COORDINATION OF COMPETING PROTOCOLS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of:

1. U.S. provisional application Serial No. 60/409,356, filed Sep. 9, 2002, entitled "A Mechanism For Collaboration And Interference Prevention Between 802.11 And Bluetooth Using The 802.11 Power Save Mechanism," and

2. U.S. provisional application Serial No. 60/411,848, filed Sep. 18, 2002, entitled "Coordinating A Plurality Of Medium Access Control Protocols That Share A Common Communications Channel,"

both of which are also incorporated by reference.

The following patent application is incorporated by reference:

1. U.S. patent application, entitled "Multi-Protocol Interchip Interface," application Ser. No. 10444,383.

FIELD OF THE INVENTION

The present invention relates to telecommunications in general, and, more particularly, to a telecommunications terminal with two radios operating in accordance with competing respective protocols (i.e., respective protocols that might interfere with each other.

BACKGROUND OF THE INVENTION

FIG. **1** depicts a schematic diagram of a portion of wireless communication system **100** in the prior art. Wireless communication system **100** comprises wireless terminals **101-1** through **101-6**, all communicating with each other by using one or more air interfaces in the same, shared radio frequency band. As an example, IEEE 802.11 (i.e., "802.11") wireless terminals **101-1**, **101-2**, and **101-4** communicate using an 802.11 air interface, Bluetooth wireless terminals **101-5** and **101-6** communicate using a Bluetooth air interface, and 802.11/Bluetooth wireless terminal **101-3** communicates using either an 802.11 or a Bluetooth air interface.

As depicted in FIG. **1**, wireless terminal **101-2** is transmitting a signal with wireless terminal **101-3** as the intended recipient. Also, wireless terminal **101-6** is transmitting a signal with wireless terminal **101-5** as the intended recipient. Wireless terminals **101-2** and **101-6** can transmit simultaneously, although in order to do so, either (1) their respective transmissions have to be coordinated, or (2) wireless terminals **101-2** and **101-6** have to be situated far enough apart from each other to minimize interference. If, however, a wireless terminal supports two air interface protocols (e.g., wireless terminal **101-3**, etc.), a mechanism must exist to prevent interference (i.e., the effect of two radios transmitting simultaneously in the same frequency band), since spatial separation of two air interfaces within the same wireless terminal is not an option.

In accordance with a first technique in the prior art, FIG. **2** depicts a block diagram of the salient components of wireless terminal **101-3**. Wireless terminal **101-3** comprises host **201**, A/B switch **202**, 802.11 radio **203**, Bluetooth radio **204**, antenna switch **205**, and antenna **206**. Host **201** comprises a microprocessor. At any given time, host **201** communicates with 802.11 radio **203** or Bluetooth radio **204**, both not both, by means of A/B switch **202**. 802.11 radio **203** communicates in accordance with the 802.11 air interface, and Bluetooth radio **204** communicates in accordance with the Bluetooth air interface. Antenna switch **205** directs a signal to be transmitted to antenna **206** from either 802.11 radio **203** or Bluetooth radio **204**. Antenna switch **205** also directs a received signal from antenna **206** to either 802.11 radio **203** or Bluetooth radio **204**. Antenna switch **205** is coordinated with A/B switch **202**.

The first technique in the prior art controls contention for the shared frequency band through A/B switch **202**. In addition to providing contention-free access to the shared frequency band, the first technique provides a low-cost solution. As a disadvantage, however, the air interface in use must remain in either 802.11 or Bluetooth mode for relatively long periods of time. Also, contention resolution requires manual intervention on the part of a user whenever wireless terminal **101-3** has to make a transmission over the air interface that is not presently active. Finally, the inactive air interface might miss a transmission by some other wireless terminal.

In accordance with a second technique in the prior art, FIG. **3** depicts a block diagram of wireless terminal **101-3**. Wireless terminal **101-3** comprises host **301**, 802.11 radio **302**, Bluetooth radio **303**, antenna switch **304**, and antenna **305**. Host **301** comprises a microprocessor. At any given time, host **301** communicates with 802.11 radio **302** or Bluetooth radio **303**, but not both, by means of an internal switch. Typically, the internal switch requires the user of wireless terminal **101-3** to select the air interface to be used (e.g., from a menu, etc.). Alternatively, host **301** chooses between the air interfaces based on the type of communication it needs to send or expects to receive. 802.11 radio **302** communicates in accordance with the 802.11 air interface, and Bluetooth radio **303** communicates in accordance with the Bluetooth air interface. Antenna switch **304** directs a signal to be transmitted to antenna **305** from either 802.11 radio **302** or Bluetooth radio **303**. Antenna switch **304** also directs a received signal from antenna **305** to either 802.11 radio **302** or Bluetooth radio **303**. Antenna switch **304** is coordinated with the selection of the air interface.

The second technique in the prior art integrates the switch into host **301**, so the intervention by the user is more convenient, even though the intervention is still possibly manual. In addition to providing contention-free access to the shared frequency band, the second technique provides a more convenient way of allowing the user to change between air interfaces. As a disadvantage, however, the air interface in use must remain in either 802.11 or Bluetooth mode for relatively long periods of time. Also, contention resolution still possibly requires manual intervention on the part of a user whenever wireless terminal **101-3** has to make a transmission over the air interface that is not presently active. Finally, the inactive air interface might miss a transmission by some other wireless terminal.

In accordance with a third technique in the prior art, FIG. **4** depicts a block diagram of wireless terminal **101-3**. Wireless terminal **101-3** comprises host **401**, 802.11/Bluetooth radio **402**, antenna switch **403**, and antenna **404**. Host **401** comprises a microprocessor. Host **401** maintains an interface with the 802.11 part of 802.11/Bluetooth radio **402** and an interface with the Bluetooth part of 802.11/Bluetooth radio **402**. 802.11/Bluetooth radio **402** is a single integrated circuit that communicates in accordance with the 802.11 air interface and with the Bluetooth air interface. 802.11/Bluetooth radio **402** coordinates transmissions to some extent between its 802.11 part and its Bluetooth part. Antenna switch **403** directs a signal to antenna **404** to be transmitted from either the 802.11 part of 802.11/Bluetooth radio **402** or the Bluetooth part of 802.11/Bluetooth radio