Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Action Item from Session #47: Consolidation of physical and logical channel selection**
Date Submitted	**2007-03-02**
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Re:	Working Group Letter Ballot #24a for IEEE P802.16h/D2.
Abstract	This document contains proposed editorial and technical changes to address the Action Item assigned to the author at Session #47. The aim is to provide clarification and consolidation of the mechanism for physical and logical channel selection within the draft standard.
Purpose	
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Action Item from Session #47: Consolidation of physical and logical channel selection

Paul Piggin
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Overview

This contribution addresses an action item assigned to the author at Session #47 concerning physical and logical channel selection within relevant sub clauses in [1].

A number of comments from the [2] are resolved through this contribution. Specifically the comments in [2] are 354, 369, 413, 429, 1001, 1002, 1014, 1015, 1037, 1102, 1107. These comments are detailed in Annex 1. The following section provides specific editorial instruction specifying changes required to [1] to address the comments described. The comments listed in Annex 1 are addressed accordingly:

Comment 354:

David Grandblaise

Comment:

The paragraph states that "After the IBS chooses the working channel for its radio link,...". How does IBS make this selection? Can this selection be done with the solution described in section 15.3.2.2?

Reply Comment:

(Xuyong Wu) *Add "(see 15.4.1)" here.*

Ad hoc suggestion:

15.3.2.2 deals with CCD (Candidate Channel Determination) and so is not the same as that being referenced here. CCD is a logical channel function; what is required in the text referred to by this comment is physical channel determination.

A reference to 15.4.1.1 should be added. Also the reference to DFS in the title of 15.4.1.1 should be removed.

John Sydor wrote: *Once we have the CSI/CMI/CXCC consolidation completed, this process will be better defined.*

David is ok with the suggestion of the ad hoc.

Comment 369:

David Grandblaise

Comment:

The subclause 15.3.1.3 "Community entry of new BS using signaling" should be added in a new subclause of 15.3.1.1 (like 15.3.1.1.4) since this section is applicable to CSI only.

Reply Comment:

(Xuyong Wu) *Only if we don't need this section. Some other feasible approaches have been addressed now?*

Ad hoc suggestion:

It appears that this comment is not related to this ad hoc activity. However the comment should be accepted since it is correct.

David is ok with the suggestion of the ad hoc.

Comment 413:

Mariana Goldhamer

Comment:

The text [sub clause *15.4.1.1*] shall use the CX CC.

Resolution:

*Subclause: 15.4.1 **Adaptive Channel Selection – ACS** goes to this adhoc discussion.*

Ad hoc suggestion:

It appears that this comment is best dealt with under the ad hoc activity concerning CSI/CMI/CXCC.

John Sydor wrote: *I take it Mariana would like to see text in line 42 which connects the CXCC to the ACS process. Would you like specific text that I can prepare for insertion into Sections 15.4.1 and 15.4.1.1? I can write something which would make the appropriate connection.*

These sections I believe were originally put together by Mariana and Xuyong, and they deal with one system changing another systems channel allocations.

Comment 429:

David Grandblaise

Comment:

Questions raised in the diamond box in the flowchart have not the appropriate grammatical interrogative form (e.g. "Optimized distribution can free subframe?" instead of "Can optimized distribution free subframe?" This observation is applicable to most of the flowcharts in the draft.

Ad hoc suggestion:

Accept.

David is ok with the suggestion of the ad hoc.

Remedy:

Change "Optimized distribution can free subframe?" into "Can optimized distribution free subframe?"

Change "Negotiation succeed?" into "Did negotiation succeed?"

Change "All kinds of optimization fail to negotiate" into "Did all kinds of optimization fail to negotiate?"

Comment 1001:

Mariana Goldhamer

Comment:

The UCP and clause 15 need to be harmonized, as the UCP creates interference to 802.16 systems based on clause 15:

- UCP does not prevents interference to 802.16 systems (LBS is not detecting 802.16 systems in DL or UL)

- UCP is not able to share the channel with 802.16 systems

Ad hoc suggestion:

LBT is primarily a feature to support coexistence with 802.11 systems.

UCP (via the aEQP feature) supports sharing of the band between 802.16 systems.

There is activity ongoing to bring together the approaches of 6.4 and 15. This discussion is wider than the discussion of physical and logical channel assignments, and moreover covers the main concepts of the amendment. Comment superseded.

Comment 1002:

Mariana Goldhamer

Comment:

Unfortunately we have now two un-compatible approaches for coexistence; if we do not succeed to merge them it is needed the separation of the relevant MAC messages in different chapters related to UCP and clause 15.

Ad hoc suggestion:

UCP is made up of a number of features that underpin the concept. The UCP features are supported in the form of MAC messages in 6.3, 8.4, 10, and 11. Clause 15 references the MAC messages added in the same sections. Text in 6.4 and 15 reference their appropriate MAC messages – what separation is required?

