TinyOS 802.15.4 Frames

Abstract

This memo documents the frame format for 802.15.4 packets in TinyOS 2.0.

1. Introduction

802.15.4 is a data-link and physical packet format for low-power wireless networks that is used in many TinyOS platforms. The TinyOS 2.0 active message layer adds a packet field for higher-level protocol dispatch. This document describes the two TinyOS 2.0 frame format for 802.15.4 networks. The first format is for isolated TinyOS networks; the second format is for networks that share the spectrum with 6lowpan networks[1]_.
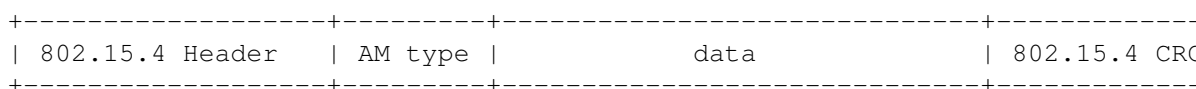
2. 802.15.4

802.15.4 supports several different source and destination addressing modes, and so has a variable sized packet header.[2]_ A TinyOS device MUST support packet frames with 16-bit short source and destination addresses. A TinyOS device MAY support additional 802.15.4 frame formats.

3. Frame Format

TinyOS has two 802.15.4 frame formats. The first format, the T-Frame, is for TinyOS networks which do not share their channel with other wireless networking architectures. This frame format assumes that TinyOS can use every bit of the packet and does not need to state that it is a TinyOS packet. T-Frame stands for "TinyOS Frame."
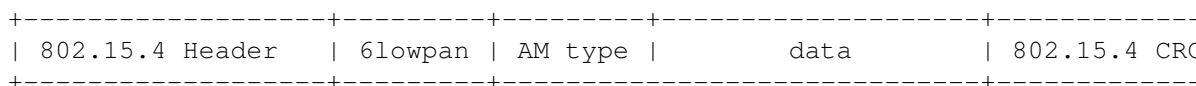
The TinyOS 802.15.4 T-frame format is as follows:

```
+------------------+--------+----------------------------+-------------
| 802.15.4 Header  | AM type |            data           | 802.15.4 CR
+------------------+--------+----------------------------+-------------
```

AM type is a single byte field which indicates which active message type the payload contains.

The second format, the I-Frame, is for TinyOS networks which share their channel with 6lowpan networks. 6lowpan reserves a series of codes for the first byte of the payload for non-6lowpan packets. In order to interoperate with 6lowpan networks, TinyOS I-Frames specify such a field. I-Frame stands for "Interoperable Frame."

The TinyOS 802.15.4 I-frame format is as follows:

```
+------------------+--------+--------+------------------+-------------
| 802.15.4 Header  | 6lowpan | AM type |        data     | 802.15.4 CR
+------------------+--------+--------+------------------+-------------
```

AM type is the same as in a T-frame. 6lowpan is the NALP code to identify this as a TinyOS packet. NALP codes must be in the range of 0-63. TinyOS uses code 63 (0x3F).

The AM type 63 is reserved for both T-Frames and I-Frames. A TinyOS program MUST NOT use it.

4. Implementation

An implementation of T-Frames and I-Frames can be found in tinyos-2.x/tos/chips/cc2420/. The components in tos/chips/cc2420/lowpan/ control which is used. By default, TinyOS 802.15.4 stacks use I-Frames, and the 'tframe' make option configures them to use T-Frames. This make option defines a symbol named `TFRAMES_ENABLED`. In the case of the CC2420 stack, this causes `CC2420.h` to define `CC2420_IFRAME_TYPE`, which adds the extra byte to the message_t header structure.

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