### IEEE P802.11Wireless LANs

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| 11ba D1.1 MAC Comment Resolution for Miscellaneous Topic Part II |
| Date: 2019-01-08 |
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Abstract

This submission proposes resolutions for comments of TGba Draft D1.1 with the following CIDs:

52, 345, 425, 424, 346, 481, 508, 55, 869, 473

Revisions:

* Rev 0: Initial version of the document.

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGba D1.1 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGba D1.1 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 existing 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.***

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| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 424 | Jarkko Kneckt | 19.13 | 3.2 | The WUR (radio) and WURx (receiver) definitions are not used in the standard. The WUR AP and WUR non AP STA terms are used in many locations in the standard, but not defined. | Please introduce WUR non AP STA and WUR AP and their possibilities to transmit and receive WUR transmissions. Please delete WUR and WURx definitions or use them to define AP and non-AP STA. | Revised –Agree in principle with the commenter. WUR is basically combined with other terms for a specific context. As a result, we can remove WUR definition. We provide the definition of WUR AP and WUR non-AP STA since it is indeed used heavily in the spec. TGba editor, please make changes as shown in doc 11-19/0029r0 under all headings that include CID 424. |
| 346 | James Lepp | 19.13 | 3.2 | My understanding was that WUR PPDU could be transmitted by any OFDMA 11ax HE radio, and the WUR radio was specific to the receiver only. | A companion radio to a primary connectivity radio with the capability to receive WUR PPDU. | Revised - Agree in principle with the commenter. We provide the definition of WUR AP and WUR non-AP STA since the capability is defined for WUR AP and WUR non-AP STA through the spec. TGba editor, please make changes as shown in doc 11-19/0029r0 under all headings that include CID 424. |
| 52 | Alfred Asterjadhi | 19.10 | 3.2 | non-HT PPDUs are by default 20 MHz. Remove 20 MHz. Also, I am thinking any primary radio can use the WUR as a companion radio. I.e., S1G, TVHT, DMG, EDMG etc. In this case simply say that the PCR is a radio with the capability to transmit and receive a non-WUR PPDU. | As in comment. | Revised – Agree in principle with the commenter. We remove PCR and define WUR AP and WUR non-AP STA directly, which is heavily used through the spec. We also remove the description of PCR component since any frame that Related to WUR will have WUR prefix.TGba editor, please make changes as shown in doc 11-19/0029r0 under all headings that include CID 52 and 424. |
| 345 | James Lepp | 19.09 | 3.2 | Why is this specifically non-HT? | A radio with the capability to transmit and receive 20 MHz PPDU | Revised – Agree in principle with the commenter. We remove PCR and define WUR AP and WUR non-AP STA directly, which is heavily used through the spec. We also remove the description of PCR component since any frame that is not WUR PPDU is transmitted using all the existing format. TGba editor, please make changes as shown in doc 11-19/0029r0 under all headings that include CID 52 and 424. |
| 425 | Jarkko Kneckt | 19.10 | 3.2 | Primary connectivity radio should be allowed to operate in larger than 20 MHz BW. | Change to "... and receive at least 20 MHz..." | Revised – Agree in principle with the commenter. We remove PCR and define WUR AP and WUR non-AP STA directly, which is heavily used through the spec. We also remove the description of PCR component since any frame that is not WUR PPDU is transmitted using all the existing format. TGba editor, please make changes as shown in doc 11-19/0029r0 under all headings that include CID 52 and 424. |
| 55 | Alfred Asterjadhi | 19.44 | 3.2 | Do we need to define what WURx is? If yes, then also define WUR transmit as well. But again, I think we don't need to define a WURx | As in comment. | Revised – Agree in principle with the commenter. We remove WURx and define WUR AP and WUR non-AP STA directly, which is heavily used through the spec. TGba editor, please make changes as shown in doc 11-19/0029r0 under all headings that include CID 55. |
| 508 | Lei Huang | 19.44 | 3.2 | WUR and WURx are defined. However, it is unclear about the relationship between WUR and WURx. | redefine the WURx to "wake-up radio (WUR) which has the capability to receive WUR PPDU only" | Revised - Agree in principle with the commenter.We remove WURx and WUR. Further, we define WUR AP and WUR non-AP STA directly, which is heavily used through the spec. TGba editor, please make changes as shown in doc 11-19/0029r0 under all headings that include CID 55 and 424. |
