



Technical Publication No. 08-005

## **DYNAMIC WIRELESS CHANNEL SELECTION TO IMPROVE RELIABILITY OF WIRELESS COMMUNICATION**

Joelle Rudnick

The invention will improve the reliability of wireless communication between transceiver-equipped devices situated on opposite sides of the isolation barrier that separates the scanner and control rooms of a magnetic resonance imaging (MRI) suite. It addresses the problem of channel availability in the increasingly crowded wireless spectrum by permitting the system into which it is incorporated to dynamically select the channel it will use for wireless communications.

### **SPECIFICATION**

This invention surveys the wireless spectrum to determine the best channel to select for establishing a wireless link through two wireless access points (APs). The spectrum is monitored to determine the channel with the least amount of activity and the lowest noise floor. Once a specific channel is identified, the system will then automatically configure the wireless APs to the selected channel. The operation described above will occur on power up. In addition, the wireless spectrum will also be monitored during normal wireless communication along with the status of the wireless link (retry, drop packets, increased latency, etc.) to determine if the system should change wireless channels. If the integrity of the wireless link is found to be low due to excessive traffic and high noise floor during normal operation, the system will prompt the user to determine if the user would like to change channels. Because the system may have to terminate the link momentarily during the process of changing channels, the user will be prompted to verify that it is okay to do so. As a safety measure, the system will not allow the channel to be changed during peak operation of the system so as to prevent the performance of the system from being compromised at a critical time.

The system will be implemented using current wireless radio and AP technology and the current IEEE 802.11 wireless communication standards. In this regard, the system will use a second standard wireless radio acting in a spectrum analyzer mode to monitor the channels to determine the best channel for operation. Information on latency, dropped packets, and retries can be pulled for the physical layer of the protocol, or embedded into the wireless data portion of the wireless packet. The latter will increase bandwidth slightly, but will only require three bits per packet.

The invention does not require the wireless radios or wireless APs to be intelligent. Instead, the system employs existing technology with new application software to create a smart wireless network that is capable of adapting to the particular wireless environment in which it is used.

When it detects delays in the delivery of packets, dropped packets, excessive retries, etc. the system will automatically initiate attempts to change the channel it is operating on. Any time the reliability of the wireless communication is compromised, the system will scan the other channels in an attempt to locate the best channel over which to operate. Once a better channel is found, and the user responds to the prompt to switch channels, the system will reconfigure the APs to the new channel at which point momentary loss of communication may occur as the switch in channels is carried out.

Shown below is an example of an MRI-compatible wireless communication system into which the invention can be incorporated. Offered by MEDRAD, the Certo® MR Wireless Network constitutes the basic infrastructure that enables the separate components of the Veris® Wireless MR Patient Monitoring System to communicate across the isolation barrier separating the scanner and control rooms of the MRI suite. Located in the scanner room, the patient monitor with its internal transceiver is able to communicate wirelessly with the remote display unit via its internal transceiver located in the control room. With such a wireless system, a patient undergoing an MRI scan can be safely monitored by medical personnel in the control room throughout the course of the imaging procedure.

The invention disclosed herein would further improve the reliability of wireless communication between devices situated on opposite sides of the isolation barrier of an MRI suite. It is well known that as more and more devices come to market with wireless communication capabilities, the wireless spectrum under the IEEE 802.11 standard is becoming increasingly crowded. The invention addresses this problem by permitting the system into which it is incorporated to dynamically select the channel it will use for wireless communications, and therein improve the reliability of communication between medical devices in the MRI suite.

