IEEE P802.11  
Wireless LANs

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| 802.11 TGac WG Letter Ballot LB190  Proposed resolution on CID 7367, 7368, 7363, 7369, 7365 | | | | |
| Date: 2013-01-15 | | | | |
| Author(s): | | | | |
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##### Comments are based on 11ac D4.0. Proposed resolutions are based on 11ac D4.2 (as indicated in each resolution). Changes indicated by a mixture of Word track-changes and instructions. For equation changes, Latex notation is sometimes used. E.g. a\_{xyz}^b denotes axyzb

Following CIDs are covered in this document (total 5):

MAC: 7367, 7368, 7363, 7369, 7365.

History:

R0: Initial revision

R1: Added CIDs 7363, 7369, 7365

R2: Editorial fix

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| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** |
| 7367 |  |  | It would be desirable to require that there be no conflict between the position of the secondary channels indicated by the various ways in which these can be indicated (SCO, NCN+NOC, NCN+WBCS) | A proposal will be brought to effect this, based on 12/1037r4 |

**Discussion:**

Nomenclature

CSA : Channel Switch Announcement

ECSA : Extended Channel Switch Announcement

CSAe : CSA element

ECSAe : ECSA element

WBCSe : Wide BW Channel Switch element

WBCSse : Wide BW Channel Switch subelement in Channel Switch Wrapper element

NCN : New Channel Number field

NOC : New Operating Class field

SCO : Secondary Channel Offset field

NCW : New Channel Width field

NCCFS0 : New Channel Frequency Segment 0

NCCFS1 : New Channel Frequency Segment 1

There are multiple ways to perform channel switching:

* Beacon or Probe Response frames containing CSAe and/or ECSAe
* CSA frame
* ECSA frame

Furthermore, SCO and/or WBCSe/se are also added depending on the new BW after the channel switch. Tables 1, 2 and 3 enumerate all possible channel switching scenarios, and the required frame/element formats, and some important contents.

Table 1. Channel Switching using Beacon/Probe Response Frames including CSAe and/or ECSAe

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Condition | | | Result / Meaning (for New Channel) | | |
| New BW [MHz] | CSAe included? | ECSAe included? | CSAe | ECSAe | WBCSse |
| 20 | Y | N | NCN = Pri20 ch. #  (D4.1(P187L45)) | Not present | Not present  (D4.1, 8.4.2.165(P105L44)) |
| N | Y | Not present | NOC = 20 MHz NCN = Pri20 ch. #  (D4.1(P187L45)) | Not present  (D4.1, 8.4.2.165(P105L44), 10.39.4(P187L60)) |
| Y | Y | NCN = Pri20 ch. #  (D4.1(P187L45)) | NOC = 20 MHz NCN = Pri20 ch. #  (D4.1(P187L45)) | Not present  (D4.1, 8.4.2.165(P105L44), 10.39.4(P187L60)) |
| 40 | Y | N | NCN = Pri20 ch. #  (D4.1(P187L45)) | Not present | NCW = 40 MHz (0) NCCFS0 = Center of 40 MHz NCCFS1 = Reserved  (D4.1, 8.4.2.165(P105L44), 10.39.4(P188L5)) |
| N | Y | Not present | NOC = 40 MHz NCN = Pri20 ch. #  (D4.1(P187L45)) | Optionally present\* (D4.1, 10.39.4(P188L10)) NCW = 40 MHz (0) NCCFS0 = Center of 40 MHz NCCFS1 = Reserved |
| Y | Y | NCN = Pri20 ch. #  (D4.1(P187L45)) | NOC = 40 MHz NCN = Pri20 ch. #  (D4.1(P187L45)) | NCW = 40 MHz (0) NCCFS0 = Center of 40 MHz NCCFS1 = Reserved  (D4.1, 8.4.2.165(P105L44), 10.39.4(P188L5)) |
| 80/160 | Y | N | NCN = Pri20 ch. #  (D4.1(P187L45)) | Not present | NCW = 80/160 MHz (1/2) NCCFS0 = Center of 80/160 MHz NCCFS1 = Reserved  (D4.1, 8.4.2.165(P105L44), 10.39.4(P188L26)) |
| N | Y | Not present | NOC = 40 MHz NCN = Pri20 ch. #  (D4.1(P187L45)) | NCW = 80/160 MHz (1/2) NCCFS0 = Center of 80/160 MHz NCCFS1 = Reserved  (D4.1, 8.4.2.165(P105L44), 10.39.4(P188L26)) |
| Y | Y | NCN = Pri20 ch. #  (D4.1(P187L45)) | NOC = 40 MHz NCN = Pri20 ch. #  (D4.1(P187L45)) | NCW = 80/160 MHz (1/2) NCCFS0 = Center of 80/160 MHz NCCFS1 = Reserved  (D4.1, 8.4.2.165(P105L44), 10.39.4(P188L26)) |
| 80+80 | Y | N | NCN = Pri20 ch. #  (D4.1(P187L45)) | Not present | NCW = 80+80 MHz (3) NCCFS0 = Center of Primary80 NCCFS1 = Center of Secondary80  (D4.1, 8.4.2.165(P105L44), 10.39.4(P188L26)) |
| N | Y | Not present | NOC = 40 MHz NCN = Pri20 ch. #  (D4.1(P187L45)) | NCW = 80+80 MHz (3) NCCFS0 = Center of Primary80 NCCFS1 = Center of Secondary80  (D4.1, 8.4.2.165(P105L44), 10.39.4(P188L26)) |
| Y | Y | NCN = Pri20 ch. #  (D4.1(P187L45)) | NOC = 40 MHz NCN = Pri20 ch. #  (D4.1(P187L45)) | NCW = 80+80 MHz (3) NCCFS0 = Center of Primary80 NCCFS1 = Center of Secondary80  (D4.1, 8.4.2.165(P105L44), 10.39.4(P188L26)) |

