[0050] In the switching mode of operation, the interoperability device **106** deactivates the Bluetooth transceiver (**110**/**114**) whenever the IEEE 802.11 transceiver (**108**/**112**) is activated, and vice versa. The interoperability device **106** is adapted to make the decision as to which mode of operation to switch to or activate. There are several alternative criteria on which the interoperability device may make this decision.

[0051] In a first alternative, the user of the device may decide which mode to switch to. For instance when the user is at home and wants to connect to the Internet through a telephone, the user may decide to switch to Bluetooth mode and dial up to an Internet Service Provider (ISP). When the user is in the office, where an IEEE 802.11 wireless LAN is present, the IEEE 802.11 mode may be selected by the user, to enable the user to log on to the network. This mode requires the user to know which is the appropriate interface to use for the chosen application. The user command will most likely be provided through an interface, such as a screen and keypad, on the device itself, and notified to the interoperability device **106** via a command signal from a central processor or controller in the device. In addition mixed environments, where both Bluetooth and IEEE 802.11 exist, may be present for example in an office environment.

[0052] In an alternative, the notification of the mode of operation may be provided to the transceivers via control from the CPU through regular drivers, or through a dedicated interoperability device driver.

[0053] In a second alternative, application software may control which mode the device switches to. For instance when the user chooses to synchronise a Personal Digital Assistant (PDA), the data-synchronisation application in the PC may tell the interoperability device to switch to Bluetooth mode. When the user chooses to surf the World Wide Web (WWW), the browser application (or the network driver software supporting it) may tell the interoperability device to switch to IEEE 802.11 mode. Again, the interoperability device **106** may be instructed via a command signal from a central processor or controller.

[0054] In a third alternative, a protocol sniffer may determine whether it detects the presence of an IEEE 802.11 device or a Bluetooth device on the air interface, and set the mode of the interoperability device accordingly. When the protocol sniffer detects both Bluetooth and IEEE 802.11 devices, it may choose a mode that the user has indicated as preferential, or it may consult the user as in the first alternative. Alternatively, the protocol sniffer may let the application decide as in the second alternative.

[0055] Thus in the switching mode the interoperability device operates merely to deactivate, or switch off, one of the two transceivers within the dual mode transceiver. This operation is transparent to the functional elements of the respective transceivers, and also to the other processing functionality in the device itself. When the interoperability device is switched to "IEEE 802.11" mode the transceiver **100** behaves as an IEEE 802.11 transceiver. When the interoperability device is switched to "Bluetooth" mode the transceiver **100** behaves as an Bluetooth transceiver.

[0056] In the switching mode, turning off one transceiver when the other is transmitting means that the one transceiver cannot receive or transmit when the other is transmitting. Thus when employing the switching mode only one radio system needs to be operating at a given time, which means that the radio hardware can be reused.

[0057] **FIG. 2** illustrates the dual mode transceiver of **FIG. 1** re-configured to utilise radio re-use. As can be seen from **FIG. 2**, the functionality of the IEEE 802.11 physical layer functional element **112** and the Bluetooth physical layer functional element **114** are combined into a single functional element referred to as the IEEE 802.11/Bluetooth dual physical layer functional element, and denoted by reference numeral **200**. The dual functional element **200** transmits and receives IEEE 802.11 and Bluetooth packets on signal lines **204** to the device antenna.

[0058] The IEEE 802.11/Bluetooth dual physical layer functional element is controlled by the interoperability device via signal lines **202** to operate as the physical layer functional element for either IEEE 802.11 or Bluetooth in accordance with the current mode of operation selected.

[0059] In the multiplexing mode of operation the IEEE 802.11 transmitter is switched off when the Bluetooth transmitter is receiving data and the Bluetooth transmitter is switched off when the IEEE 802.11 device is receiving data. In this way one radio system is never transmitting when the other is receiving, and vice versa. The interoperability device **106** observes the rules of the medium access control protocols, and while the transmission and reception of the IEEE 802.11 and Bluetooth radio systems are time multiplexed, it will appear to the user that the two systems operate in parallel. There will, however, be some performance impact (reduced data throughput, increased data error rate, reduced voice quality).

[0060] Furthermore, the interoperability device **106** additionally preferably does not allow the IEEE 802.1 and Bluetooth radio systems to transmit at the same time. Thus interference of one signal with the other at an external (remote) receiver is prevented.

[0061] In a preferred implementation of the multiplexing mode, if an IEEE 802.11 packet must be transmitted, all Bluetooth data connections are placed in the so-called PARK mode. The interoperability device **106** will issue one HLC_Park_Mode primitive per active ACL (Asynchronous Connectionless data) connection to the Bluetooth transceiver, to put all ACL connections in PARK mode. The PARK mode of the Bluetooth radio system will be familiar to one skilled in the art. In this way, the Bluetooth radio system is deactivated whilst an IEEE 802.11 transmission takes place.

[0062] Although the example implementation is presented herein with reference to a discussion of the Bluetooth PARK mode, it will be appreciated by one skilled in the art that the Bluetooth HOLD mode may alternatively be utilised.

[0063] If there are active Bluetooth SCO (Synchronous, connection-oriented voice) connections, which transmit and receive periodically in a 0.625 ms Bluetooth slot, then the IEEE 802.11 transceiver must schedule its packet transmissions in-between the Bluetooth packets. The Bluetooth SCO connections are real-time (voice) connections. The interoperability device **106** must take the full IEEE packet exchange period into account, which includes an acknowl-