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

Submission Title: [Frame ID Extension]

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Re: [802.15.4 Maintenance Standing Committee.]

Abstract: [This contribution reports on the discussion of the Frame ID Extension Team.]

Purpose: [To suggest possible mechanisms for extending the 15.4 Frame ID field.]

Frame ID Field Extension

Frame ID Extension Team
Jussi Haapola (CWC)
Tim Harrington (Zebra Technologies)
Tom Herbst (Silver Spring Networks)
Ben Rolfe (Blind Creek Associates)
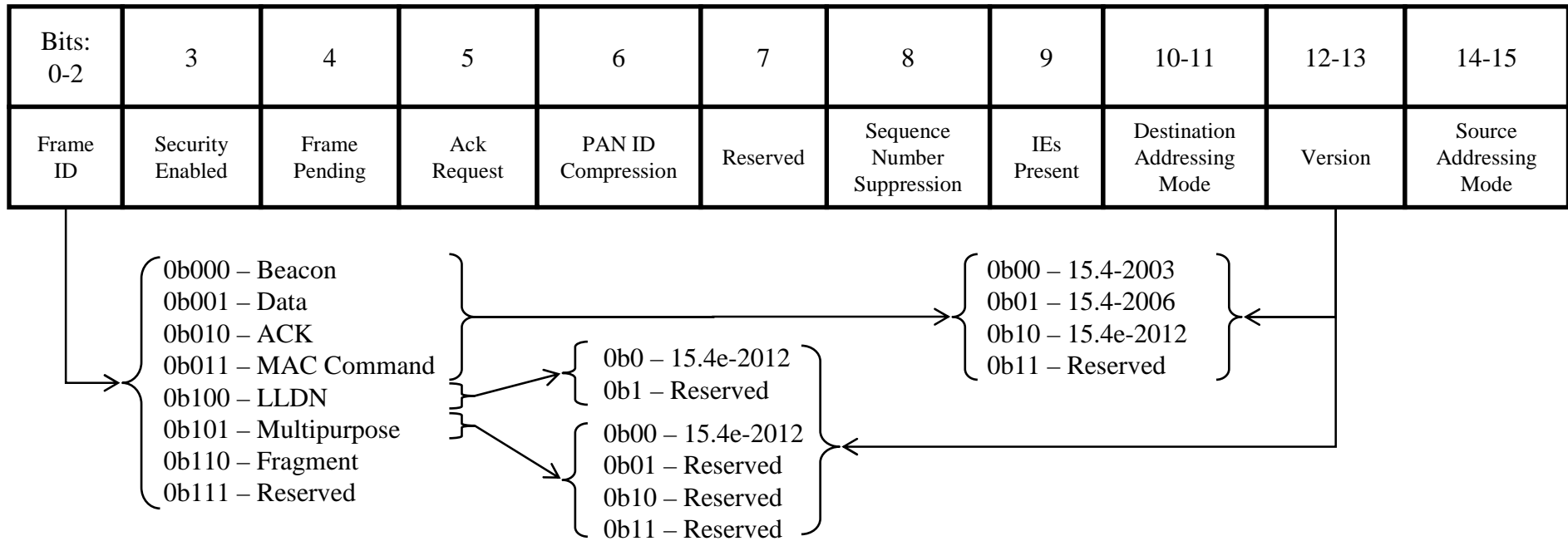Larry Taylor (DTC (UK))

Summary

- Hawaii SC-Main meeting formed 3 teams to:
  - Suggest possible mechanisms for Frame ID extension
  - Suggest management method for 15.4 resource identifiers
  - Suggest possible mechanisms for differentiating between LTV and TLV format
- SC-M discussions had proposed:
  - Maintain backwards compatibility
  - Maintain octet alignment
  - ETSI proposed Frame ID extension
    - 3 additional bits
    - Additional bits in first octet in Data Payload field
- Task - propose a flexible, backwards compatible Frame ID extension format
  - Support for future 15.4 specifications
  - Support for managed SDO allocation

Frame ID Extension Team

Need for Frame ID Extension

- **With success comes responsibility….**
  - **802.15.4g is being widely adopted as the PHY specification for Utilities in multiple regions**
    - North America
    - Japan
    - Europe
  - PHY specifies the PHY HDR and so…
  - …when other MAC specifications are defined over 15.4g there is risk of co-located systems incompatibility
  - Frame ID defines how to interpret received data and so…
  - …Frame ID Management is an important tool to
    - Promote 15.4g & other 15.4 PHYs
    - Prevent potential market confusion
    - Support continued growth of 15.4 standards

Existing15.4e Frame Types & Frame Control Field

Figure 36

Bits: 0-2	3	4	5	6	7	8	9	10-11	12-13	14-15
Frame ID	Security Enabled	Frame Pending	Ack Request	PAN ID Compression	Reserved	Sequence Number Suppression	IEs Present	Destination Addressing Mode	Version	Source Addressing Mode

0b000 – Beacon
0b001 – Data
0b010 – ACK
0b011 – MAC Command
0b100 – LLDN
0b101 – Multipurpose
0b110 – Fragment
0b111 – Reserved

