IEEE P802.11  
Wireless LANs

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| 802.11bc LB257 – Resolution for CIDs 2120, 2023, 2024, 2025, 2026 and 2083 | | | | |
| Date: January 17, 2022 | | | | |
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Abstract

This submission proposes resolutions for the following CIDs submitted during LB257 for 11bc D2.0:

2120, 2023, 2024, 2025, 2026 and 2083

##### 19.4.5.30 Enhanced Broadcast Services ANQP-element

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3 The Enhanced Broadcast Services ANQP-element provides a list of ~~one~~ zero [CID2120] or more enhanced

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Broadcast services that are available from the STA transmitting this element. The format of the Enhanced Broadcast

Services ANQP-element is defined in [Figure 9-839a (Enhanced Broadcast Services ANQP-element format](#_bookmark90)).

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| --- | --- | --- | --- |
| Info ID | Length | Next EBCS Info Frame Tx Time | Enhanced Broadcast Services Tuples |

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12 Octets: 2 2 2 variable

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##### 14 Figure 9-839a—Enhanced Broadcast Services ANQP-element format

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16 The Info ID and Length fields are defined in 9.4.5.1 (General).

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18

1. The Next EBCS Info Frame Tx Time field indicates the number of TBTTs until the beacon interval in which
2. the next Info frame is transmitted.

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1. The Enhanced Broadcast Services Tuples field contains one or more Enhanced Broadcast Services Tuple
2. fields as defined in [Figure 9-839b (Enhanced Broadcast Services Tuple field format](#_bookmark91)).

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Control | Content ID | Negotiation  Method | Content Authentication Algorithm | Content Address Type | Content Address Length  [CID 2083] | Content Address |
| Octets | 1 | 1 | 1 | 1 | 1 | 1 | Variable |

3134

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|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Title Length | Title | PHY Type | TX Rate | Next TX Schedule (optional) | Time to Termination (optional) |

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39 Octets: 1 variable 1 variable 0 or 8 0 or 2

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##### 41 Figure 9-839b—Enhanced Broadcast Services Tuple field format

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1. The Control field defines which of the optional fields are present in the Enhanced Broadcast Services Tuple
2. field and is defined in [Figure 9-839c (Control field format](#_bookmark92)).

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B1 | B2 | B3 | B3 B7 |
| Next Tx Schedule Present | Time To Termination Present | Association Required | Reserved |
| Bits: | 1 | 1 | 1 | 5 |

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##### 60 Figure 9-839c—Control field format

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1. The Next Tx Schedule Present subfield is set to 1 by a STA to indicate that the Enhanced Broadcast Services
2. Tuple field contains a Next Tx Schedule field. This subfield is set to 0 to indicate that there is no Next Tx
3. Schedule field.

4

5

1. The Time To Termination subfield is set to 1 by a STA to indicate that the Enhanced Broadcast Services
2. Tuple field contains a Time To Termination field. This subfield is set to 0 to indicate that there is no Time
3. To Termination field.

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1. A value of 1 in the Association Required subfield indicates that association is required to consume the EBCS
2. traffic stream identified by the content ID contained in the Content ID subfield. A value of 0 indicates that
3. association is not required to consume the EBCS traffic stream identified by the content ID contained in the
4. Content ID subfield.

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17 The Content ID subfield indicates the identifier of the content.

1. The format of the Negotiation Method subfield is shown in Fig. XX (Negotiation Method subfield format)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 | B4-B7 |
|  | EBCS Content Request Frame | EBCS Request ANQP Element | Out Of Band Request | Content with Restriction | Reserved |
| Bits | 1 | 1 | 1 | 1 | 1 |

41

##### Figure XX—Negotiation Method subfield format

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1. The EBCS Content Request Frame subfield is set to 1 if the EBCS traffic stream identified by the Content ID
2. subfield included in the same Enhanced Broadcast Services Tuple field can be requested using EBCS Content
3. Request frames, otherwise it is set to 0.