\* Strictly speaking, WBCSse does not provide any additional information when switching to 40 MHz using ECSAe in a Beacon or Probe Response frame when CSAe is not present. However, D4.0 states that WBCSse ‘may’ be present. In case there are already devices which strictly follows the D4.0, it is recommended to allow WBCSse to be optionally present in this case. Note that it provides no harm that the WBCSse is present. Also, it may actually simplify some TX implementations, where one could choose to insert the WBCSse in Beacon or Probe Response frames when switching to 40 MHz regardless of using CSAe or ECSAe.

Table 2. Channel switching using CSA frames

|  |  |  |  |
| --- | --- | --- | --- |
| Condition | Result / Meaning (for New Channel) | | |
| New BW | NCN | SCO | WBCSe |
| 20 MHz | Pri20 ch. #  (D4.1(P187L45)) | Not present or SCN  (REVmc D0.6(P807L60)) | Not present  (D4.1, 8.5.2.6(P108L7), 10.39.4(P187L53)) |
| 40 MHz | Pri20 ch. #  (D4.1(P187L45)) | SCA or SCB  (REVmc D0.6(P807L60)) | Not present  (D4.1, 8.5.2.6(P108L7)) |
| 80/160 MHz | Pri20 ch. #  (D4.1(P187L45)) | SCA or SCB  (REVmc D0.6(P807L60)) | NCW = 80/160 MHz (1/2) NCCFS0 = Center of 80/160 MHz NCCFS1 = Reserved  (D4.1, 8.5.2.6(P108L7), 10.39.4(P187L21)) |
| 80+80 MHz | Pri20 ch. #  (D4.1(P187L45)) | SCA or SCB  (REVmc D0.6(P807L60)) | NCW = 80+80 MHz (3) NCCFS0 = Center of Primary80 NCCFS1 = Center of Secondary80  (D4.1, 8.5.2.6(P108L7), 10.39.4(P187L21)) |