Comment 1014:

Ken Stanwood

Comment:

The sentence at line 13 and the sentence at line 35 partially contradict each other. At line 13 it talks about using the best channel. Line 35 talks about discarding any interfered channel.

Resolution:

Superceded by contribution 07/009r1 and the related comment resolution.

Ad hoc suggestion:

It appears that this comment is best dealt with under the ad hoc activity concerning CSI/CMI/CXCC.

John Sydor wrote: *This section has been revamped between D1 and D2....but Ken's comment still needs to be answered because it is still valid for D2. Additionally, his comment illuminates a subtlety of the Candidate Channel Determination process.....which is a process for choosing the best Physical Channel (not logical channels as written elsewhere).*

The subtlety lies in the following assumptions. A candidate channel can be occupied by two types of users that cause interference: it is either occupied by non-WirelessMAN-CX users such as 802.11 systems, cordless phones, etc. or it is occupied by other WirelessMAN-CX systems.... with the former we cannot coordinate channel sharing, with the latter we can. In the former the channel is useless to us (unless the interference power is low) in the latter, the channel can still be useful, even if the interference power is high.....the issue is how do we differentiate between the two and not waste time selecting channels?

To determine if a channel has non- WirelessMAN-CX users and if it can or cannot be used, we use the process detailed in and around line 35. We measure only in the No+Io intervals. WirelessMAN-CX systems are excluded from transmitting here....so in essence we are measuring occupation due to non- WirelessMAN-CX systems. If those measurements show us that noise is 3 dB higher than the No and/or that the interference statistics are non-Gaussian.....we then have proof that the channel is occupied heavily by a user(s) with which we cannot coordinate and that interference is so high that we simply wont be able to tolerate it......so the physical channel is discarded because of this occupancy.

If the No+Io measurements show no non-WirelessMAN-CX occupancy, we then check the channel for WirelessMAN-CX occupancy. This is done by monitoring the CMI slots. By monitoring these slots over time we determine the level of interference caused by all WirelessMAN-CX systems operating cooperatively on the channel. The value of interference here is set at [I]....and it may be high, but the physical channel is not discarded even if interference is high because it is occupied by WirelessMAN-CX systems, for which coordinated coexistence is still possible. These channels are then ranked by their intensity of [I], with the channel having the lowest [I] being the best. This is what is meant by the text around line 13.

I don't know if this clarification is suitable....I hope it explains why in one instance we discard channels while in other cases we rank their interference.

I would like to point out the CCD process is the Physical channel selection process, while the process of entry, shown in h36 of D1, is the Logical channel selection process.

<u>Comment 1015:</u>

Ken Stanwood

Comment:

The right hand box doesn't take into account the number of available master subframes. One channel may be only slightly worse, but may have more space to operate, possibly making it a better choice.

Reply Comment:

(Xuyong Wu): *Or using interference criteria, we can treat the channel below threshold the same.*

If no channel is below threshold and no one able to be coordinated to switch, we can treat this way.

Ad hoc suggestion:

It appears that this comment is best dealt with under the ad hoc activity concerning CSI/CMI/CXCC.

John Sydor wrote: *The process called "CCD" or "Candidate Channel determination" is the process for selecting the physical channel with the least amount of activity on it. The monitoring process first looks for non wirelessman-CX systems that may be on a candidate physical channel by monitoring the (Io+No) CCXX slots. IF the Physical Channel is free of non-WirelessMAN-CX systems, then in the next step, the monitoring process looks for WirelessMAN-CX systems that may be on the channel (remember, WirelessMAN-CX systems do not indicate their presence on the (Io+No) CXCC and cant be detected there). In the second monitoring process the CMI slots are checked, where the WirelessMAN-CX systems indicate their presence. In this manner the whole band is checked for occupancy by WirelessMAN-CX and non- WirelessMAN -CX systems.*

Ken's comments regarding sub-frame occupancy are therefore not relevant to the CCD process. They are relevant to the CMI identification process shown in H36 (of d1) or H42 of D2. In that process the best CMI/Subframe are chosen...so this is where his comment is satisfactorily addressed.

Comment 1037:

Ken Stanwood

Comment:

DFS and DCS are already well defined. There is no need to define yet another way of doing it.

Reply Comment:

(Xuyong Wu): *We can see:*

The system shall do the DFS/DCS first, while their is no channel's situation meet the necessary interference criteria, the system should execute channel distribution reallocation to enlarge the network capacity, as long as the system and its neighbor/neighbors related to the action.

More evidence is shown in C802.16h-05_042 & C802.16h-06_018, which shows, in most practical case, it increases more than 20 percent of network capacity.

Actually DFS/DCS is in different level of coexistence comparing to ACS. ACS is attempt to doing resource allocation in a collaborative way, while I believe it is within the scope.