0b0 – 15.4e-2012
0b1 – Reserved

0b00 – 15.4e-2012
0b01 – Reserved
0b10 – Reserved
0b11 – Reserved

0b00 – 15.4-2003
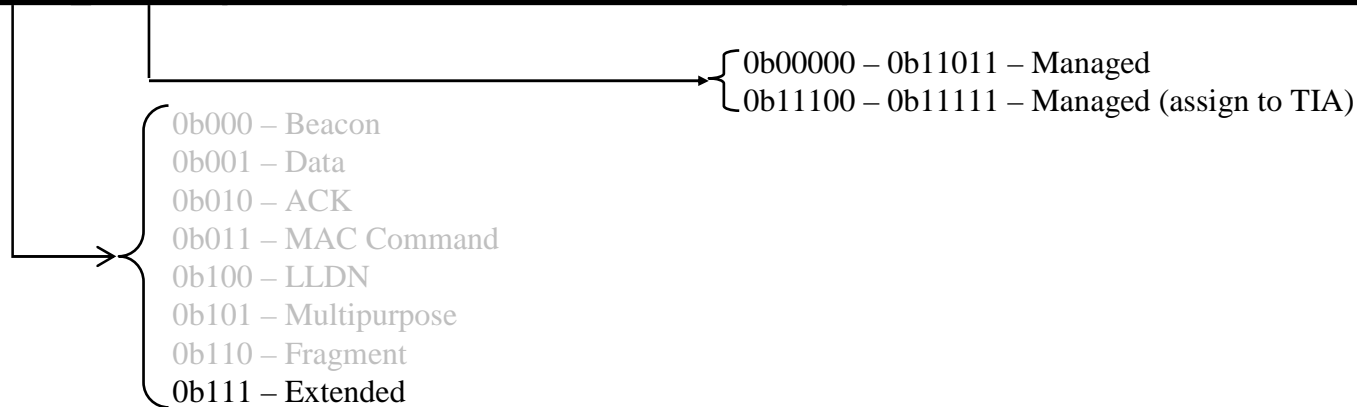0b01 – 15.4-2006
0b10 – 15.4e-2012
0b11 – Reserved

Note:
- The Version field in LLDN frames is defined as a 1-bit field
- The Version field is only present in Long Frame Control Field forms of the Multipurpose frame
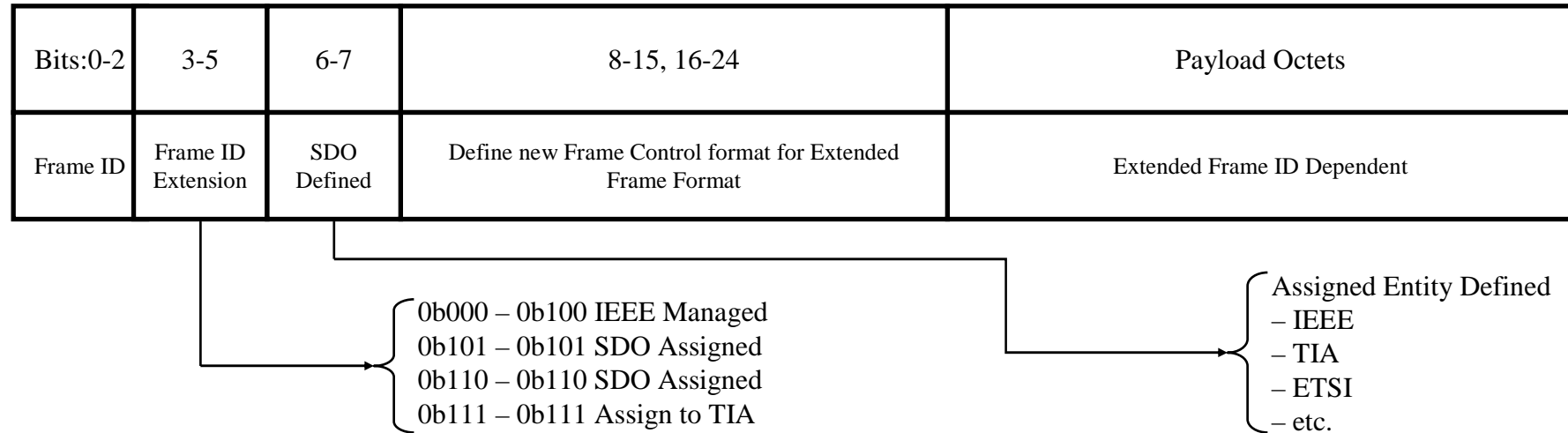- There is no Version field in the Fragment frame

New Extended Frame ID Field for Frame ID 0b111

Bits:0-2	3-7	8-15, 16-24	Payload Octets
Frame ID	Frame ID Extension	Define new Frame Control format for Extended Frame Format	Extended Frame ID Dependent

0b00000 – 0b11011 – Managed
0b11100 – 0b11111 – Managed (assign to TIA)

0b000 – Beacon
0b001 – Data
0b010 – ACK
0b011 – MAC Command
0b100 – LLDN
0b101 – Multipurpose
0b110 – Fragment
0b111 – Extended

- Remain compatible with legacy frame types and formats
- Provides large expansion space for IEEE 802.15.4 family
- Allows assignment of Frame ID(s) to external SDO(s)
- Extended Frame ID field compatible with TIA TR51
- Retains octet alignment

Example Extended Frame ID Management

Bits:0-2	3-5	6-7	8-15, 16-24	Payload Octets
Frame ID	Frame ID Extension	SDO Defined	Define new Frame Control format for Extended Frame Format	Extended Frame ID Dependent

0b000 – 0b100 IEEE Managed
0b101 – 0b101 SDO Assigned
0b110 – 0b110 SDO Assigned
0b111 – 0b111 Assign to TIA

Assigned Entity Defined
– IEEE
– TIA
– ETSI
– etc.

- Flexible Frame ID Extension mapping
  - For example 3-bit SDO ID + 2-bit SDO defined Frame IDs
  - IEEE managed 5 x 4 = 20 Frame IDs
  - 3 x SDO managed + 2 bits for use by the individual SDO
- Allows block allocation of Frame IDs to SDO
  - e.g. 2 bit SDO specific Frame ID Extension
- Any combination of block & individual IDs possible