| 474 | Joseph Levy | 19.13 | 3.2 | WUR is defined as a companion radio with the capability to transmit or receive WUR PPDUs.  I am confused by this definition. I thought WUR is a capability that an 802.11 device may have and that there are two basic types of 802.11 devices with WUR capabilites:1) a device containing at least one non-AP STA and a WURx that can negotiate a WUR configuration with a WUR capable AP and can receive WRU PPDUs; and 2)  a device containing an AP that is capable of transmitting WUR PPDUs and can negotiate with "device type 1)" a WUR configuration. Also a radio is typically used in the specification to describe a device that can both transmit and receive signals.  My understanding is that the WUR "radio" is a receiver, a receive only device, when collocated with an 802.11 non-AP STA and is a transmitter, transmit only device, when collocated with an 802.11 AP.  Both of these device types (containing a non-AP STA or an  AP) communicate to establish WUR configuration via standard 802.11 STA to STA frame exchange, | Delete the current wake-up radio (WUR) definition.  The abbreviation/acronym is adequate. | Revised - Agree in principle with the commenter.We remove WURx and WUR. Further, we define WUR AP and WUR non-AP STA directly to describe the capability, which is heavily used through the spec. TGba editor, please make changes as shown in doc 11-19/0029r0 under all headings that include CID 55 and 424. |
| 869 | Robert Stacey | 19.10 | 3.2 | The operations performed by the PCR and the operations performed by the WUR are not clear. These need to be spelled out in Clause 4 as well as in the intro sections of Clause 31 and 32. This is fundmanental to the readers understanding and can't be hidden in the definitions clause. | Contrary to the statements here, I would assume that the PCR not only transmits and recieves non-HT PPDUs, but also transmits the WUR PPDU. I would assume that the WUR is only capable of receiving WUR PPDUs. The PCR and WUR are conceptual components that are not necessarily tied to the OFDM and WUR PHYs. The transmit aspects of the WUR PHY can be part of the PCR (as are the transmit and receive aspects of the OFDM PHY) while the receive aspects of the WUR PHY are part of the WUR. This could be spelled out in the intro to the WUR PHY specification. If PCR and WUR terms are tied to the waveforms transmitted and received, then the terms can't be used to explain the different operating modes. To me the terms are much more useful explaining operating modes. The terms AP and non-AP STA are also orthogonal to PCR and WUR. A non-AP STA can transmit WUR PPDUs (using its PCR) and an AP can receive them (using its WUR). | Revised - Agree in principle with the commenter.We remove definitions of WURx, PCR and WUR. Further, we define WUR AP and WUR non-AP STA directly, which is heavily used through the spec. TGba editor, please make changes as shown in doc 11-19/0029r0 under all headings that include CID 55, 52, and 424. |
| 473 | Joseph Levy | 19.10 | 3.2 | The definition of PCR seems to be very vague. Isn't a PCR an 802.11 STA? Is the PCR a specific non-AP STA that has negotiated with an associated WUR AP to have a WUR configuration and hence a WUR ID associated with it? If so it should be defined as such. If not how is it different from a non-AP STA? I am unaware of any functionality of a PCR that is not currently in a non-AP STA, I don't think there shouldn't be two names for the same entity. | Delete primary connectivity radio (PCR) from the specification. | Revised – Agree in principle with the commenter. We remove PCR and define WUR AP and WUR non-AP STA directly, which is heavily used through the spec. We also remove the description of PCR component since any frame that Related to WUR will have WUR prefix.TGba editor, please make changes as shown in doc 11-19/0029r0 under all headings that include CID 52. |
| 481 | Joseph Levy | 19.44 | 3.2 | It is unnecessary to state that a WURx is a companion receiver to a PCR. A WURx is a receiver capable of receiving WRU PPDUs. If more description is necessary, then it should be stated that a WUR is contained in a device which contains at least 1 non-AP STA. Simplify the definition to what is essential. | Replace the current definition for WURx with:wake-up receiver (WURx)l: A receiver with the capability to receive WUR PPDUs. | Revised – Agree in principle with the commenter. We remove WURx and define WUR AP and WUR non-AP STA directly, which is heavily used through the spec. TGba editor, please make changes as shown in doc 11-19/0029r0 under all headings that include CID 55. |

