802.11ba Draft Specification

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| --- |
| Spec Text Update for WUR Discovery |
| Date: 2018-07-10 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Rojan Chitrakar | Panasonic |  |  | Rojan.chitrakar@sg.panasonic.com |
| Guoqing Li | Apple |  |  |  |

Abstract

This submission contains spec text to be incorporated in the next draft of 802.11ba:

The content of this document is based on 11-18/0244r4 and the following motions in the SFD:

1. [Assigned D0.1] Define a type of WUR frame as WUR Discovery frame to assist the STAs to discover the BSS.

[Motion, Nov 2017, see [6] [61]]

1. [Assigned D0.3] Following information about APs’ WUR Discovery frames may be provided by the PCR :
* WUR Discovery Channel:
	+ Should be selected from a fixed subset of all possible WUR channels

[Motion, March 2018, see [8] [62]]

Revision History:

* Rev 0: Initial version of the document
* Rev 1: Revised based on feedbacks received during 18 June Teleconference call. Main changes are (Changes in green.):
	+ Renamed WUR Neighbor AP element to WUR Discovery element to reflect that the element may also carry information about itself (i.e. its own WUR Discovery channel)
	+ Moved the 2 optional WUR Discovery channel fields from the WUR Operation element to WUR Discovery element.
	+ De-coupled the advertising of WUR Discovery channels from a WUR AP’s transmission of Discovery frames (i.e. a WUR AP that does not transmit WUR Discovery frames may advertise neighbour WUR APs that do). A new MIB (dot11WURNeighborDiscoveryImplemented) is defined for the purpose.
	+ Renamed WUR Smart Scan as WUR Scanning.
	+ Added definition of WUR discovery channel
	+ Renamed WUR AP Information field to WUR AP Information Set field.
	+ Added expected WUR non-AP STA behaviour upon receiving the WUR Discovery element.
* Rev 2:
	+ Changed WUR Scanning to WUR scanning (Changes in blue).
	+ Added Straw Poll
* Rev 3:
	+ Combined the changes from 11-18/1209r1 (Changes in pink).
* Rev 4: Changed channel for WUR Discovery in the 2.4 GHz to channel 1(Changes in blue).

***Editing instructions formatted like this are intended to be copied into the TGba Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGba Editor: Editing instructions preceded by “TGba Editor” are instructions to the TGba editor to modify or insert material in the TGba draft. As a result of adopting the changes, the TGba editor will execute the instructions rather than copy them to the TGba Draft.***

**Staw Poll: Do you agree to incorporate the proposed changes provided in document 11-18/1082r2 in the next draft of TGba?**

**16Y/0N/3A**

**Motion: Move to incorporate the proposed changes provided in document 11-18/1082r4 in the next draft of TGba.**

**Mover: Rojan Chitrakar**

**Second:**

**Y/N/A**

* Definitions, acronyms, and abbreviations
* Definitions specific to IEEE 802.11

***TGba Editor: Instruction: Insert the following definition at appropriate location maintaining the order:***

**wake-up radio (WUR) discovery channel: The channel in which the WUR Discovery frames are transmitted.**

* Format of individual frame types
* Management frames
* Beacon frame format

***TGba Editor: Instruction: Insert the following row into Table 9-27 (Beacon frame body) maintaining row order:***

|  |
| --- |
| * Beacon frame body
 |
| Order | Information | Notes |
| <Last-1> | WUR Discovery | The WUR Discovery element is present if dot11WURDiscoveryImplemented is true and optionally present if dot11WURNeighborDiscoveryImplemented is true. |

* Probe Response frame format

***TGba Editor: Instruction: Insert the following row into Table 9-34 (Probe Response frame body) maintaining row order:***

|  |
| --- |
| * Probe Response frame body
 |
| Order | Information | Notes |
| <Last-1> | WUR Discovery | The WUR Discovery element is present if dot11WURDiscoveryImplemented is true and optionally present if dot11WURNeighborDiscoveryImplemented is true. |

* **Elements**
* **General**

***TGba Editor: Instruction: Insert the following new row into Table 9-77 (Element IDs) (header row shown for convenience):***

|  |
| --- |
| * **Element IDs**
 |
| **Element** | **Element ID** | **Element ID Extension**  | **Extensible** | **Fragmentable** |
| WUR Discovery | 255 | <ANA> | Yes | No |

***TGba Editor: Instruction: Insert the following new subclauses after the last subclause in 9.4.2:***

9.4.2.265 WUR Discovery element

The WUR Discovery element is used to advertise the WUR discovery channels on which WUR APs transmit WUR Discovery frames. The format of the WUR Discovery element is shown in Figure 9-xxx (WUR Discovery element format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID Extension | WUR AP Information Set |
| Octets: | 1 | 1 | 1 | variable |
| Figure 9-xxx - WUR Discovery element format |

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1 (General).

The WUR AP Information Set field contains one or more WUR AP Information subfields. The format of the WUR AP Information subfield is shown in Figure 9-xxx (WUR AP Information subfield format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | WUR Discovery Operating Class | WUR Discovery Channel | WUR AP Count | WUR AP List |
| Octets: | 1 | 1 | 1 | variable |
| Figure 9-xxx - WUR AP Information subfield format |

The WUR Discovery Operating Class field indicates the operating class in use for transmission of WUR Discovery frames by WUR APs listed in this subfield. The encoding is the same as the definition of Operating Class field in 9.4.1.22 (Operating Class and Channel field).

