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Title	Action Item from Session #47: Ad-Hoc Status Report on the CMI/CSI/CXCC Consolidation Process
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Source(s)	John Sydor Communications Research Centre 3701 Carling Avenue Ottawa, Ontario Voice: 613-998-2388 Fax: [Fax Number] john.sydor@crc.ca
Re:	CSI/CMI/CXCC Ad Hoc Consolidation: Status Report
Abstract	Summary of the Ad-Hoc developments
Purpose	Consolidate the diverse signaling concepts that support coexistence in WirelessMAN-CX
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Action Item from Session #47: Ad-Hoc Status Report on the CMI/CSI/CXCC Consolidation Process

John Sydor
Communications Research Center Ottawa

Introduction

The Ad-Hoc for coexistence of the CSI/CMI/CXCC concepts was started on 12 February 2007. There have been a total of 26 reply comments on the Ad-Hoc to date. The Ad-hoc set up an agenda to cover the major issues of the consolidation and is working on a consensus basis with all of the authors of the concepts. The details of the work can be found on the LE Forum reflector site.

Status to Date

Agreement or Agreement in Principle amongst the Ad-hoc members has been reached on the following issues :

- CMI and CSI signals can be encapsulated in an RSSI envelop.
- Location of CMI/CSI to be at the TTG gap.
- Size of the slot to accommodate the CMI/CSI signaling still has to be determined, but that it will be in the order of hundreds of microseconds in duration.
- Definition of RS somewhat nailed down: a carrier set composed of OFDM(A) subcarrier suites, which can be similarly found in other bandwidths and can be power detected. They encode specific terminals, they can be sent at specific directions, their identity is better ascertained by knowing what slot (frame/subframe/time offset)

Pending issues to be soon resolved or which agreement is close at hand:

- Proposal made to move CXCC to TTG gap, label its frame locations with respect to absolute timing reference.
- Radio Signature signaling needs to be better defined and new text is necessary to help this. RS concept to be included in the slot structure proposed for CMI/CSI at the TTG.
- The CSI coding as an fragmentary RSSI bit is a concept that can be improved if we provide FEC to it. Annex 1 to this report shows the improvement in BER garnered is FEC is used. FEC will also reduce that number of fragmentary bits required to undertake the CSI signaling. This issue to be discussed.

Work at Hand and Plan for the next 6 weeks:

Definition of New Control Channel (details)

The main focus of the Ad-hoc should be to define a new Coexistence Control Channel and have it located at the TTG gap. In doing this, all of the functions of the current CXCC will be migrated to the new channel, which will be defined in a manner to accommodate the signaling required for CSI/CMI/and RS. OCSI/ICSI scheme and the claiming scheme can be blended.

Consolidation of Messaging undertaking same functions

All three schemes deal with the same issues such as informing foreign receivers of the interference presence, identification, quantification of interference, etc. Some messages such as BSD and BS_NURBC have similar roles. Task at hand will be to go through the D2 document, compile such common features, and begin the discussion of consolidating messaging that undertakes common tasks in the Ad-Hoc

Clear Differentiation of Separate Features in Proposed Schemes

Though there are commonalities between the three approaches that we should consolidate, there are also significant differences…which is not bad because each scheme has a different technical functionality. However, it is important to have a clear delineation of each scheme, and consolidate each scheme to a particular part of Section 15 where it can be localized (rather than distributed throughout D2). As part of this work special schemes and techniques unique to the scheme should be referenced and used. For example, in the CMI signaling concept there is no use for a BSIS to help in the identification of the interferers. In the RS scheme, a BSIS is required in order to interpret a Radio Signature received at a particular Frame/Sub-frame/Time offset, etc. Connections such as these should be emphasized, especially when one scheme need it more than another.

Incorporation of OFDMA (IEEE 802.16e)

Because OFDMA results in sub-carrier selection and transmission, concepts such as the CMI interference identification need to be restructured. Conceivably concepts common to RS can be used here, though at issue is the speed of messaging and the detail that may be required to support dynamic interference control in an OFDMA environment. Current references to OFDMA in the D2 can be retained, but the Ad-hoc need some better details on how OFDMA is supported using the signaling schemes.

Detection of Non-WirelessmanCX users

The concept of the No+Io noise measurement interval has to be revisited and possibly changed to allow the detection of users such as the IEEE 802.11y beacon. Work here will depend on developments elsewhere and the outcome of the joint Dot16h/Dot11y meetings in Orlando.

Action Items for Session #47

These have been reviewed but no action is taken on them by directly speaking to the commentators because of the consolidation activity that is being undertaken. The action items are being used as a general directive for the Ad Hoc….ie, the issues they raise are being resolved through the Ad Hoc work. It is hoped that these will all be addressed by Session #49.