**Discussion:** *None.*

**Propose:** Revised for CID 52, 424, 55 per discussion and editing instructions in 11-19/0029r0.

***TGba editor: Change “WURx awake state” to “WUR awake state” through the spec(#55)***

***TGba editor: Change “WURx doze state” to “WUR doze state” through the spec(#55)***

***TGba editor: Change “the WURx of the WUR non-AP STA” to “the WUR non-AP STA” through the spec(#55)***

***TGba editor: Change 3.2 Definitions specific to IEEE Std 802.11 as follows: (Track change on)***

3.2 Definitions specific to IEEE Std 802.11

***Insert the following definitions maintaining alphabetical order:***

 (#52)

(#424)

**wake-up radio (WUR) access point (AP):** An APthat is a non-HT, HT, VHT, or HE AP that is capable of transmitting a WUR physical layer (PHY) protocol data unit (PPDU) and supports the WUR mechanism as defined in 4.3.15a Wake-up radio (WUR) STA.(#424)

**wake-up radio (WUR) channel:** A channel in which a WUR non-AP STA in the WUR awake state listens.(#55)

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

**wake-up radio (WUR) mode:** A negotiation status between a WUR AP and a WUR non-AP STA such that the WUR non-AP STA alternates between the WUR awake state and the WUR doze state when the PCR component of the WUR non-AP STA is in the doze state. (#984, #55)

**wake-up radio (WUR) non-access-point (non-AP) station (STA):** A non-AP STA is a non-HT, HT, VHT, or HE non-AP STA that is capable of receiving a WUR physical layer (PHY) protocol data unit (PPDU) and is not capable of transmitting a WUR physical layer (PHY) protocol data unit (PPDU) and supports the WUR mechanism as defined in 4.3.15a Wake-up radio (WUR) STA.(#424)

**wake-up radio (WUR) primary channel:** The common channel of operation for all WUR stations (STAs) in which the WUR beacons are transmitted.

**wake-up radio (WUR) primary 40 MHz channel:** The 40 MHz channel that is used to transmit 40 MHz WUR Frequency Division Multiple Access (FDMA) physical layer (PHY) protocol data units (PPDUs).

**wake-up radio (WUR) primary 80 MHz channel:** The 80 MHz channel that is used to transmit 80 MHz WUR Frequency Division Multiple Access (FDMA) physical layer (PHY) protocol data units (PPDUs).

**wake-up radio (WUR) secondary channel:** The 20 MHz channel adjacent to the WUR primary channel that together form the 40 MHz channel.

**wake-up radio (WUR) secondary 40 MHz channel:** The 40 MHz channel adjacent to the WUR primary 40 MHz channel that together form the 80 MHz channel.

**wake-up radio (WUR) physical layer (PHY) protocol data unit (PPDU):** A PPDU transmitted with the TXVECTOR parameter FORMAT equal to WUR.

(#55)

***TGba editor: Change 3.4 Abbreviations and acronyms specific to IEEE Std 802.11 as follows: (Track change on)***

* Abbreviations and acronyms

***Insert the following acronym definitions (maintaining alphabetical order):***

HDR high data rate

FL fixed-length

LDR low data rate

MC-OOK multicarrier on-off keying

OOK on-off keying

(#52)PPN partial packet number (#1025)

SGID starting group identifier

TWBTT target WUR beacon transmission time

VL variable-length

WUR wake-up radio

WUR ID wake-up radio identifier (#787, #459)

(#55)