56

1. The EBCS Request ANQP Element subfield is set to 1 if the EBCS traffic stream identified by the Content ID
2. subfield included in the same Enhanced Broadcast Services Tuple field can be requested using the EBCS

59

1. Request ANQP-element, otherwise it is set to 0.

60

1. The Out Of Band Request subfield is set to 1 if the EBCS traffic stream identified by the Content ID subfield
2. included in the same Enhanced Broadcast Services Tuple field, can be requested using an out of band
3. method, otherwise it is set to 0. The URL to be used for the out of band negotiation method is contained in the
4. EBCS Info frame.
5. In case the Association Required bit in the Control field included in the same Enhanced Broadcast Services Tuple field is set to 1, the only allowed request method is through EBCS Content Request/Response frames, therefore the EBCS Content Request Frame bit is set to 1 and EBCS Request ANQP Element bit is set to 0. [CID 2024]
6. The Content With Restriction subfield is set to 1 if the content requires off-line registration to be consumed
7. and is set to 0 otherwise. The registration process is outside of the scope of this standard. The Service URL used
8. for off-line registration is contained in the EBCS Info frame. [CID2024, CID2025, CID2026].
9. When the EBCS Content Request Frame subfield, the EBCS Request ANQP Element subfield and the Out Of
10. Band Request subfield are all set to 0, the EBCS will be transmitted without any STA requesting it.[CID2023]
11. ~~The Negotiation Method subfield is a bit mask that indicates the method to request the transmission of the~~
12. ~~EBCS traffic stream identified by the Content ID subfield. The encoding of the Negotiation Method subfield~~
13. ~~is defined in~~ [~~Table 9-340a (Negotiation Method subfield encoding~~](#_bookmark93)~~). When no bits are set within the~~

22

~~23 Negotiation Method subfield, there is no negotiation.~~

~~24~~

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##### ~~26~~ ~~Table 9-340a~~~~—Negotiation Method subfield encoding~~

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| --- | --- | --- |
| **~~Negotiation Method subfield bit value~~** | **~~Meaning~~** | **~~Notes~~** |
| ~~1~~ | ~~Request using EBCS Con- tent Request frames~~ | ~~EBCS request by STAs that are associated with the broad- caster~~ |
| ~~2~~ | ~~Request using Enhanced Broadcast Services Request ANQP-element~~ | ~~EBCS request by STAs whose association state is defined by the Association Required subfield of the Control field of the Enhanced Broadcast Services Tuple field~~ |
| ~~3~~ | ~~Request using the URL indicated in the EBCS Info frame~~ | ~~EBCS request by STAs whose association state is defined by the Association Required subfield of the Control field of the Enhanced Broadcast Services Tuple field~~ |
| ~~4-7~~ | ~~Reserved~~ |  |

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1. The Content Authentication Algorithm field indicates the authentication algorithm used for this EBCS
2. traffic stream.

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1. The Content Authentication Algorithm subfield is defined in [Table 9-340b (Content Authentication](#_bookmark95)
2. [Algorithms](#_bookmark95)).

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##### 56 Table 9-340b—Content Authentication Algorithms

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|  |  |
| --- | --- |
| **Value** | **Content Authentication Algorithms** |
| 0 | HLSA (see [12.14.4 (No frame authentication with mandatory higher layer source authentication](#_bookmark256) [(HLSA))](#_bookmark256)) |
| 1 | PKFA (see [12.14.2 (EBCS public key frame authentication (PKFA))](#_bookmark227)) |

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##### 1 Table 9-340b—Content Authentication Algorithms

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| --- | --- |
| 2 | HCFA without instant authentication (see [12.14.3 (EBCS hash chain frame authentication (HCFA))](#_bookmark241)) |
| 3 | HCFA with instant authentication (see [12.14.3 (EBCS hash chain frame authentication (HCFA))](#_bookmark241)) |
| 4-255 | Reserved |

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12 The Content Address Type subfield is defined in [Table 9-340c (Content Address Type subfield](#_bookmark97)).

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##### 15 Table 9-340c—Content Address Type subfield

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|  |  |
| --- | --- |
| **Value** | **Address Type** |
| 0 | UDP/IPv4 |
| 1 | UDP/IPv6 |
| 2 | MAC address |
| 3-255 | Reserved |

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1. The Content Address Length contains the length of the Content Address subfield in octets. [2083]
2. The Content Address subfield contains the addresses and the port to select the content, encoded as follows.
3. If the Content Address Type subfield indicates UDP/IPv4, the format of the Content Address subfield is
4. shown in [Figure 9-839d (Content Address subfield format for UDP/IPv4](#_bookmark98)).

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38

|  |  |  |
| --- | --- | --- |
| Source IPv4 Address | Destination IPv4 Address | Destination UDP Port |

39

40

41 Octets: 4 4 2

42

##### 43 Figure 9-839d—Content Address subfield format for UDP/IPv4

44

45

1. The Source IPv4 Address subfield contains the source IPv4 address of the content. If the value of the Source
2. IPv4 Address subfield is 0, the source address of the content is not specified.

