IEEE P802.11
Wireless LANs

|  |
| --- |
| **Specification Framework for TGba** |
| **Date:** 2017-04-10 |
| **Author(s):** |
| **Name** | **Affiliation** | **Address** | **Phone** | **email** |
| Po-Kai Huang | Intel | 2200 Mission College Blvd, Santa Clara, CA 95054 | +1-765-418-6733 | po-kai.huang@intel.com |

Abstract

This document provides the framework from which the draft TGba amendment will be developed. The document provides an outline of each the functional blocks that will be a part of the final amendment. The document is intended to reflect the working consensus of the group on the broad outline for the draft specification. As such it is expected to begin with minimal detail reflecting agreement on specific techniques and highlighting areas on which agreement is still required. It may also begin with an incomplete feature list with additional features added as they are justified. The document will evolve over time until it includes sufficient detail on all the functional blocks and their inter-dependencies so that work can begin on the draft amendment itself.

**Revision history**

|  |  |  |
| --- | --- | --- |
| Revision | Date | Changes |
| 0 | April 10, 2017 | Added motioned text agreed in March IEEE F2F [1] |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

# Definitions

# Abbreviations and acronyms

DFS dynamic frequency selection

OFDM orthogonal frequency division multiplexing

OOK on-off keying

WUR wake-up radio

WURx wake-up receiver

# WUR Physical Layer

## General

This section describes the functional blocks in the physical layer.

## WUR Preamble

## WUR Payload

1. Use OOK for modulation of the payload portion of the wake-up packet. The Preamble design is TBD. The operation in DFS channels is TBD. [Motion 1, March 2017, see [1] [2]]
2. The OOK waveform of wake-up packet is generated by populating TBD number of 802.11 OFDM subcarriers
* The WUR preamble part is TBD
* The operation in DFS channel is TBD

[Motion 1, March 2017, see [1] [3]]

# WUR MAC

## General

This section describes general MAC functional blocks.

1. IEEE 802.11ba shall provide mechanisms to enable re-discovery of WUR stations by AP. [Motion, March 2017, see [1] [4]]

## WUR Negotiation

1. Define WUR Action frame to enable WUR negotiation
* Note that WUR Action frame is sent through primary connectivity radio

[Motion 1, March 2017, see [1] [5]]

## WURx Schedule

1. STA can have Duty cycle mode for wake-up receiver (WURx) [Motion 2, March 2017, see [1] [5]]

## WUR Beacon

1. Define a WUR Beacon frame which can be transmitted periodically
* The WUR Beacon is transmitted to WURs.

[Motion 4, March 2017, see [1] [6]]

1. WUR Beacon interval can be indicated in WUR Mode element
* Note that WUR mode element is sent through primary connectivity radio

[Motion 2, March 2017, see [1] [7]]

1. Define a synchronization mechanism to solve the timing mismatch problems associated with WUR duty cycle mode. [Motion 1, March 2017, see [1] [8]]

## Wake-up Operation

### General

1. A STA shall not transmit WUR signal if the primary connectivity radio of the STA is turned off. [Motion 2, March 2017, see [1] [6]]
2. Use EDCA to send wake-up packets
* The EDCA parameter set for wake-up packets is TBD

[Motion 5, March 2017, see [1] [6]]

1. The AP can send a Trigger Frame in 11ax to solicit response frames from one or more STAs after sending a wake-up packet to the STA(s). [Motion 3, March 2017, see [1] [6]]

### Unicast Wake-up Operation

1. After AP sends a unicast wake-up packet to a STA, AP waits for a timeout interval
* If AP receives any transmission from the STA within the timeout interval, then the wake-up packet transmission is successful
* Otherwise, the wake-up packet transmission fails, and AP may retransmit the wake-up packet to the STA

[Motion 3, March 2017, see [1] [5]]

1. A STA should send a response frame to the AP using primary connectivity radio after receiving a unicast wake-up packet. [Motion 1, March 2017, see [1] [6]]

### Multicast Wake-up Operation

1. 802.11ba spec shall define a mechanism to wake up multiple WUR mode STAs (e.g., multi-user wake-up frame). [Motion 2, March 2017, see [1] [9]]
2. After the transmission of broadcast wake-up frame, the AP can transmit broadcast/multicast frames through primary connectivity radio after the preparation period. [Motion 3, March 2017, see [1] [10]]

## WUR Frame formats

1. The identifier of transmitter and/or receiver in a wake-up frame shall not be the MAC address. [Motion 1, March 2017, see [1] [10]]

# References

|  |  |
| --- | --- |
| [1]  | Leif Wilhelmsson (Ericsson), “17/526r0 Meeting Minutes March 2017”.  |
| [2]  | Shahrnaz Azizi (Intel Corp), “17/368r1 Motion for High Level PHY Design”.  |
| [3]  | Jia Jia (Huawei Technologies), “17/373r2 Performance Investigations on Single-carrier and Multiple-carrier-based WUR”.  |
| [4]  | Jianhan Liu (Mediatek Inc.) , “17/27r4 Re-Discovery Problems in WUR WLAN”.  |
| [5]  | Po-Kai Huang (Intel), “17/342r4 WUR Negotiation and Acknowledgement Procedure Follow up”.  |
| [6]  | Jason Yuchen Guo (Huawei Technologies), “17/0354r2 Initial thoughts on MAC procedures”.  |
| [7]  | Po-Kai Huang (Intel), “17/343r3 WUR Beacon”.  |
| [8]  | Tianyu Wu (Mediatek), “17/371r4 WUR duty cycle mode and timing synchronization follow up”.  |
| [9]  | Jeongki Kim(LG Electronics) , “17/54r3 WUR MAC issus”.  |
| [10]  | Liwen Chu (Marvell), “17/124r4 WUR MAC and Wakeup Frame”.  |