***TGba editor: Change 9.4.2.273 WUR Capabilities element as follows: (Track change on)***

9.4.2.273 WUR Capabilities element(…existing texts ….)

The format of the WUR Capabilities Information field is defined in Figure 9-751c (WUR Capabilities Information field format).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0      B7 | B8 | B9      B10 | B11 | B12 | B13 | B14 B15 |
|  | (#52)Transition Delay | Frame Body Support | Group IDs Support | Protection Support | 20 MHz WUR PPDU with HDR Support | WUR Channel Switching Support | Reserved |
| BBits:  | 8 | 1 | 2 | 1 | 1 | 1 | 2 |
| * WUR Capabilities Information field format
 |

The subfields of the WUR Capabilities Information field is defined in Table 9-318a (Subfields of the WUR Capabilities Information field).

|  |
| --- |
| * Subfields of the WUR Capabilities Information field
 |
| Subfield | Definition | Encoding |
| Transition Delay(#52) | Indicates the maximum time that the non-AP STA requires to transition (#52)from the doze state to the awake state.  | The indicated value is equal to 256 × (value of the field plus 1) µs.Reserved for a WUR AP. |
| Frame Body Support | Indicates support for the reception of VL WUR frames. | Set to 1 to indicate support for the reception of VL WUR frames. Set to 0 otherwise.Reserved for a WUR AP. |

(…existing texts ….)

***TGba editor: Change 9.10.3.2 WUR Wake-up frame format as follows: (Track change on)***

9.10.3.2 WUR Wake-up frame format

(…existing texts ….)

The Counter subfield:

* Contains the BSS Update Counter field if the WUR Wake-up frame is broadcast addressed. The BSS Update Counter field is defined as an unsigned integer that increments when a critical update to the (#52)BSS parameters has occurred (see 31.7.2 (WUR AP Operation)), or (#29,#30, #637)
* Contains the 4 LSBs of the PPN (see 31.8 (Protected WUR frames)) if the WUR Wake-up frame is not broadcast addressed, the Protected subfield in the Frame Control field is 1, and the most recently sent WUR Operation element has the Common IPN subfield equal to 0, or (#294, #389)
* Is reserved otherwise.

(…existing texts ….)

***TGba editor: Change 9.10.3.3 WUR Discovery frame format as follows: (Track change on)***

9.10.3.3 WUR Discovery frame format

(…existing texts ….)

The format of the Frame Body field is as defined in Figure 9-963g ( Frame Body Field format of WUR Discovery frame).

|  |  |  |
| --- | --- | --- |
|  | B0                     B15 | B16                                 B31 |
|  | Compressed SSID | (#52)Operating Channel |
| Bits: | 16 | 16 |
| * Frame Body Field format of WUR Discovery frame
 |

The Compressed SSID field contains 16 LSBs of the Short-SSID as defined in 9.4.2.170.3 (Calculating the Short-SSID).

The (#52)Operating Channel field contains operating class and channel information as defined in 9.4.1.22 (Operating Class and Channel field).The format of the Frame Body field is as defined in Figure 9-747a (Frame Body field format of WUR Discovery frame).The Compressed SSID field contains 16 LSBs of the Short-SSID as defined in 9.4.2.171.2. The PCR Operating Channel field contains operating class and channel information as defined in 9.4.1.22.

(…existing texts ….)

***TGba editor: Delete “The PCR components of” and “The PCR component of” through the spec(#52)***

***TGba editor: Change 31.6.2 WUR Mode Setup as follows: (Track change on)***

**31.6.2 WUR Mode Setup**

To use the WUR power management service, a WUR non-AP STA exchanges(#52) WUR Mode Setup frame with a WUR AP within the same infrastructure BSS and the detail is defined in Table 31-1 (WUR Mode Setup frame exchange - Request and Response) and Table 31-2 (WUR Mode Setup/Teardown frame transmission).

