IEEE P802.11
Wireless LANs

|  |
| --- |
| Proposed text for clause 6 and other updates |
| Date: October 15, 2020 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Abhishek Patil | Qualcomm Inc. |  |  | appatil@qti.qualcomm.com |
| George Cherian |  |  |  |

 Abstract

This submission proposes spec text related to the eBCS UL use case for clause 6 and other clauses.

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Minor updates based on offline feedback from Antonio
* Rev 2: Live updates made when the doc was presented on 10/20 TGbc telco
* Rev 3: Additional updates based on offline feedback from Antonio and Morioka-san
* Rev 4: Highlighted changes between r2 to r3 so that they are easier spot
	+ Note: deletions are not marked
* Rev 5: Live updates when the doc was presented on 10/27
	+ Changes highlighted
		1. **Enhanced Broadcast Service**

Enhanced Broadcast Service (eBCS) enables efficient local distribution of information. eBCS provides enhanced transmission and reception of broadcast data in an infrastructure BSS, both where there is an association between the transmitter and the receiver(s) and in cases where there is no association between transmitter(s) and receiver(s). Further, eBCS APs can provide forwarding service in which the eBCS AP forwards the contents carried in an UL (uplink) eBCS frame to a remote destination specified in the frame. The UL eBCS frame is broadcasted by an eBCS non-AP STA without solicitation from the eBCS AP. The forwarding eBCS AP embeds metadata, if supported by the AP, when requested by the transmitting STA.

eBCS provides additional means for protecting broadcast traffic and the privacy of the stations receiving that traffic, including protection of origin authenticity between STAs that use a group temporal key security association (GTKSA) for broadcast transmissions.

The main features of eBCS are the following:

- eBCS capability advertisements

- eBCS frames

- eBCS procedures, such as registration and deregistration

6 Layer management

6.3 MLME SAP interface

*Insert the following new subclause:*

6.3.bc2 UL eBCS forwarding

6.3.bc2.1 General

The following MLME primitives support transmission and reception of the UL eBCS frame.

6.3.bc2.2 MLME-ULEBCS.request

6.3.bc2.2.1 Function

This primitive requests that an UL eBCS frame be sent. It is valid only at an eBCS non-AP STA.

6.3.bc2.2.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-ULEBCS.request(

DestinationURI,

HLPPayload,

STACertificate,

Timestamp,

EBCSParametersPrivateKey

)

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| DestinationURI | Destination URI element | As defined in 9.4.2.89 (Destination URI element). | The Destination URI element as defined in9.4.2.89 (Destination URI element). |
| HLPPayload | Sequence of octets | N/A | Specifies the contents from the higher layer to be included in UL eBCS frame. |
| STACertificate | Sequence of octets | N/A | Specifies the certificate for the transmitting STA. |
| Timestamp | Sequence of octets | N/A | Specifies the timestamp at transmitting STA when the UL eBCS frame is transmitted. |
| EBCSParameters | E-BCS Parameters element | As defined in 9.4.2.bc (E-BCS Parameters element). | The E-BCS Parameters element as defined in9.4.2.bc (E-BCS Parameters element). |
| PrivateKey | Sequence of octets | N/A | Specifies the private key for signature generation. |

6.3.bc2.2.3 When generated

This primitive is generated by the SME to request an UL eBCS frame be sent.

6.3.bc2.2.4 Effect of receipt

On receipt of this primitive, the MLME constructs an UL eBCS frame. The eBCS non-AP STA then attempts to broadcast this frame by following the procedure described in 11.bc.3.3 (eBCS UL operation at an eBCS non-AP STA).

6.3.bc2.3 MLME-ULEBCS.indication

6.3.bc2.3.1 Function

This primitive indicates that an UL eBCS frame was received. It is valid only at an eBCS AP.

6.3.bc2.3.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-ULEBCS.indication(

DestinationURI,

HLPPayload,

Timestamp,

EBCSParameters

)

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| DestinationURI | Destination URI element | As defined in 9.4.2.89 (Destination URI element). | The Destination URI element as defined in9.4.2.89 (Destination URI element). |
| HLPPayload | Sequence of octets | N/A | Specifies the contents from the higher layer to be included in UL eBCS frame. |
| Timestamp | Sequence of octets | N/A | Specifies the timestamp at transmitting STA when the UL eBCS frame is transmitted. |
| EBCSParameters | E-BCS Parameters element | As defined in 9.4.2.bc (E-BCS Parameters element). | The E-BCS Parameters element as defined in9.4.2.bc (E-BCS Parameters element). |

6.3.bc2.3.3 When generated

This primitive is generated by the MLME when a UL eBCS frame is received.

6.3.bc2.3.4 Effect of receipt

On receipt of this primitive, the SME operates according to the procedure in 11.bc.3.2 (eBCS UL operation at an eBCS AP)

**9.3.3.2 Beacon frame format**

**Beacon frame body**

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <TBD> | E-BCS Parameters element | This element is present if dot11eBCSSupportActivated is true. |

**9.3.3.10 Probe Response frame format**

**Probe Response frame body**

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <TBD> | E-BCS Parameters element | This element is present if dot11eBCSSupportActivated is true. |

**9.4.2.bc E-BCS Parameters element**

**9.4.2.bc1.1 General**

The E-BCS Parameters element contains fields that are used to advertise the parameters of an eBCS STA.