Table 3. Channel switching using ECSA frames

|  |  |  |  |
| --- | --- | --- | --- |
| Condition | Result / Meaning (for New Channel) | | |
| New BW | NOC | NCN | WBCSe |
| 20 MHz | 20 MHz | Pri20 ch. #  (D4.1(P187L45)) | Not present  (D4.1, 8.5.8.7(P109L51), 10.39.4(P187L60)) |
| 40 MHz | 40 MHz | Pri20 ch. #  (D4.1(P187L45)) | Not present  (D4.1, 8.5.8.7(P109L51)) |
| 80/160 MHz | 40 MHz | Pri20 ch. #  (D4.1(P187L45)) | NCW = 80/160 MHz (1/2) NCCFS0 = Center of 80/160 MHz NCCFS1 = Reserved  (D4.1, 8.5.8.7(P109L51), 10.39.4(P187L31)) |
| 80+80 MHz | 40 MHz | Pri20 ch. #  (D4.1(P187L45)) | NCW = 80+80 MHz (3) NCCFS0 = Center of Primary80 NCCFS1 = Center of Secondary80  (D4.1, 8.5.8.7(P109L51), 10.39.4(P187L31)) |

Note that given the target BW, center frequency and primary 20 MHz channel location to which the AP wishes to switch the channel to, there are no ambiguities on how to set the fields in all the elements and or subelements.

Note, however, that while most of the rules on whether the WBCSe/se is included or not is specified in 10.39.4, there are a few cases missing from 10.39.4. While those missing cases are specified else where in the draft, it would be clearer to the readers to have all the cases listed in 10.39.4 in order to avoid any unnecessary confusions. Also, the fact that the WBCSse can be optionally present in a Beacon or Probe Response frame when switching to 40 MHz using ECSAe is missing from 8.4.2.165 (but specified in 10.39.4), and thus 8.4.2.165 should be updated accordingly.

Finally, there are a few places where the use of the terms WBCSe and WBCSse are not correct (note that WBCSe are in CSA/ECSA frames, while WBCSse are in Beacon or Probe Response frames). These are almost editorial changes, which are also taken care of in the proposed resolution for this CID.

**Proposed Resolution: CID 7367**

REVISED. See proposed text changes under CID 7367 in 11-13/0105r2 which clarifies channel switching mechanism further.

**Proposed Text Change: CID 7367**

**8.4.2.165 Channel Switch Wrapper element**

***Change D4.2 P105L44 as follows:***

The Wide Bandwidth Channel Switch subelement is present when

* channel switching to a BSS Operating Channel Width of 40 MHz or wider, or
* extended channel switching to a BSS Operating Channel Width of 80 MHz or wider,

and is optionally present when extended channel switching to a BSS Operating Channel Width of 40 MHz; if switching to a 20 MHz BSS Operating Channel Width then this subelement is not present.

**10.39.4 Channel switching methods for a VHT BSS**

***Change D4.2 P187L57 as follows:***

If a Channel Switch Announcement frame is used to announce a switch to a 20 MHz operating channel width, then neither a Wide Bandwidth Channel Switch element nor a Secondary Channel Offset element shall be present in the frame, except that a Secondary Channel Offset element may be present in a Channel Switch Announcement frame if the Secondary Channel Offset field within the Secondary Channel Offset element is set to SCN.

If a Channel Switch Announcement element in a Beacon or Probe Response frame to announce a switch to a 20 MHz operating channel width, then the Wide Bandwidth Channel Switch subelement in the Channel Switch Wrapper element shall not be present in the same frame.

If an Extended Channel Switch Announcement element in a frame or an Extended Channel Switch Announcement frame is used to announce a switch to a 20 MHz operating channel width, then neither a Wide Bandwidth Channel Switch element nor a Wide Bandwidth Channel Switch subelement shall be present in the same frame.

