

Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: Discussion of MAC changes needed by TG4f

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Re: [802.15.4f] Discussion of possible MAC Modifications for RFID support.

Abstract: This presentation discusses issues related to RFID support and the MAC changes that might be necessary to support both TX only RFID devices and RFID devices that are capable of bidirectional communications.

Purpose: To prompt discussed by TG4f group and assist in formulating the MAC requirements.

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Introduction

- This document is intended to prompt a discussion, within TG4f, on the MAC requirements for RFID, and, in particular, to identify any changes necessary to support RFID devices that may be Transmit-only.
 - Changes to support any new PHY coming out of TG4f are not discussed.
 - It is envisioned that TG4f will identify those MAC elements needed for active RFID devices and seek a review by MAC experts in other 15.4 groups as to how to accommodate these.
- There are in general two types of Active RFID tags being considered within TG4f.
 - (a) TX-Only Tags, that blink at a pre-set rate and do not listen for any response
 - (b) Tags that can transmit and receive.
- Tags that can transmit and receive are essentially capable of participation in a 802.15.4 based network and can follow standard procedures for joining such a network. These do not need any special MAC considerations and do not feature in the remaining discussion here.
- The MAC requirements for Transmit-Only tags are considered on the following pages.

What MAC changes do we need for TX only tags?

- There are two items of possible change identified so far by TG4f:
 - (a) What message to use for the periodic Transmit-only blink, and,
 - (b) What data should the RFID message convey.
- Submissions (0591 and 0596) tried to address these two questions, by proposing new frame types and payload fields, with a view to including these in the MAC changes being undertaken by TG4e
 - Some feedback received suggests that perhaps no changes are needed to support the TX only requirement, i.e. perhaps the standard 15.4 data frame may suffice.
 - The characteristics of the 802.15.4 data frame and its API are discussed on the next slide.
- As to the data conveyed by the RFID message, the main requirement, a unique ID, can be delivered by using the IEEE 64-bit address which is a standard component of the MAC Header of a 802.15.4 data frame.
 - The data frame payload can be used to carry any supplemental ID required along with sensor data, battery health, alarm status, or other application specific information.

Is the standard 15.4 Data Frame sufficient?

MCPS-DATA.request

- This primitive is defined for sending data. The API already includes the following elements:
 - SrcAddrMode Allows for 64-bit source address.
 - DstAddrMode, DstPANId & DstAddr Allow for broadcast or particular PAN-ID destinations.
 - msduLength and msdu Allow for data payload specification.
 - TxOptions Allows for unacknowledged transmissions.
- The text says “On receipt of the MCPS-DATA.request primitive, the MAC sublayer entity begins the transmission of the supplied MSDU”.
 - Some conditions may preclude transmission, but lack of association is not one of them.
 - So, while the MAC has the hooks for channel scan, association, etc ... , there is no imperative to use these facilities. Their operational usage can be defined by the higher layers.
 - Thus the RFID application in a TX-only tag may use the MCPS-DATA.request primitive to directly send its blink whenever it chooses.
 - And so TG4f does not need a new message type to support the RFID blink.

What about the RFID Payload?

- As stated, the 64-bit source address is a standard component of the MAC Header of a 802.15.4 data frame. This field thus provides a unique device identifier as required for the RFID application.
- All other RFID payload elements identified are application specific, different RFID applications will need different data, nothing is applicable to all.
 - Items identified so far include additional ID numbers, sensor data, alarm status, etc.
- Given that these items are application specific, their content , format, range ... etc, ... should be defined by the application layer.
- It is not the role of the MAC layer definition to specify the content of the MAC payload. This payload is supplied by the upper layers. It should be defined by the upper layers.
 - It is not within the scope of 802.15.4 to define the RFID payload.

Conclusions

- The existing 802.15.4 data API primitives (MCPS-DATA) as defined already seem to support their use for Transmit-Only RFID applications.
- It is up to the RFID application in the layers above the MAC to specify the MAC data payload (transferred in the msdu) that is appropriate for their particular application areas.
- No MAC changes per se are needed to support RFID.
 - All that may be required is to add an explanatory annex to 802.15.4 describing how Transmit-Only RFID applications are supported by the standard.
 - Obviously if a new PHY is defined within TG4f then MAC changes will be needed, e.g. to specify the value for its enabling channel page and to provide controls for any other new configuration parameters within it.

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