Affected Sections of the Standard D2 (IEEE P802.16h/D2 January 2007)

The following sections in D2 have the possibility of being changed as a consequence of the consolidation process. The sections identified usually have a reference to a concept, or have parameters related to a concept that is under consideration by the Ad-hoc.

Section in D2 of Interest to Ad-Hoc	Comments
Table of Contents	Needs to be changed accordingly, wait for final consolidation to be completed.

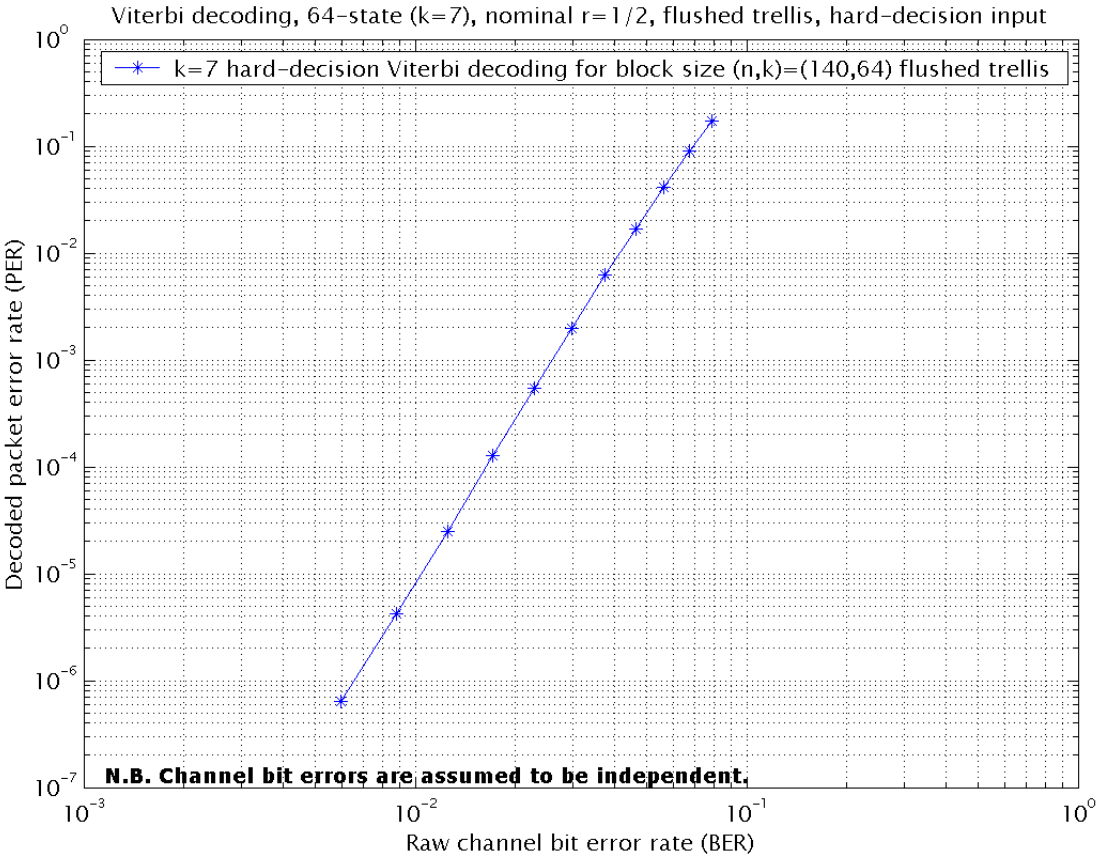
List of Figures	As above.
3.0 Definitions	Affected sections: 3.93,3.95,3.98,3.99,3.111
4.0 Abbreviations	To be changed accordingly
6.3.2.3.62	Concept OK, nomenclature changes only
6.3.2.3.63	As above
6.3.2.3.67	As above
6.3.2.3.68	As above
6.3.2.3.71	As above
6.3.2.3.72	As above
8.2.1.9.2.8	As above
8.3.6.2.8	As above
8.3.6.2.10	As above
8.4.4.2	May be affected/Unknown at present
8.4.5.3.28	Nomenclature changes expected/other changes possible with consideration of OFDMA in Ad-hoc
8.4.5.3.31	As above.
10.5.1	Tables 345a;345b;345c;345d likely will see significant modification or replacement with a functionally equivalent tables.
10.5.3.1	Concept OK, section will need to be re-written to reflect consolidation.
10.5.4	As above
11.11	Reference to CSI concept parameters here. Needs consideration, esp with ref to BS_NURBC
11.12	As above
11.20	Possible nomenclature changes
11.21	As above
11.22	As above
15.1.3.1	Reference to ICSI broadcast which may be now handled by the equivalent of a CXCC. There is also reference to CSI/CMI, which may be altered in the consolidation.
15.1.3.2	Concept likely OK. Nomenclature and consolidation changes may impact on the written description here.
15.1.4	Section need to be re-written to reflect consolidation.
15.1.4.1	As above but also Figure h19 needs changing
15.1.4.1.1	Needs to be consolidated with Sec 15.1.4.1.2 Concept to be retained. H20-22 need to be redrawn.
15.1.4.1.2	Consolidate with 15.1.4.1.1. Figure h17 to be blended with h20-22. CX_CMI frame numbering plan needs consolidation with