(…existing text…)

After a WUR non-AP STA has negotiated WUR power management service with a WUR AP, the WUR non-AP STA may switch from WUR mode to WUR mode suspend or switch from WUR mode suspend to WUR mode by initiating and completing(#52) a successful frame exchange, which includes a WUR Mode Setup frame with Action Type field of the carrying WUR Mode element set to “Enter WUR Mode Suspend” or “Enter WUR Mode” from the WUR non-AP STA and an Ack frame from the WUR AP.

(…existing text…)

After a WUR non-AP STA has negotiated WUR power management service with a WUR AP, the WUR AP may update the WUR parameters with the WUR non-AP STA in WUR mode or WUR mode suspend by initiating and completing(#52) a successful frame exchange, which includes an unsolic­ited WUR Mode Setup frame with the Action Type in WUR Mode element set to “Enter WUR Mode Response” or “Enter WUR Mode Suspend Response” from the WUR AP and an Ack frame from the WUR non-AP STA. The WUR non-AP STA that sent the ACK frame in response to the unsolicited WUR Mode Setup frame shall update the WUR parameters to the parameters included in the received WUR Mode Setup frame. The WUR non-AP STA may teardown WUR operation as described below if the WUR non-AP STA doesn’t intend to use the parameters.

After a WUR non-AP STA negotiates WUR power management service with a WUR AP, the WUR non-AP STA may tear down WUR power management service by initiating and completing(#52) a successful frame exchange, which includes a WUR Mode Teardown frame from the WUR non-AP STA and an Ack frame from the WUR AP.

After a WUR non-AP STA negotiates WUR power management service with a WUR AP, the WUR AP may tear down WUR power management service by initiating and completing(#52) a suc­cessful frame exchange, which includes a WUR Mode Teardown frame from the WUR AP and an Ack frame from the WUR non-AP STA.

***TGba editor: Change 31.6.3 WUR non-AP STA operation as follows: (Track change on)***

**31.6.3 WUR non-AP STA operation**

A WUR non-AP STA can be in one of two WUR power states(#55):

—WUR Awake: the WUR non-AP STA is able to receive WUR frame. (#55)

—WUR Doze: the WUR non-AP STA is not able to receive WUR frame. (#55)

(#729, #123)

NOTE 1—A(#52) WUR non-AP STA can be in the awake or doze state as defined in 11.2.1 (General).

NOTE 2—A(#52) WUR non-AP STA can be in active mode or power save (PS) mode as defined in 11.2.3.2 (Non-AP STA power management modes).

If a WUR non-AP STA is in WUR mode, then:

* T(#55)he WUR non-AP STA shall be in the WUR(#55) awake state during the WUR duty cycle schedule agreed between WUR AP and WUR non-AP STA if (#52)the WUR non-AP STA is in the doze state. the(#55) WUR non-AP STA may be in the WUR(#55) doze state outside the WUR duty cycle schedule agreed between the WUR AP and the WUR non-AP STA if (#52)the WUR non-AP STA is in the doze state. (#889)
* the(#55) WUR non-AP STA may be in the WUR(#55) doze state after the WUR non-AP STA completes(#52) a successful frame exchange with the WUR AP, which informs the WUR AP that (#52)the WUR non-AP STA is in the awake state. (#1133)
* The WUR non-AP STA may not listen for Beacon frame if (#52)the WUR non-AP STA is in PS mode (see 11.2.3.1 (General)).
* The existing negotiated service period between WUR AP and WUR non-AP STA for the WUR non-AP STA’s(#52) schedule is suspended:
	+ the(#52) WUR non-AP STA may not be in the awake state during the negotiated service period of PCR schedule between the WUR AP and the WUR non-AP STA
	+ the(#52) WUR non-AP STA shall be in the awake state at the next service period following the existing PS operation (e.g., individual TWT) agreed between the WUR AP and the WUR non-AP STA after the WUR non-AP STA receives a WUR Wake-up frame addressed to itself from the WUR AP with an indication of individually addressed BU(s) plus the(#52) transition delay indicated by the WUR non-AP STA in the WUR Capabilities element. (#430, #730, #431)
	+ The parameters of the negotiated service period for the WUR non-AP STA’s (#52) schedule between the WUR AP and the WUR non-AP STA are maintained by the WUR non-AP STA.
	+ The WUR non-AP STA shall follow the wake-up operation defined in 31.7 (Wake-up Operation). (#126)