48

1. The Destination IPv4 Address subfield indicates the IPv4 address used as the destination address (typically a
2. multicast IPv4 address) in the broadcast frames for the EBCS traffic stream identified by the Content ID

51

1. field. The Destination Port subfield indicates the UDP port associated with the IPv4 address indicated in the
2. Destination IPv4 Address subfield.

54

55 NOTE—The UDP port and IPv4 addresses are encoded per the conventions defined in 9.2.2.

56

57

1. If the Content Address Type subfield indicates UDP/IPv6, the format of the Content Address subfield is
2. shown in [Figure 9-839e (Content Address subfield format for UDP/IPv6](#_bookmark99)).

60

1. The Source IPv6 Address subfield contains the source IPv6 address of the content. If the value of the Source
2. IPv6 Address subfield is 0, the source address of the content is not specified.

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1

|  |  |  |
| --- | --- | --- |
| Source IPv6 Address | Destination IPv6 Address | Destination UDP Port |

2

3

4 Octets: 16 16 2

5

##### 6 Figure 9-839e—Content Address subfield format for UDP/IPv6

7

1. The Destination IPv6 Address subfield indicates the IPv6 address used as the destination address (typically a
2. multicast IPv6 address) in the broadcast frames for the EBCS traffic stream identified by the Content ID

10

1. field. The Destination Port subfield indicates the UDP port associated with the IPv6 address indicated in the
2. Destination IPv6 Address subfield.

13

14 NOTE—The UDP port and IPv6 addresses are encoded per the conventions defined in 9.2.2.

15

16

1. If the Content Address Type subfield indicates MAC address, the format of the Content Address subfield is
2. shown in [Figure 9-839f (Content Address subfield format for MAC Address](#_bookmark100)). The Content Address
3. subfields contain MAC addresses.

20

21

Source MAC Address

Destination MAC Address

22

23

24

25 Octets: 6 6

26

##### 27 Figure 9-839f—Content Address subfield format for MAC Address

28

29

1. The Source MAC Address subfield contains the source MAC address of the content. If the value of the
2. Source MAC Address subfield is 0, the source MAC address of the content is not specified.

32

1. The Destination MAC Address subfield contains the destination MAC address of the content that is a group
2. address.

35

36

37 The Title Length field indicates the length of the Title field in octets.

38

1. The Title field is a human readable title of the content as a UTF-8 string.

Continues..

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16

##### 17 9.6.7.54 EBCS Info frame format

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1. The format of the Action field of the EBCS Info frame is shown in [Figure 9-909al (EBCS Info frame Action](#_bookmark149)
2. [field format](#_bookmark149)).

21

22

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Category | Public Action | EBCS Info Sequence Number | EBCS Info Timestamp | EBCS Info Control | EBCS Info Authentication Algorithm | EBCS Info Interval |

23

24

25

26

27 Octets: 1 1 4 8 1 1 1

28

29

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|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fragment Hash Values | Certificate Length | Certificate | Content Information Number | Content Information List | Signature |

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36 Octets: *n* x 32 0 or 2 variable 1 variable variable

37

##### 38 Figure 9-909al—EBCS Info frame Action field format

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41 The Category field is defined in 9.4.1.11 (Action field).

42

43 The Public Action field is defined in 9.6.7.1 (Public Action frames).

44

45

46 The EBCS Info Sequence Number field contains the sequence number of the EBCS Info frame.

47

48 The EBCS Info Timestamp field is the elapsed time from 2020-01-01 00:00 UTC in milliseconds.

49

50

51 The EBCS Info Control field is shown in [Figure 9-909am (EBCS Info Control field format](#_bookmark150)).

52

53

54 B0 B2 B3 B5 B6 B7

55

|  |  |  |
| --- | --- | --- |
| Number Of Fragments | Fragment Index | Reserved |

56

57

58

59 Bits: 3 3 2

60

##### 61 Figure 9-909am—EBCS Info Control field format

62

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64 The Number Of Fragments subfield indicates the number of the EBCS Info frame fragments minus 1.

65

1. The Fragment Index subfield indicates the EBCS Info frame fragment number (see [11.55.2.5 (EBCS Info](#_bookmark205)
2. [frame fragmentation)](#_bookmark205)). The first fragment is fragment 0.

3

4

1. The EBCS Info Authentication Algorithm field indicates the algorithm used to authenticate the EBCS Info
2. frame. This field are defined in [Table 9-397b (EBCS Info Authentication Algorithm field](#_bookmark151)).