Ad hoc suggestion:

It appears from inspection and reply comments that ACS is a method to find a minimum interfered logical channel with an element of resource allocation. Perhaps the ad hoc activity concerning CSI/CMI/CXCC can comment?

John Sydor wrote: *Yes I would agree with Ken's comment and would also delete 15.4.1.2 but leave it up to your ad-hoc to recommend this. These sections discuss the manipulation of one system's chosen physical channels by another system. I doubt any operators would allow this. If the channel selection process undertaken by entering systems is robust and respects existing occupancy, we don't need a process that is being discussed here.*

Comment 1102:

Xuyong Wu

Comment:

According to IEEE C802.16-06/123: Action Items from Session #46 (Mariana Goldhamer; 2006-11-17) I list some comments to be resolved in the action items; some did have resolutions and have some consensus during the discussion.

Resolution:

Accept C802.16h-07_003r2 with additional

Ad hoc suggestion:

Xuyong – what is the resolution of all these action items? Comparing 003r2 with database it is not completed clear to me. There are references to 'waiting for clarification' on elements that impact this ad hoc discussion. Again this comment is wider than a consideration of physical and logical channels. Xuyong – can you please comment on the state of the implement of the action items in 003r2, especially those related to this ad hoc. Thanks.

Comment 1107:

John Sydor

7

Comment:

More precise definition of active interference management is required. Sentences 2 and 3 of lines8-10 of page 65 should be combined.

Inter-system detection should also be pointed out.

See remedy. Delete current lines 2) and 3) and replace as below:

2) Broadcasting of specific messages or signaling in order to determine the extent of these broadcasts as interference on other co-channel systems and receiving report messages back from the interfered-with systems indicating the effects. (15.3.1.1.1. &15.3.2)

3) Detecting inter-system interference such as radar, envelop detection of bursty users, etc.

Ad hoc suggestion:

The comment is adding clarity to ill defined high-level concepts in terms of CMI and CSI. What is the relevance to physical and logical channel definition?

Anyway the suggested remedy needs rewording. The language is not precise and somewhat ambiguous.

John Sydor wrote: *This process (2) was part of the interference information gathering approach and it alludes to CMI and CSI...it has no relevance to physical and logical channel definition.*

I thought (2) added clarity....though it is complex. For (3) try:

3) Detecting inter-system interference such as radars or other users.

Observations and further direction for ad hoc activity

It is necessary to include a definition for 'working channel' or 'working frequency'. 16/D2 contains 3 occurrences of 'working frequency', and 59 'working channel', but there is no definition. Is it better to use a term like 'operational frequency/channel'?

David Grandblaise says "Definitions for DFS, DCS, ACS, and CCD are required in the draft."

Do we agree that:

DFS is a method of finding a minimum interfered physical channel. This is specifically for SSUs.

DCS is a method of finding a minimum interfered physical channel. This is specifically for non-SSUs.

ACS is a method of finding a minimum interfered logical channel with an element of resource allocation.

CCD is a method of finding a minimum interfered physical and logical channel. This is specifically for logical CXCC slots.

John Sydor wrote: *CCD is a Physical Channel determination operation in that it selects the most appropriate physical channel based on the least amount on non-WirelessMAN-CX/Wirelessman-CX occupancy. The process in flowchart h35 identifies channels which can or cannot be used, and of the channels that can be used, ranks them by their interference. If the physical channel is occupied by a powerful non-wirelessMAN-CX user, it is discarded. Logical channels are selected by the process in H36. Here the IBS finds a suitable subframe.*

Specific editorial changes

This section provides a list of changes to IEEE P802.16h/D2 document [1].

Blue underlined text represents specific editorial additions.

Red strikethrough text is to be deleted.

Black text is text already in the draft.

Bold italic text is editorial instructions to the editor.

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Annex 1

Comment 354:
David Grandblaise

Page: 66
Line: 36

Subclause: 15.3.1.1.1

Comment:
The paragraph states that "After the IBS chooses the working channel for its radio link,...". How does IBS make this selection? Can this selection be done with the solution described in section 15.3.2.2?

Suggested Remedy:
Clarify the working channel selection by the IBS.

Reply Comment:
(Xuyong Wu) *Add "(see 15.4.1)" here.*

Comment 369:
David Grandblaise

Page: 70
Line: 61
Subclause: 15.3.1.3

Comment:
The subclause 15.3.1.3 "Community entry of new BS using signaling" should be added in a new subclause of 15.3.1.1 (like 15.3.1.1.4) since this section is applicable to CSI only.

Suggested Remedy:
Move the subclause 15.3.1.3 into the new subclause 15.3.1.1.4 and remove subclause 15.3.1.3.