NOTE 1—The WUR duty cycle schedule agreed between WUR AP and WUR non-AP STA can be that the WUR non-AP STA is always in the WUR awake state. (#127, #55)

NOTE 2—Examples of the negotiated service period between WUR AP and WUR non-AP STA for the WUR non-AP STA’s schedule include individual TWT and schedule for WNM sleep mode. (#431)

NOTE 3 –A(#52) WUR non-AP STA can be in Active mode or PS mode when the WUR non-AP STA is in WUR mode or WUR mode suspend. A(#52) WUR non-AP STA can be in the awake state or the doze state when the WUR non-AP STA is in WUR mode or WUR mode suspend.(#632) NOTE 4 – The WUR power state of (#55)a WUR non-AP STA is implementation specific if (#52)the WUR non-AP STA is in the awake state. (#414)

NOTE 4 – The WUR power state (#55)of a WUR non-AP STA is implementation specific if (#52)the WUR non-AP STA is in the awake state. (#414)

If a WUR non-AP STA is in WUR mode suspend, then:

* the WUR non-AP STA may be in the WUR doze state. (#55)
* The negotiated WUR parameters between the WUR AP and the WUR non-AP STA are maintained by the WUR non-AP STA.

NOTE—If a WUR non-AP STA is in WUR mode suspend, the existing negotiated service period between WUR AP and WUR non-AP STA for the WUR non-AP STA’s (#52) schedule is active. (#128)

***TGba editor: Change 31.6.4 WUR AP operation as follows: (Track change on)***

**31.6.4 WUR AP operation**

For each WUR non-AP STA that requests WUR power management service from an associated WUR AP, the WUR AP shall maintain a WUR status that indicates whether the WUR non-AP STA is in WUR mode or WUR mode suspend. (#536, #325) When a WUR non-AP STA is in WUR mode, then:

* The WUR AP may send a WUR Wake-up frame to the WUR non-AP STA in the WUR duty cycle schedule agreed between the WUR AP and the WUR non-AP STA if (#52)the WUR non-AP STA is in the doze state. (#1157)
* The existing negotiated service period between WUR AP and WUR non-AP STA for the WUR non-AP STA’s (#52)schedule is suspended:
	+ The WUR AP expects that (#52)the WUR non-AP STA is in the awake state at the next service period following the existing PS operation (e.g., individual TWT) agreed between the WUR AP and the WUR non-AP STA after the WUR AP transmits a WUR Wake-up frame addressed to the WUR non-AP STA with an indication of individually addressed buffered BU(s) plus the (#52)transition delay indicated by the WUR non-AP STA in the WUR Capabilities elements. (#430, #978)
	+ The parameters of the negotiated service period for the WUR non-AP STA’s (#52) schedule between the WUR AP and the WUR non-AP STA are maintained by the WUR AP.
* The WUR AP shall follow the wake-up operation defined in 31.7 (Wake-up Operation).

When a WUR non-AP STA is in WUR mode suspend, then:

* The negotiated WUR parameters between the WUR AP and the WUR non-AP STA are maintained by the WUR AP.

***TGba editor: Change 31.7 Wake-up Operation as follows: (Track change on)***

**31.7 Wake-up Operation**

**31.7.1 General**

An WUR AP may send a WUR Wake-up frame to an associated WUR non-AP STA as described in 31.6.4 (WUR AP operation) to notify the WUR non-AP STA that the WUR AP intends to have (#52)operation with the WUR non-AP STA as described in 31.7.2 (WUR AP Operation) and 31.7.3 (WUR non-AP STA Operation). (#866)

A WUR AP shall not send a WUR Wake-up frame to associated WUR non-AP STA(s) with data rate that is not supported by the WUR non-AP STA(s). (#829)

If the WUR AP and the WUR non-AP STA support traffic filtering service (TFS) as specified in 11.22.12 (TFS Procedures), then the WUR AP and the WUR non-AP STA may reuse existing traffic filter sets to control the WUR Wake-up frame transmission as described in 31.7.2 (WUR AP Operation).