7

8

##### 9 Table 9-397b—EBCS Info Authentication Algorithm field

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|  |  |  |  |
| --- | --- | --- | --- |
| **Value** | **Algorithm** | **Certificate Present** | **Signature Length (octets)** |
| 0 | None | No | - |
| 1 | Pre-negotiated | No | variable |
| 2 | RSASSA-PSS- 2048 | Yes | 256 |
| 3 | RSASSA-PSS- 4096 | Yes | 512 |
| 4 | ECDSA P-256 | Yes | variable |
| 5 | ECDSA P-521 | Yes | variable |
| 6 | Ed25519 | Yes | 64 |
| 7-127 | Reserved | - | - |

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35 Details of each algorithm are described in [12.14.2.1 (Signature of an EBCS Info frame)](#_bookmark229).

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37

1. The EBCS Info Interval field indicates the EBCS Info frame transmission interval (from
2. dot11EBCSInfoInterval), in units of a beacon interval.

40

41 NOTE—Even if PKFA is used, the EBCS Info frames are transmitted periodically to advertise EBCS

42

43 availability.

44

1. The Fragment Hash Values field is only present if the Number Of Fragments subfield, *n*, is nonzero. It
2. contains a sequence of *n* 16-octet Fragment Hash Value subfields.

47

48

1. The Certificate Length field, the Certificate field and the Signature field are present if the EBCS Info
2. Authentication Algorithm subfield indicates that a certificate is present, and are not present otherwise. The
3. Certificate Length field indicates the length of the Certificate field in octets.

52

53 The Certificate field contains the X.509v3 certificate of the EBCS transmitter encoded according to IETF

54

55 RFC 5280.

56

1. The Content Information Number field indicates the number of Content Information subfields included in
2. the Content Information List field.

59

60

1. The Content Information List field contains one or more Content Information subfields. The format of each
2. Content Information subfield is shown in [Figure 9-909an (Content Information field format](#_bookmark152)).

63

1. The Content ID subfield contains a number that uniquely identifies an EBCS traffic stream in a BSS.

65

1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Content ID | Content Authentication Algorithm | Content Information Control | Content Address Type | Content Address | Title Length | Title | Negotiation Info |

5 Octets: 1 1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 6 |  | | | | | | | | | | | | | | | |
| 7 |
| 8 |
| 9 |
| 10 |
| 11 |
| 12 |
| 13 |
| 14 |
| 15 |
| 16 | Octets: | 0 or 2 |  | 0 or 2 |  | 0 or 2 |  | 0 or 32 | 0 or 1 |  | 0 or 3 |  |  | 0 or 1 |  | 0 or 32 |
| 17 |  | | | | | | | | | | | | | | | |
| 18 |
| 19 |
| 20 |
| 21 |
| 22 |
| 23 |
| 24 |

1 1 variable

1 variable 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Time Of Termination (optional) | Next TX Schedule (optional) | Allowable Time Difference (optional) | HCFA Base Key (optional) | Previous Period HCFA Base Key 0 Sequence (optional) | Previous Period HCFA Base Key 0 (optional) | Previous Period HCFA Base Key 1 Sequence (optional) | Previous Period HCFA Base Key 1 (optional) |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| HCFA Key  Change Interval (optional) | Number Of Instant Authenticat ors (optional) | Instant Authenticat or List (optional) | Service URL Length (optional) | Service URL  (optional) | Vendor Specific Data Length (optional) | Vendor Specific Data (optional) |

1. Octets: 0 or 1 0 or 1 *n* x 33 0 or 1 variable 0 or 1 variable

##### Figure 9-909an—Content Information field format

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|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Content ID | Content Authentication Algorithm | Content Information Control | Content Address Type | Content Address Length [2038] | Content Address | Title Length | Title | Negotiation Info |
| Octets | 1 | 1 | 1 | 1 | 1 | Variable | 1 | Variable | ~~1~~ variable |

1. The Content Authentication Algorithm subfield is defined in [Table 9-397c (Content Authentication](#_bookmark153)
2. [Algorithm field](#_bookmark153)).