An eBCS AP declares support for forwarding service and capabilities related to that forwarding service by including the E-BCS Parameters element in Beacon and Probe Response frames it transmits.

An eBCS non-AP STA advertises the E-BCS Parameters element in an UL eBCS frame if it intends for an AP to append additional information to the packet before forwarding it to a remote destination. Otherwise, an eBCS non-AP STA does not include this element in the eBCS UL frame.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID Extension | E-BCS Parameters |

Octets: 1 1 1 variable

 **Figure 9-bc1 - E-BCS Parameters element format**

The format of E-BCS Parameters element is shown in Figure 9-bc1 (E-BCS Parameters element format).

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

The contents of an E-BCS Parameters field is defined in 9.4.2.bc1.2 when the element is transmitted by an eBCS AP and defined in 9.4.2.bc1.3 when the element is transmitted by an eBCS non-AP STA.

**9.4.2.bc1.2 E-BCS AP Parameters for an AP STA**

The format of an E-BCS Parameters field when transmitted by an eBCS AP is shown in Figure 9-bc2 (Format of E-BCS Parameters field for an AP).

|  |  |  |
| --- | --- | --- |
|  | AP UL Control | Next eBCS Info frame |

Octet: 1 2 (optional)

 **Figure 9-bc2 - Format of E-BCS Parameters field for an AP**

The format of AP Control is shown in Figure 9-bc3 (AP UL Control field format).

B0 B1 B2 B3 B4 B5 B7

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | UL Authentication Mode | UL Limiting Mode | Metadata Embedding Supported |  |  | Reserved |

Bits: 2 2 1 3

 **Figure 9-bc3 - AP Control field format**

The encoding of the UL Authentication Mode subfield is shown in Table 9-bc1 (Encoding of UL Authentication Mode subfield).

 **Table 9-bc1 - Encoding of UL Authentication Mode subfield**

|  |  |  |
| --- | --- | --- |
| **Subfield value** | **Definition** | **Encoding** |
| 0 | No Authentication | AP forwards contents of an UL eBCS frame to the remotedestination identified in the frame without authenticating the transmitter of the frame. |
| 1 | Per Destination | AP forwards contents of an UL eBCS frame only if it is able to authenticate the transmitter of the frame based on an establishedrelationship with the remote destination identified in the frame. |
| 2 – 3 | Reserved |  |

The encoding of the UL Limiting Mode subfield is shown in Table 9-bc2 (Encoding of UL Limiting Mode subfield).

**Table 9-bc2 - Encoding of UL Limiting Mode subfield**

|  |  |  |
| --- | --- | --- |
| **Subfield value** | **Definition** | **Encoding** |
| 0 | Throttling scheme for all destinations | AP applies no restrictions or allows a fixed amount or frequency ofuplink data from a non-AP STA to be forwarded to a remote destination. |
| 1 | ThrottlingScheme per destination | AP applies forwarding limits as specified by the remote destination with whom it has established a relationship. |
| 2 – 3 | Reserved |  |

The Metadata Embedding Supported subfield is set to 1 if the AP supports embedding of metadata (such as location, date/time etc based on the relationship with the remote destination), when a non-AP STA requests embedding, before forwarding the HLP payload carried in an UL eBCS frame to the remote destination. Otherwise, the subfield is set to 0.

The Next eBCS Info frame subfield indicates the number of TBTTs until the next eBCS Info frame is transmitted. If the STA does not transmit eBCS Info frames, this subfield is not used.

**9.4.2.bc1.3 eBCS Capabilities for a non-AP STA**

The format of an E-BCS Parameters field when transmitted by an eBCS non-AP STA is shown in Figure 9-bc4 (Format of E-BCS Parameters field for a non-AP STA).

|  |  |
| --- | --- |
|  | Non-AP STA Control |
| Octets: | 1 |

**Figure 9-bc4 - Format of E-BCS Parameters field for a non-AP STA**

The format of Non-AP STA Control field is shown in Figure 9-bc5 (Non-AP STA Control field format).

B0 B1 B3 B7

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Metadata Embedding Requested  | No Forwarding Without Embedding |  |  | Reserved  | Reserved |

Bits: 1 1 6

**Figure 9-bc5 - Non-AP STA Control field format**

The Metadata Embedding Requested subfield is set to 1 to indicate that the non-AP STA transmitting the element is requesting an eBCS AP to forward its content to a remote destination after appending metadata information. Otherwise the subfield is set to 0.

When the Metadata Embedding Requested subfield is set to 1, the No Forwarding Without Embedding subfield is set to 1 to indicate that the AP can discard an uplink frame received from a non-AP STA and not forward the contents of the frame to the remote destination if it cannot append metadata (such as location, date/time etc) to the packet before forwarding. Otherwise, the subfield is set to 0 to indicate that AP can forward a frame to the remote destination specified in the non-AP STA’s uplink frame even if it cannot support appending the requested information or without appending any metadata.