The WUR AP may transmit a WUR Wake-up frame to an associated WUR non-AP STA to indicate that individually addressed BU(s) are available for the non-AP STA(#52). The WUR Wake-up frame shall satisfy any of the conditions below:

—The ID field of the WUR Wake-up frame contains a WUR ID that identifies the WUR non-AP STA.

—The ID field of the WUR Wake-up frame contains a group ID that identifies a group of WUR non-AP STAs that include the WUR non-AP STA.

—The WUR Wake-up frame has a list of identifiers in the Frame Body field where one of the identifi­ers identifies the WUR non-AP STA (see 9.10.3.2 (WUR Wake-up frame format)).

(#866, #130, #417, #732)

The WUR AP may transmit a broadcast WUR wake-up frame (see 31.3.2 (Transmitter ID)) with the Group Addressed BU subfield of the Misc subfield set to 1 to indicate that group addressed BU(s) are available for all the associated WUR non-AP STA(s)(#52). (#1186, #733, #866, #132)

The WUR AP may transmit a broadcast WUR Wake-up frame to associated WUR non-AP STA(s) to indicate that a critical update to the (#52) BSS parameters has occurred for the associated WUR non-AP STA (see 31.7.2 (WUR AP Operation)). The critical update is indicated in the Counter subfield of the Type Dependent Control field. (#866, #1246, #37, #1135)

**31.7.2 WUR AP Operation**

A WUR AP that transmits a WUR Wake-up frame to a WUR non-AP STA that indicates the availability of individually addressed BU(s) (#52)shall follow the existing (#52)operation, which is any PS opera­tion that the WUR AP and the WUR non-AP STA has agreed to use (e.g., baseline active mode and PS mode change, U-APSD, TWT, etc.), to deliver individually addressed BU(s) to the WUR non-AP STA. Individu­ally addressed BU(s) are delivered at specific times, which are provided along with the agreed PS operation.(#332)

When the WUR AP schedules a transmission that is not a WUR PPDU to the WUR non-AP STA(#52), the WUR AP shall ensure that either of the conditions below is met:

* The(#52) transition delay indicated by the WUR non-AP STA in the WUR Capabilities elements fol­lowing the most recent transmitted WUR Wake-up frame intended to the WUR non-AP STA has expired.
* The WUR non-AP STA has indicated that it is in the awake state by transmitting a frame (#52)to the WUR AP.

(#133)

NOTE—The frames scheduled by the WUR AP to be delivered (#52)are not limited to individually addressed BU(s) only.

A WUR AP that transmits a broadcast WUR Wake-up frame to a WUR non-AP STA that indicates the availability of group addressed BU(s) (#52)shall follow existing (#52)operation, which is any PS operation that the WUR AP and the WUR non-AP STA has agreed to use (e.g., DTIM, FMS, etc.), to deliver group addressed BU(s) to the WUR non-AP STA. Group addressed BU(s) are delivered at specific times, which are provided along with the agreed PS operation. (#1186)

When the WUR AP schedules a transmission of group addressed BU(s) (#52)to the WUR non-AP STA(s), the WUR AP shall ensure that the following condition is met:

* The maximum (#52)transition delay following the most recently transmitted WUR Wake-up frame indicating buffered group addressed BU(s) (#52)has expired. The maximum (#52)transition delay is defined as the maximum value of the(#52)transition delay values in the WUR Capabilities ele­ments indicated by all the WUR non-AP STAs that are not in the awake state, have negotiated WUR power management service with the WUR AP, and are in WUR mode.

(#891, #735)

(..existing texts…)

After a WUR AP sends a WUR Wake-up frame with the ID field set to a WUR ID that identifies a WUR non-AP STA, the WUR AP waits for a timeout interval that is larger than the (#52)transition delay indicated by the WUR non-AP STA in the WUR Capabilities elements:

* If the WUR AP receives any transmission from the WUR non-AP STA within the timeout interval, then the WUR Wake-up frame transmission is successful.
* Otherwise, the WUR Wake-up frame transmission fails, and the WUR AP may retransmit the WUR Wake-up frame to the WUR non-AP STA.

