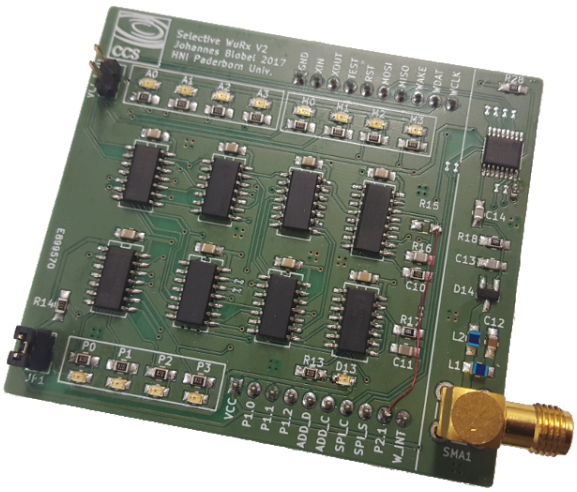
Master's Thesis

Investigating Selective Wakeup Transceivers for IEEE 802.11 WLAN



Wireless communication based on IEEE 802.11 is a promising technology for the Internet of Things (IoT). One of the main concerns for IoT devices is their power consumption, which is primarily caused by the wireless module listening for potential data traffic sent by an access point. Current state of the art for power saving techniques in IEEE 802.11 is the use of Delivery Traffic Indication Map (DTIM) Messages where connected stations go into sleep mode and periodically wake up to check for packets to be received – similar to a process better known as Duty Cycling.

In the past several approaches have been introduced to improve power management for WLAN, yet they have to make a trade off between energy efficiency, and network performance. Most importantly, research in that area lead the standardization body of IEEE 802.11 to form a dedicated Task Group IEEE 802.11ba to study possible ways towards energy efficient reception modes without increasing communication delay.

Recently we created a prototype of a selective wakeup receiver for wireless sensor networks which incorporates a flexible addressing scheme to wake up either one particular node (unicast), a set of nodes (multicast), or all nodes (broadcast) within the communication distance.

We believe that wireless networks according to IEEE 802.11 can benefit from our selective wakeup receiver to save energy by still keeping network response times at an acceptable level.

Goals of the thesis

In the above context the idea of this thesis is to study in which degree WLAN devices can benefit from selective wakeup transceivers. The main challenge is to design power saving algorithms for medium access control such that the impact on channel access behavior is minimized.

This thesis will integrate our selective wakeup receiver into commercially available WLAN hardware and assess the performance in terms of energy efficiency, throughput, and communication latency. The quality of the designed algorithms is then evaluated in different scenarios.

Keywords

C, C++, WLAN, Hardware

[1] J. Blobel and F. Dressler, "Sender-Triggered Selective Wake-Up Receiver for Low-Power Sensor Network," in *36th IEEE Conference on Computer Communications (INFOCOM 2017), Demo Session*, Atlanta, GA: IEEE, May 2017.

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