Reply Comment:
(Xuyong Wu) *Only if we don't need this section. Some other feasible approaches have been addressed now?*

Comment 413:
Mariana Goldhamer

Page: 85
Line: 42
Subclause: 15.4.1.1

Comment:
The text shall use the CX CC.

Suggested Remedy:
Modify the text accordingly.

Resolution:
Subclause: 15.4.1 **Adaptive Channel Selection – ACS** *goes to this adhoc discussion.*

Comment 429:
David Grandblaise

Page: 94
Line:
Subclause: 15.4.2.2

Comment:
Questions raised in the diamond box in the flowchart have not the appropriate grammatical interrogative form (e.g. "Optimized distribution can free subframe?" instead of "Can optimized distribution free subframe?" This observation is applicable to most of the flowcharts in the draft.

Suggested Remedy:
Provide the appropriate interrogative form in the flowcharts.

Comment 1001:
Mariana Goldhamer

Page: 1
Line: 24
Subclause: *All*

Comment:
The UCP and clause 15 need to be harmonized, as the UCP creates interference to 802.16 systems based on clause 15:
        - UCP does not prevents interference to 802.16 systems (LBS is not detecting 802.16 systems in DL or UL)
        - UCP is not able to share the channel with 802.16 systems

Suggested Remedy:
Discuss in the ad hoc group.

Comment 1002:
Mariana Goldhamer

Page: 7
Line:
Subclause: *6*

Comment:
Unfortunately we have now two un-compatible approaches for coexistence; if we do not succeed to merge them it is needed the separation of the relevant MAC messages in different chapters related to UCP and clause 15.

Suggested Remedy:

Comment 1014:
Ken Stanwood

Page: 74
Line: 13
Subclause: *15.3.2.2*

Comment:
The sentence at line 13 and the sentence at line 35 partially contradict each other. At line 13 it talks about using the best channel. Line 35 talks about discarding any interfered channel.

Suggested Remedy:

Clarify.

Resolution:
Superceded by contribution 07/009r1 and the related comment resolution.

Comment 1015:
Ken Stanwood

Page: 75
Line: 16
Subclause: *15.3.2.2*

Comment:
The right hand box doesn't take into account the number of available master subframes. One channel may be only slightly worse, but may have more space to operate, possibly making it a better choice.

Suggested Remedy:
Specifically leave the algorithm for vendor differentiation.

Reply Comment:
(Xuyong Wu): *Or using interference criteria, we can treat the channel below threshold the same.*
If no channel is below threshold and no one able to be coordinated to switch, we can treat this way.

Comment 1037:
Ken Stanwood

Page: 85
Line: 25
Subclause: *15.4.1*

Comment:
DFS and DCS are already well defined. There is no need to define yet another way of doing it.

Suggested Remedy:
Delete section 15.4.1.

Reply Comment:
(Xuyong Wu): *We can see:*
The system shall do the DFS/DCS first, while their is no channel's situation meet the necessary interference criteria, the system should excute channel distribution reallocation to enlarge the network capacity, as long as the system and its neighbor/neighbors related to the action.

More evidence is shown in C802.16h-05_042 & C802.16h-06_018, which shows, in most practical case, it increases more than 20 percent of network capacity.
Actually DFS/DCS is in different level of coexistence comparing to ACS. ACS is attempt to doing resource allocation in a collaberative way, while I believe it is within the scope.

Comment 1102:
Xuyong Wu

Page: 999
Line: 999
Subclause:

Comment:
According to IEEE C802.16-06/123: Action Items from Session #46 (Mariana Goldhamer; 2006-11-17) I list some comments to be resolved in the action items; some did have resolutions and have some consensus during the discussion.

Suggested Remedy:
1) Accept the proposed remedy in contribution C802.16h-07_003 and its updated revision.
2) Continue the discussion for resolution after the consensus in the rest issue.

Resolution:
Accept C802.16h-07_003r2 with additional

Comment 1107:
John Sydor

Page: 65
Line: 8
Subclause: *15.3*

Comment:
More precise definition of active interference management is required. Sentences 2 and 3 of lines8-10 of page 65 should be combined.
Inter-system detection should also be pointed out.
See remedy. Delete current lines 2) and 3) and replace as below.

Suggested Remedy:
2) Broadcasting of specific messages or signaling in order to determine the extent of these broadcasts as interference on other co-channel systems and receiving report messages back from the interfered-with systems indicating the effects. (15.3.1.1.1. &15.3.2)

3) Detecting inter-system interference such as radar, envelop detection of bursty users, etc.

References

[1] IEEE P802.16h/D2: *Air Interface for Fixed Broadband Wireless Access Systems Improved Coexistence Mechanisms for License-Exempt Operation*, Draft Standard.

[2] IEEE 80216h-06_068r4: *Letter Ballot #24 Commentary file with resolutions from Session #47.*