NOTE—A Secondary Channel Offset element is never present with the Extended Channel Switch Announcement element in a frame or in the Extended Channel Switch Announcement frame. Instead, the indicated operating class within the Extended Channel Switch Announcement element or frame is used to differentiate between BSS operating channel width of 20 MHz and greater than 20 MHz, as well as indicate the location of the secondary 20 MHz channel. When switching to a 20 MHz operating channel width, the operating class indicated within the Extended Channel Switch Announcement element or frame has a Channel spacing of 20 MHz. When switching to an operating channel width greater than 20 MHz, the operating class indicated within the Extended Channel Switch Announcement element or frame has a Channel spacing of 40 MHz.

If a Channel Switch Announcement frame is used to announce a switch to a 40 MHz operating channel width, then

* the Secondary Channel Offset element shall be present in the same frame, and
* the Wide Bandwidth Channel Switch shall not be present in the same frame.

If an Extended Channel Switch Announcement frame is used to announce a switch to a 40 MHz operating channel width, then the Wide Bandwidth Channel Switch shall not be present in the same frame.

If a Channel Switch Announcement element is used in a Beacon or Probe Response frame to announce a switch to a 40 MHz operating channel width, then the Wide Bandwidth Channel Switch subelement in the Channel Switch Wrapper element shall also be present in the same frame.

If an Extended Channel Switch Announcement element is used in a Beacon or Probe Response frame to announce a switch to a 40 MHz operating channel width, then the Wide Bandwidth Channel Switch subelement in the Channel Switch Wrapper element may be present in the same frame.

NOTE—The indicated operating class within the Extended Channel Switch Announcement element identifies the bandwidth and the relative position of the primary 20 MHz and secondary 20 MHz channels. Hence a Wide Bandwidth Channel Switch subelement is optional when the Extended Channel Switch Announcement element is used for a channel switch to a 40 MHz bandwidth.

If a Channel Switch Announcement frame is used to announce a switch to an 80 MHz, 80+80 MHz or 160 MHz operating channel width, then both the Secondary Channel Offset element and the Wide Bandwidth Channel Switch element shall be present in the frame.

If a Channel Switch Announcement element or an Extended Channel Switch Announcement element is used in a frame to announce a switch to a 80 MHz, 80+80 MHz or 160 MHz operating channel width, then a Wide Bandwidth Channel Switch subelement in the Channel Switch Wrapper element shall be present in the same frame.

If an Extended Channel Switch Announcement frame is used to announce a switch to an 80 MHz, 80+80 MHz or 160 MHz operating channel width, then the Wide Bandwidth Channel Switch element shall be present in the frame.

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| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** |
| 7368 |  |  | The structure of the Country element is better, but still not totally clear and consistent | A proposal will be brought to effect this, based on 12/1037r4 |

**Discussion:**

Upon further review of the Country element, there are two ambiguities which needs to be resolved.

First, note that the Triplet field has two different definitions – one consisting of Subband Triplet fields (Figure 8-90a), and another consisting of Operating/Subband Sequence (Figure 8-90c). D4.2 P76L61 states:



This could be interpreted as saying that an AP which has dot11OperatingClassesRequired equal to true shall not transmit any Subband Triplet fields. However, if the AP wishes to convey Country element information to other STAs which have dot11OperatingClassesRequired equal to false, then the AP needs to send both the Subband Triplet fields and the Operating/Subband Sequences.

Second, interpretation of the Number of Channels within a Subband Triplet field requires the knowledge of the operating channel width.

D4.2 P78L20:



If the Subband Triplet field is within a Operating/Subband sequence, then the operating channel width can be determined from the Operating Class subfield within the Operating Triplet field (see Figure 8-90d). However, if the Subband Triplet field is within a Subband Triplet sequence (see Figure 8-90a), then the operating channel width is not clearly defined. Note that the Subband Triplet sequence was introduced prior to 11n. Hence, it is natural to assume that legacy devices would presume that the operating channel width is 20 MHz for the Subband Triplet sequence.

**Proposed Resolution: CID 7368**

REVISED. See proposed text changes under CID 7368 in 11-13/0105r2 which clarifies the Country element further.

