 b/g and Bluetooth occupy the same 2.4-GHz ISM range of wireless communications spectrum, their RF signals can cause interference for each other unless a coexistence solution is deployed.

TI's coexistence package provides intelligent and seamless coordination between TI's WLAN and Bluetooth technologies at the media access control (MAC) layer. With this level of time domain coordination, no RF isolation is needed between the 802.11 and Bluetooth antennas, simplifying designs and ensuring effective operations in small form factors.

Simultaneous 802.11 and Bluetooth Functions

As a result of the simultaneous functionality of 802.11 and Bluetooth, advanced, next-generation applications are now possible. For example, TI's WANDA (Wireless Any-Network Digital Assistant) PDA concept design is a handheld tri-wireless mobile device with GSM/GPRS, 802.11 and Bluetooth communica-

tions capabilities. TI's solution enables a handset such as WANDA to be connected to the cellular phone network while Bluetooth forwards the voice conversation to a wireless headset. At the same time, WANDA's 802.11 WLAN processor can be receiving e-mail messages or downloading an e-mail attachment. This level of wireless operation would not be possible without the interference-canceling abilities of a coexistence solution.

The firmware takes advantage of the general purpose coexistence interface BUS connection between TI's 802.11 MAC processors, the TNETW1100B and TNETW1130, and an I/O channel on TI's advanced Bluetooth subsystem-on-a-chip, the BRF6100. Software monitors WLAN and Bluetooth traffic patterns and, when both 802.11 and Bluetooth require bandwidth, it uses multiplexing techniques to allocate the

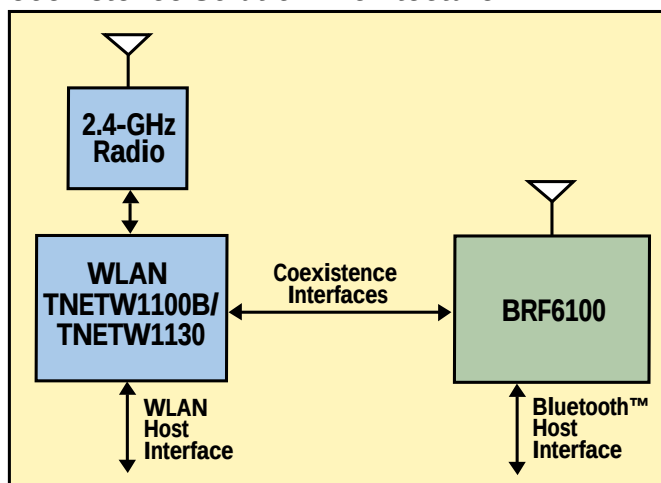
Key Features:

- Coexistence of 802.11 Wi-Fi and Bluetooth™ in small form factors, including cell phones, PDAs, laptops and web tablets
- Simultaneous 802.11 and Bluetooth functionality
- Bluetooth voice simultaneous with 802.11 data communication
- Flexibility supported by TI's WLAN b/g PHY chips and its single-chip Bluetooth device
- Low power consumption for mobile battery-operated platforms
- No RF isolation requirements saves board space
- Intelligent MAC-layer coordination eliminates performance penalties caused by allocating dedicated bandwidth
- Small footprint ideal for compact handheld devices
- Seamlessly coordinated two-chip solution

bandwidth for simultaneous functions. In this way, RF interference between 802.11 and Bluetooth is eliminated, packet collisions are avoided and high throughput rates are maintained without requiring antenna isolation.

Unlike other possible coexistence solutions which dedicate a fixed portion of the available

Coexistence Solution Architecture



bandwidth to 802.11 and Bluetooth, the solution's MAC-level coordination makes efficient use of all of the bandwidth in the 2.4-GHz ISM range. At any time, all of the available bandwidth can be dedicated to either 802.11 or Bluetooth, as long as one or the other is idle. For example, when no Bluetooth communication is taking place, all of the bandwidth can support 802.11g communications at speeds up to 54 Megabits per second (Mbps). Conversely, when 802.11 is idle, all of the bandwidth in the 2.4-GHz range can be devoted to Bluetooth communications.

To ensure the quality of certain types of critical communications, the coexistence solution can intelligently set different priorities depending on the time-sensitive nature of the communication. For example, the quality of Bluetooth wireless voice communication between a cell phone or wireless PDA and a Bluetooth headset can be maintained at a high level while significant bandwidth demands are being made on the system by its 802.11 WLAN processor.

Low Power and Small Footprint for Mobile Platforms

Taken individually, the devices that support the coexistence solution are among the leaders in the industry in low power consumption.

Both the Bluetooth and WLAN devices were designed to meet the aggressive size and power requirements needed for mobile, battery-operated applications such as cell phones and PDAs. The additional power needed to process the intelligent WLAN/Bluetooth coordination algorithm is negligible. Indeed, the major portion of the power consumed by processing this algorithm occurs only when coordination between the 802.11 WLAN and Bluetooth processors is required. By eliminating contention between 802.11 and Bluetooth, TI's solution actually reduces the system's overall power consumption because packet collisions and the consequent re-transmissions are avoided. This also improves the throughput of the system.

Moreover, there is no additional space on a printed circuit board (PCB) because it operates on TI's current 802.11 and Bluetooth devices. As a firmware upgrade, no added board space is required beyond the space already devoted to the system's 802.11 and Bluetooth processors. And the combined footprint of TI's 802.11 processors, either the TNETW1100B or the TNETW1130, and the area of the BRF6100 single-chip Bluetooth subsystem are decidedly less than that of comparable devices in the industry today.

The Future of 802.11 and Bluetooth Coexistence

TI's coexistence solution has been designed in accordance with the recommendations of the IEEE's 802.15.2 task group on 802.11 and Bluetooth coexistence. In addition, TI's roadmap for future coexistence solutions will include the adaptive frequency hopping functionality of the Bluetooth 1.2 standard. Other advanced features, such as voice over Internet Protocol (VoIP) over 802.11 WLAN networks, also have been designed into the coexistence solution and will be available in the future.

For More Information

For more information on TI's 802.11 and Bluetooth coexistence solution, go to

www.ti.com/wlan

www.ti.com/bluetooth

www.ti.com/wireless

Important Notice: The products and services of Texas Instruments Incorporated and its subsidiaries described herein are sold subject to TI's standard terms and conditions of sale. Customers are advised to obtain the most current and complete information about TI products and services before placing orders. TI assumes no liability for applications assistance, customer's applications or product designs, software performance, or infringement of patents. The publication of information regarding any other company's products or services does not constitute TI's approval, warranty or endorsement thereof.

C010203

Real World Signal Processing and the black/red banner are trademarks of Texas Instruments. Bluetooth is a trademark owned by Bluetooth SIG, Inc. and licensed to Texas Instruments.