	OCSI/ICSI identification plan.
15.1.5.3	This section to be changed significantly.
15.1.5.3.1	This section to be changed significantly.
15.2.1.1	Reference to a control channel attribute needs changing.
15.2.1.5	Synchronization refers to a control channel attribute, needs text modification
15.2.1.6	Reference to control channel attributes, needs text modification.
15.3	References made to CMI and CSI which will require text changes.
15.3.1.1.1	General reworking of this section is required, drawings must reflect new forms equivalent to ICSI and OCSI mappings.
15.3.1.1.2	Conceptually to be preserved and integrated with new concept of a control channel.
15.3.1.1.3	Conceptually to be preserved and built on. CMI is to be integrated into the timing of a CSI fragmentary bit.
15.3.1.2.	This may be a good spot to give more Radio Signature details, especially with the concept consolidated.
15.3.1.2.1	As above. Details needed on the concept.
15.3.1.2.2	This concept, essentially replicate that detailed in Sec 15.5.1.1 and 15.3.2.4. Messaging is used to communicate to coexistence neighbors. Consolidation is required here.
15.3.1.3	As part of the consolidation, this section should be re-written to indicate that the process is used for coordinating community entry for systems of different PHYs. This process detailed is handled more efficiently using CMI messaging for Same-PHY systems. Discussion is required regarding the circumstances where this approach is used
15.3.1.4	Collision detection of CSI messages may be handled more conveniently using a consolidated control channel concept. This section to be reviewed once such channel is determined.
15.3.2	This section has to be re-evaluated in view of the consolidation.
15.3.2.1	This section has to be re-evaluated. Use of wide (1.9 ms) CXCC not needed since BSD collision probability will change with

	incorporation into the CCS/CMI
15.3.2.2	This section is will have to be re-evaluated based on the outcome of the consolidation. Candidate Channel determination must be undertaken using new control channel characteristics. Figure may need changing.
15.3.2.3	This section may remain the same except for nomenclature changes.
15.3.2.4	Conceptual remains the same/ Nomenclature changes.
15.3.2.5	As Above
15.3.3.1	Various changes to places referring to CSI/CMI etc.
15.4.1.2	Reference made to OCSI, other nomenclature changes may be needed.
15.4.2.1.1	Numerous reference made to CXCC functions, nomenclature changes only.Radio signature references also made
15.4.2.1.2	As above.
15.4.2.3	RS reference
15.4.2.3.1.1	RS reference Reference to BS_NURBC
15.4.2.4.4	Reference to Radio Signatures
15.4.3.2	Reference to Cognitive Signals (?), Frequency keyed signaling, etc.
15.4.3.3	As Above
15.4.3.4	As Above
15.5.1	Table h11 nomenclature changes. In table h12 reference to RS
15.5.1.17	Reference to RS
15.5.1.18	As Above
15.5.1.19	Reference to RS operation which may change with consolidation…maybe not.
15.5.1.20	Reference to RS operation.
15.5.1.21	As above.
15.5.1.27	Reference to CMI based signaling which may be changed.
15.5.1.28	As above
15.5.1.59	Reference to the OCSI message
15.5.1.60	As above
15.5.5.1.1	Reference to the BS_NURBC

Annex 1: Viterbi Decoding of Fragmentary RSSI Bits.

Encoding of a 64 Bit CSI/RSSI fragmentary message into a 140 bit block will result in the BER improvement as shown below. Raw channel error rate will be the BER rate of the RSSI detector system.


Viterbi decoding, 64-state (k=7), nominal r=1/2, flushed trellis, hard-decision input
k=7 hard-decision Viterbi decoding for block size (n,k)=(140,64) flushed trellis
Decoded packet error rate (PER)
Raw channel bit error rate (BER)
N.B. Channel bit errors are assumed to be independent.