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## Method and System for Transmitting a Cross-Protocol Message

This invention allows the direct bidirectional exchange of information across the most popular wireless devices using the 2.4 GHz ISM frequency band (e.g., IEEE 802.15.4, Bluetooth Low Energy, and Wi-Fi devices) without the need of intermediate gateways. In particular, it's letting off-the-shelf wireless devices with incompatible PHY layer transmit precisely timed energy bursts and/or gaps using standard-compliant data packets, and extract information using the received signal strength information.

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KEYWORDS:
Cross-technology Communication
Communication through Energy Sensing
Wireless communication without gateways

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COOPERATION OPTIONS:
Licensing
Sale
Technical cooperation

DEVELOPMENT STATUS:
Prototype

STATUS OF PATENTS:
PCT Application filed

BACKGROUND

Wireless devices with incompatible physical layer are typically unable to exchange data directly using regular communications and standard protocols. Traditionally, a gateway embedding multiple radios is used to allow a data exchange between heterogeneous devices. However, this approach suffers from several drawbacks, such as additional hardware costs, complex network structure and management, increased traffic overhead (network bottleneck), and reduced performance (single point of failure).

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The invention is based on (i) the transmission of precisely timed energy bursts and/or gaps using standard-compliant data packets, and (ii) the use of the energy level of a channel (e.g., received signal strength information) to detect the transmissions of other devices with incompatible physical layer. It's letting, for example, off-the-shelf Bluetooth Low Energy (BLE) and IEEE 802.15.4 (Zigbee) devices exchange information by transmitting standard-compliant data packets of different lengths on a pre-defined channel. This information is decoded and reconstructed using high frequency RSSI sampling and algorithms to distinguish between background noise and valid information.
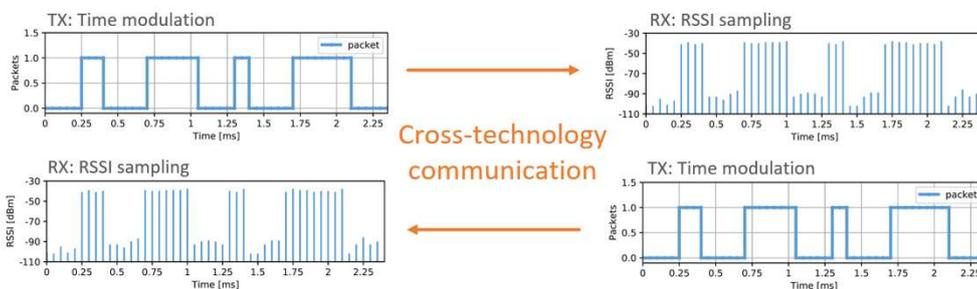
ADVANTAGES

This technology enables a direct communication across popular wireless devices in the 2.4 GHz frequency band (e.g., IEEE 802.15.4, Bluetooth Low Energy, and Wi-Fi devices) without the need of gateways. Hence, the following applications / use cases are enabled:
- Direct data exchange between smartphones/tablets (e.g., embedding a BLE radio) and smart sensors/actuators (e.g., embedding an IEEE 802.15.4 transceiver);
- Updating the firmware of smart objects (e.g., based on IEEE 802.15.4) using smartphones or tablets (e.g., embedding a BLE or Wi-Fi transceiver);
- Coordinating the frequency usage in the shared, unlicensed 2.4 GHz ISM band;
- Synchronizing the clock of heterogeneous wireless devices with incompatible PHY layer.

Please refer to the following links to get an overview about the possibilities:
Prototype principle: https://youtu.be/7OgCQzbUQQE
Prototype in Smart Home scenario: https://youtu.be/whD_H-UynJY

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