The WUR Discovery Channel field indicates the channel in use for transmission of WUR Discovery frames by WUR APs listed in this subfield. The encoding is the same as the definition of Channel field in 9.4.1.22 (Operating Class and Channel field).

The WUR AP Count field specifies the number of WUR AP subfields that are included in the WUR AP List field, minus one. A value of 0 indicates that one WUR AP subfield is present.

The WUR AP List field contains one or more WUR AP subfields. Each WUR AP subfield identifies one WUR AP, which may be the WUR AP transmitting this WUR Discovery element itself or may be a neighboring WUR AP. The format of the WUR AP subfield is shown in Figure 9-xxx (WUR AP subfield format).

|  |  |  |  |
| --- | --- | --- | --- |
|  | Bitmap Control | Short-SSID | BSSID |
| Octets: | 1 | 0 or 4 | 0 or 6 |
| Figure 9-xxx - WUR AP subfield format |

The Bitmap Control field indicates the presence of the BSSID field. The format of the Bitmap Control field is shown in Figure 9-xxx (Bitmap Control field format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3              B7 |
|  | TransmittingWUR AP | Short-SSID Present | BSSID Present | Reserved |
| Bits: | 1 | 1 | 1 | 5 |
| Figure 9-xxx - Bitmap Control field format |

The Transmitting WUR AP subfield is set to 1 if the WUR AP Information subfield identifies the WUR AP’s own WUR discovery channel.

The Short-SSID Present subfield is set to 1 if the Short-SSID field is present in the WUR AP subfield and is set to 0, otherwise.

The BSSID Present subfield is set to 1 if the BSSID field is present in the WUR AP subfield and is set to 0, otherwise.

The Short-SSID field contains the Short-SSID as defined in 9.4.2.171.2 (Calculating the Short-SSID).

The BSSID field contains the BSSID as defined in 9.2.4.3.4.

* WUR Discovery

***TGba Editor: Instruction*: *Change the subclause as follows (Track changes on):***

A WUR AP with dot11WURDiscoveryImplemented equal to true shall periodically transmit WUR Discovery frames on the WUR AP’s WUR discovery channel to assist WUR STAs in WUR AP discovery. The WUR AP’s WUR discovery channel is indicated in the transmitted WUR Discovery elements by the WUR Discovery Operating Class and WUR Discovery Channel fields in the WUR AP Information subfield in which the Transmitting WUR AP subfield is set to 1. discovery schannel 1 in the 2.4 GHz frequency band and channel 40, 44, 149 and 153 in the 5 GHz frequency band as specified in Table E-4 in Annex E.

A WUR non-AP STA may use its WURx to scan WUR discovery channels. Using the WURx to scan WUR discovery channels may be referred to as *WUR scanning.*

A WUR AP with dot11WURNeighborDiscoveryImplemented equal to true may transmit a WUR Discovery element in Beacon and Probe Response frames to advertise the WUR discovery channel(s) used by neighboring WUR APs. The WUR AP may include the WUR Discovery element in a Probe Response frame that is transmitted in response to a Probe Request frame that contains a WUR Capability element.

A WUR non-AP STA receiving the WUR Discovery element may use the information of the WUR discovery Channels to schedule WUR scanning for faster WUR AP Discovery. The WUR non-AP STA may limit the WUR scanning to the WUR discovery channels listed in the WUR Discovery element. The WUR non-AP STA may further optimize the WUR scanning by using the information of the WUR APs listed in the WUR Discovery element. Details of how to further optimize the WUR scanning is out of scope of this standard.

***TGba editor: Change Annex C as the following (Track changes on):***

**Annex C (normative)**

**ASN.1 encoding of the MAC and PHY MIB**

**C.3 MIB Detail**

Dot11StationConfigEntry ::= SEQUENCE

 {

 …,

 dot11FutureChannelGuidanceActivated TruthValue,

 dot11WUROptionImplemented TruthValue,

 dot11WURBeaconPeriod Unsigned32,

 dot11WURChannelSwitchActivated TruthValue,

 dot11WURDiscoveryImplemented TruthValue,

 dot11WURNeighborDiscoveryImplemented TruthValue

 }

…

dot11WURDiscoveryImplemented OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a capability variable. This attribute when true, indicates that the STA is capable of transmitting WUR Discovery frames (see 31.10 (WUR Discovery)). The capability is disabled otherwise."

DEFVAL { false }

::= { dot11StationConfigEntry <ANA>}

dot11WURNeighborDiscoveryImplemented OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a capability variable. This attribute when true, indicates that the STA is capable of transmitting WUR Discovery element to advertise the WUR discovery channels used by neighboring WUR APs (see 31.10 (WUR Discovery)). The capability is disabled otherwise."

DEFVAL { false }

::= { dot11StationConfigEntry <ANA>}

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- \* End of dot11StationConfigTable TABLE

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*