(#737, #130)

(..existing texts…)

**31.7.3 WUR non-AP STA Operation**

A WUR non-AP STA that receives a WUR Wake-up frame addressed to itself with an indication of individ­ually addressed BU(s) (see 31.7.1 (General)) shall follow existing (#52)operation, which is any PS operation the associated WUR AP and the WUR the non-AP STA has agreed to use (e.g., baseline PM change, U-APSD, TWT, etc.), to retrieve individually addressed BU(s) and follow the wake up timing information (e.g., the next service period) that is provided along with the agreed PS operation. In this case, (#52)the STA may be in the doze state until the time indicated by the wake up timing information (e.g., the next service period) that is provided along with the agreed PS operation.(#437, #738, #465)

NOTE—For example, rule b), c), and d) in 11.2.3.7 (Receive operation for STAs in PS mode) describes one operation for a WUR non-AP STA to retrieve individually addressed BU(s) using PS-Poll or U-APSD.

A WUR non-AP STA that receives a WUR Wake-up frame with an indication of buffered group addressed BU(s) (see 31.7.1 (General)) shall follow existing (#52)operation, which is any PS operation that the WUR AP and the WUR non-AP STA has agreed to use (e.g., DTIM, FMS, etc.) to receive group addressed BU(s) and follow the wake up timing information (e.g., the next DTIM TBTT) that is provided along with the agreed PS operation. In this case, (#52)the STA may be in the doze state until the time indicated by the wake up timing information (e.g., the next DTIM TBTT) that is provided along with the agreed PS operation.(#438, #739)

NOTE—For example, rule e) in 11.2.3.7 (Receive operation for STAs in PS mode) describes one operation for a WUR non-AP STA to receive group addressed frame.

A WUR non-AP STA shall maintain a BSS Parameter Update Counter. The WUR non-AP STA shall update the value of its BSS Parameter Update Counter to the value of the Counter subfield contained in the latest WUR Operation element received from the WUR AP with which it is associated. A WUR non-AP STA that receives the Counter subfield of the Type Dependent Control field in a broadcast WUR Wake-up frame that contains a value that is different from the value of its BSS Parameter Update Counter shall follow the proce­dure defined in 11.2.3.15 (TIM Broadcast) to attempt to receive the Beacon information. (#141, #1147, #740)

A WUR non-AP STA should send a frame to the associated WUR AP (#52)after receiv­ing a WUR Wake-up frame with ID field set to the WUR ID that identifies the WUR non-AP STA. (#142, #1077)

***TGba editor: Change 31.8 Protected WUR frames as follows: (Track change on)***

**31.8 Protected WUR frames**

(..existing texts…)

The WUR AP shall protect the WUR frame using the BIP protocol as defined in 12.5.4 (Broadcast/multicast integrity protocol (BIP)) except as defined below:

* The WUR AP shall use BIP-CMAC-128 to provide data integrity and replay protection and shall use an integrity key(#52) to compute the MIC of the WUR frame.

(..existing texts…)

***TGba editor: Change 31.10 WUR Discovery as follows: (Track change on)***

**31.10 WUR Discovery**

(..existing texts…)

A WUR non-AP STA may scan WUR discovery channels for WUR Discovery frames. Scanning WUR discovery channels is known as *WUR scanning.*(#151, #55)

(..existing texts…)

***TGba editor: Change 32.2.12.5 CCA sensitivity as follows: (Track change on)***

32.2.12.5 CCA sensitivity

The CCA sensitivity shall follow each CCA sensitivity specification for the attached non-WUR(#52) PHY as defined in 17.3.10.6 (CCA requirements) for OFDM, 19.3.19.5 (CCA sensitivity) for HT, 21.3.18.5 (CCA sensitivity) for VHT and 28.3.19.6 (CCA sensitivity) for HE depending on the Capabilities Element of PCR.(#471)