**Proposed Text Change: CID 7368**

**8.4.2.10 Country element**

***Change D4.2 P76L61 as follows:***

If dot11OperatingClassesRequired is true, then the Triplet field is composed of zero or more Subband Triplet fields followed by one or more Operating/Subband Sequences, as shown in Figure 8-90c. Each Operating/Subband Sequence is composed of one Operating Triplet field followed by one Subband Triplet Sequence field, as shown in Figure 8-90d. Each Subband Triplet Sequence field is composed of zero or more Subband Triplet fields. If dot11OperatingClassesRequired is true, the number of triplets in the Triplet field is , where *N* is the total number of Subband Triplet fields, *M* is the total number of Operating/ Subband Sequences contained in Country element and *P*(*m*) is the number of Subband Triplet fields making up Operating/Subband Sequence field *m*.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Zero or more | | One or more indexed by |
|  | Subband Triplet field | | Operating/Subband Sequence |
| Octets: | 3 | | 3 |
|  | | * Triplet field if dot11OperaratingClassRequired is true | |

***Change D4.2 P78L20 as follows:***

The Number of Channels subfield ~~of the subelement~~ is 1 octet in length. Outside the 2.4 GHz band, the channel numbers that are included in a group of channels are separated by the operating channel width. For Subband Triplet fields that are not within an Operating/Subband Sequence, the operating channel width is 20 MHz. For Subband Triplet fields that are within an Operating/Subband Sequence, the operating channel width is as specified by the Operating Class within the same Operating/Subband Sequence. In the 2.4 GHz band, the channel numbers that are included in a group of channels are separated by 5 MHz (for both 20 and 40 MHz operating channel width), except that channel 14 is treated as if it were 5 MHz above channel 13.

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| 7363 | Mark RISON | The new power/constraint/operating class stuff should be usable by non-11ac devices | A proposal will be brought to effect this, based on 12/1037r4 (with the "use WBCSE in 40 MHz CSAE in Beacon/PR switches" option chosen).  This includes generalising the VHT Transmit Power Envelope element not to be VHT-specific |

**Proposed resolution:**

REVISED.  The draft does not prohibit 11a/n devices released in the future to not understand/make use of the enhancement made in 11ac regarding transmit power control, channel switching, etc.  For example, 11n devices which can understand the VHT Transmit Power Envelope element may use the info in the element to control their transmit power.  Also, D4.0 already requires inclusion of the Wide BW Channel Switch subelement within Beacon or Probe Response frames when switching to 40 MHz, and further clarified under CID 7367 in 11-13/0105.  11n devices which can understand the WBCSse are not restricted to discard the helpful info within the WBCSse (that the new channel BW is 40 MHz).  Hence, the current draft already accomplishes what the comment is asking for.

Note to editor: There is no text change proposed specifically for this CID.  The resolution is REVISED because CID 7367 in 11-13/0105 has some edits which may aid this CID as well.

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| 7369 | Mark RISON | The new power/constraint/operating class stuff sometimes uses terminology inconsistently and has a few bugs | A proposal will be brought to effect this, based on 12/1037r4 |

**Proposed Resolution:**

REVISED.  Proposed resolutions on CIDs 7367 and 7368 in 11-13/0105 fixes known issues.

Note to Editor: No text change is proposed specific for this CID.

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| 7365 | Mark RISON | It would be desirable to allow a new Country to be specified for a switch signalled using a Channel Switch Announcement MMPDU (as already possible when using an Extended Channel Switch Announcement MMPDU) | A proposal will be brought to effect this, based on 12/1037r4 |

**Proposed Resolution:**

REJECTED.  There are two major purposes of the New Country element – 1) inform TX power limit and 2) inform Operating Class info for the new channel.  Note that the Channel Switch Announcement (CSA) does not use Operating Class.  Extended Channel Switch Announcement (ECSA) is used when transfer of Operating Class info is desired.  As for informing the TX power limit of the new channel, the New VHT Transmit Power Envelope element within the CSA frame already conveys such info.  Any new devices which understand the New Country element can be programmed to understand the New VHT Transmit Power Envelope element.  Hence, inclusion of a New Country element within the CSA frame is redundant and not necessary.