32

33

34

##### 35 Table 9-397c—Content Authentication Algorithm field

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37

|  |  |
| --- | --- |
| **Value** | **Content Authentication Algorithm** |
| 0 | HLSA (see [12.14.4 (No frame authentication with mandatory](#_bookmark256) [higher layer source authentication (HLSA))](#_bookmark256)) |
| 1 | PKFA (see [12.14.2 (EBCS public key frame authentication](#_bookmark227) [(PKFA))](#_bookmark227)) |
| 2 | HCFA without instant authentication (see [12.14.3 (EBCS](#_bookmark241) [hash chain frame authentication (HCFA))](#_bookmark241)) |
| 3 | HCFA with instant authentication (see [12.14.3 (EBCS hash](#_bookmark241) [chain frame authentication (HCFA))](#_bookmark241)) |
| 4-255 | Reserved |

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55 The Content Information Control subfield is shown in [Figure 9-909ao (Content Information Control](#_bookmark154)

56

57 [subfield format](#_bookmark154)).

58

59 The Time Of Termination Present subfield indicates whether the Time Of Termination field is present.

60

61 The Next Schedule Present subfield indicates whether the Next Schedule field is present.

62

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1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 | ~~B4~~ | B4 B7 |
| Time Of Termination Present | Next Schedule Present | Service URL  Present | Vendor Specific Data Present | ~~Content With Restriction~~ | Reserved |
| Bits: | 1 | 1 | 1 | 1 | ~~1~~ | 3 |

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##### 9 Figure 9-909ao—Content Information Control subfield format

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11 The Service URL Present subfield is set to 1 if the Service URL Length subfield and the Service URL

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13 subfield are present and is set to 0 otherwise

14

1. The Vendor Specific Data Present subfield is set to 1 if the Vendor Specific Data Length subfield and the
2. Vendor Specific Data subfield are present ans is set to 0 otherwise.

17

18

1. ~~The Content With Restriction subfield is set to 1 if the content requires off-line registration to be accessed~~
2. ~~and is set to 0 otherwise. The registration process is outside of the scope of this standard.~~ [CID2024, CID2025, CID2026].

21

1. The Content Address Type subfield, the Content Address Length subfield [2038], and the Content Address subfield are defined in [Figure 9.4.5.30](#_bookmark88) [(Enhanced Broadcast Services ANQP-element](#_bookmark88)).

24

25

1. The Negotiation Info subfield indicates the negotiation method. The format of the Negotiation Info subfield
2. is shown in [Figure 9-909ap (Negotiation Info subfield format](#_bookmark155)).

|  |  |  |
| --- | --- | --- |
| Negotiation ~~Capability~~  Method [2024, 2025, 2026] | Request URI Length | Request URI |

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33

1. Octets: 1 0 or 1 variable

##### Figure 9-909ap—Negotiation Info subfield format

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1. The format of the Negotiation Method subfield is described in 9.4.5.30 (Enhanced Broadcast Services ANQP-element). [CID2024, CID2025, CID2026].
2. .

41

~~42 B0 B1 B2 B3 B7~~

~~43~~

|  |  |  |  |
| --- | --- | --- | --- |
| ~~EBCS~~  ~~Content Request Frame~~ | ~~EBCS Request ANQP Element~~ | ~~Out Of Band Request~~ | ~~Reserved~~ |

~~44~~

~~45~~

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~~47~~

~~48~~

~~49 Bits: 1 1 1 5~~

~~50~~

##### ~~51~~ ~~Figure 9-909aq—Negotiation Capability subfield format~~

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~~53~~

1. ~~The EBCS Content Request Frame subfield is set to 1 if the transmitter supports requests using EBCS~~
2. ~~Content Request frames, otherwise it is set to 0.~~

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1. ~~The EBCS Request ANQP Element subfield is set to 1 if the transmitter supports requests using the EBCS~~
2. ~~Request ANQP-element, otherwise it is set to 0.~~

59

~~60~~

1. ~~The Out Of Band Request subfield is set to 1 if the transmitter supports requests using an out of band~~
2. ~~method, otherwise it is set to 0.~~

~~63~~

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65

1. The Request URI Length subfield and the Request URI subfield are present if the Out Of Band Request
2. subfield in the Negotiation Capability subfield is equal to 1. The Request URI Length subfield indicates the
3. length of the Request URI subfield in octets. The Request URI subfield is the URI to request to start the

4

5 EBCS traffic stream.

6

1. The Title Length subfield indicates the length of the following Title subfield in octets. The Title subfield is a
2. human readable title of the content as a UTF-8 string.

9

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1. The Time Of Termination subfield indicates the number of TBTTs until the content identified by the content
2. ID contained in the Content ID subfield is terminated. A value of 0 indicates that the content identified by
3. the content ID in the Content ID subfield will be terminated at the following TBTT. A value of 65535
4. indicates that the content identified by the content ID in the Content ID subfield has no specific termination
5. time.

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Continues..