**11.bc.3 eBCS UL Service**

**11.bc.3.1 General**

The eBCS UL Service procedure allows a non-AP STA to transmit an UL frame with the expectation that one or more eBCS APs in the neighborhood might forward the contents of the frame to a remote destination specified in the frame. An eBCS non-AP STA may include a request to the forwarding AP to append additional information to the frame before forwarding the frame to the remote destination. The forwarding service is best effort with no guarantee that the contents will be delivered to the remote destination identified in the STA’s UL frame. Furthermore, a STA’s request to embed metadata might not be fulfilled by a forwarding AP.

**11.bc.3.2 eBCS UL operation at an eBCS AP**

An eBCS AP may provide forwarding service in which it supports forwarding the contents of an UL eBCS frame received from an eBCS non-AP STA to a remote destination identified in the frame.

An eBCS AP that supports forwarding service shall declare its ability to forward by including the E-BCS Parameters element (see 9.4.2.bc.2 (E-BCS AP Parameters)) in the Beacon and broadcast Probe Response frames that it transmits.

An eBCS AP that supports forwarding and is capable of embedding shall indicate its ability to support embedding by setting the Metadata Embedding Supported subfield in the E-BCS Parameters element to 1 and shall append metadata to the HLP content received from the STA before forwarding it to the remote destination.

NOTE 1—The content and the format of the embedded metadata is out of scope of this standard and can be based on a relationship with the remote destination.

NOTE 2 – Upon receiving an UL eBCS frame from an unassociated eBCS STA, a forwarding eBCS AP (or a switch with which the eBCS AP is affiliated with) generates an IP packet intended for the remote destination specified in the frame.

An eBCS AP that supports forwarding but does not support embedding of the requested metadata shall not forward the frame to the remote destination if the No Forwarding Without Embedding subfield in the E-BCS Parameters element carried in the UL eBCS frame is set to 1. Otherwise the AP shall forward the frame to the remote destination identified in the frame.

In order to prevent denial-of-service attacks or injection attacks directed towards the remote destination, an eBCS AP that supports forwarding service should perform source authentication and validate the frame signature. Furthermore, eBCS APs should throttle the number or the frequency of uplink frames it forwards to a remote destination to defend against such attacks.

An eBCS AP that authenticates the transmitter of the packet before forwarding it to a remote destination shall provide an indication of the authentication scheme in the E-BCS Parameters element that it transmits (see Table 9-bc1 (Encoding of UL Authentication Mode subfield)).

NOTE – An eBCS AP that does not perform authentication of the transmitter forwards an UL eBCS frame to the remote destination indicated in the frame irrespective of whether the frame carries the STA Certificate field or the Timestamp field or the Frame Signature field.

An eBCS AP that limits the number or frequency of eBCS UL frames it forwards to a remote destination shall provide an indication of the throttling scheme in the E-BCS Parameters element that it transmits (see Table 9-bc2 (Encoding of UL Limiting Mode subfield)).

NOTE—Forwarding service is best effort and an eBCS AP that supports forwarding service is not required to forward a STA’s data to the destination identified in the STA’s UL eBCS frame if the conditions indicated by the AP (such as authentication and/or throttling) are not satisfied or for other reasons.

**11.bc.3.3 eBCS UL operation at an eBCS non-AP STA**

An eBCS non-AP STA that intends to send data to a remote destination shall transmit an UL eBCS frame to the broadcast destination address (i.e., Address 1 and Address 3 fields are set to the broadcast address) carrying data intended for the remote destination. The URI of the remote destination shall be carried in the frame. The frame may also carry additional requests from the transmitting STA to the forwarding AP and fields for source authentication, preventing replay attacks and protecting the contents of the frame.

The format of the UL eBCS frame is described in 9.6.7.bc (UL eBCS frame Format).

When the STA has time information, the Time subfield of the Timestamp field shall carry the number of seconds since 2020-01-01 00:00:00 UTC when the frame is queued for transmission at the STA; otherwise the subfield shall be set to 0.

NOTE—How a STA obtains time information is out of scope of this standard.

The Counter subfield of the Timestamp field shall carry a numeric value which is incremented for each packet transmission. When the STA has transmitted 232 – 1 frames, the value in the field wraps around and starts from 0.

An eBCS non-AP STA may request an eBCS AP that provides forwarding service to embed metadata (such as location, date/time etc) by including the E-BCS Parameters element in the eBCS UL frame.

The Frame Signature field when present in the frame shall carry the signature for the contents of the UL eBCS frame Action field except for the field itself. The contents of this field provide protection against any attack that attempts to tamper with the contents of the frame. Also see Table 9-bc4 (Encoding of Frame Signature Type subfield), 12.bc.2.5 (Signature of the eBCS UL frame), and 12.bc.2.2 (Authentication of an eBCS UL frame).

Forwarding service is best effort. An eBCS non-AP STA may transmit an UL eBCS frame without discovering eBCS APs, if any, or obtaining information about nearby eBCS AP(s). An eBCS non-AP STA may choose to monitor the WM and may choose to obey the requirements, such as an authentication scheme, indicated by neighboring eBCS AP(s), if any, that support forwarding service.