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Re:	Call for Technical Proposals regarding IEEE Project 802.16j 2006-12-12
Abstract	This contribution proposes the changes in the diversity set and anchor BS updating procedure.
Purpose	This contribution is provided as input for the IEEE 802.16j amendment
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Using the Relative Thresholds in Handover Procedure

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1. Introduction

This contribution proposes using of the relative thresholds instead of absolute thresholds in the diversity set update and anchor BS or RS update procedure in case of MDHO or FBSS handover. With the purpose of integrating this contribution into IEEE 802.16j standard a terminology from document IEEE 802.16j-06/217 [1] is used.

2. Absolute and relative thresholds

According to IEEE 802.16e-2005 [2] the decision about the diversity set updating in the case of MDHO/FBSS is based on the absolute CINR means in the unit of dB. These values are measured within the scanning procedure performed by MS. During the scanning interval the MS scans neighbour ISs and also all ISs included in diversity set. The scanning result of these ISs can be used to decide about diversity set or anchor ISs update. This decision can be based either on the comparison of results obtained from neighbour ISs and the specified thresholds or on the comparison of results obtained from neighbour ISs and the ISs included in the diversity set with thresholds.

The threshold values are set in the fields H_Add Threshold and H_Delete Threshold in DCD message. In [1], H_Add Threshold and H_Delete Threshold are absolute values and are used by MS to add and drop a neighbour IS to the diversity set respectively. For these absolute thresholds the diversity set is updated every time when the measured CINR mean is higher or lower then H_Add or H_Delete thresholds. This situation is illustrated in the figure 1.

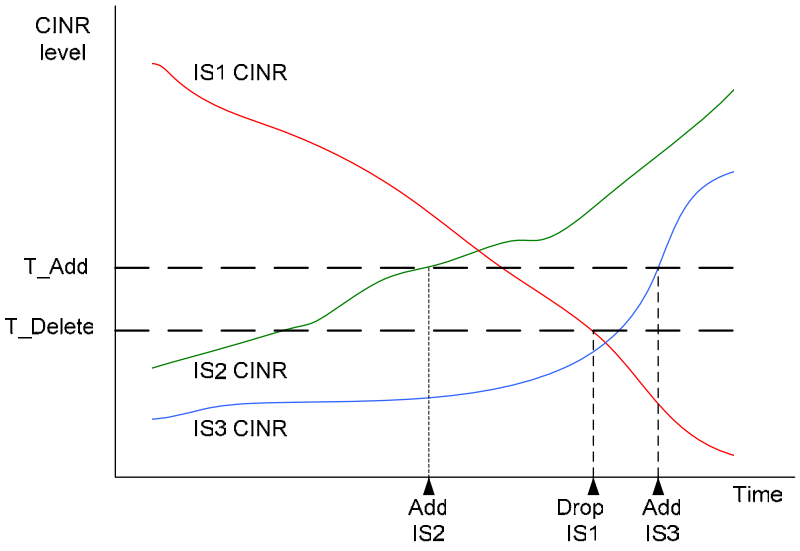

Figure 1. Diversity set updating procedure with absolute thresholds relation to 802.16e

The proposed modification is to use the relative thresholds instead of absolute one. It means the diversity set updating is based on the interrelation among the CINR means of the involved ISs. The MS should send a request to add this neighbour IS to the diversity set when the difference between neighbour IS CINR and serving IS CINR is less then H_Add Threshold. The MS should send a request to drop the IS from the diversity set when the difference between this IS CINR and serving IS CINR is greater then H_Delete Threshold.
Absolute threshold are easier to implement, but it has difficulty in dealing with dynamic load changes. The using of the relative thresholds allows the reducing of the length of threshold parameters from 8 bits to 4 bits per parameter because the relative threshold values are in the lower order than absolute. In the proposal the parameters were integrated into one parameter with two parts per 4 bits as it can be seen in Table 358.

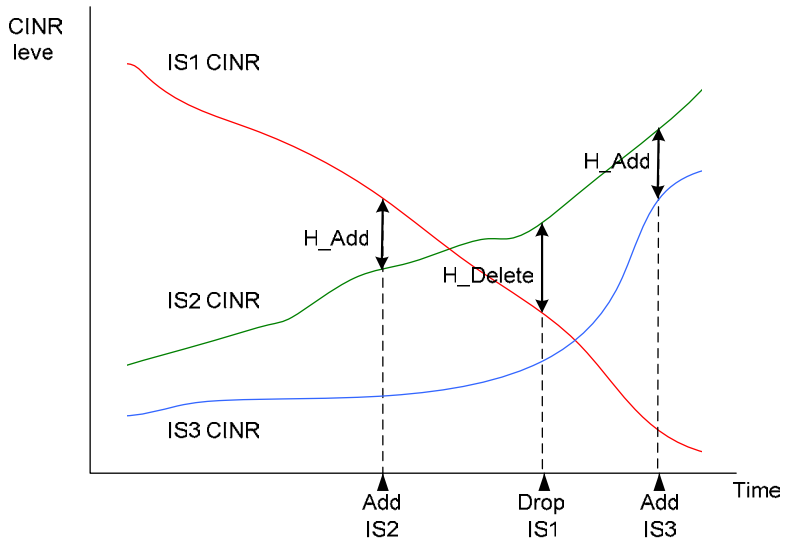

Figure 2. Diversity set updating procedure with relative thresholds

3. Proposed text

[Replace the fourth paragraph in subsection 6.3.22.3.1 with following paragraph]

The IS supporting MDHO shall broadcast the DCD message that includes the H_Add Threshold and H_Delete Threshold. These thresholds, the CINR mean of neighbour IS and IS that are in the current diversity set are used by MDHO handovers to decide if MOB_MSHO-REQ should be sent. The MS should send MOB_MSHO-REQ asking to add this neighbour IS to the diversity set when the difference between neighbour IS CINR and serving IS CINR is less then H_Add Threshold. The MS should send MOB_MSHO-REQ asking to drop the IS from the diversity set when the difference between this IS CINR and serving IS CINR is greater then H_Delete Threshold.

[Replace the second paragraph in subsection 6.3.22.3.2 with following paragraph]

The IS supporting FBSS shall broadcast the DCD message that includes the H_Add Threshold and H_Delete Threshold. These thresholds, the CINR mean of neighbour IS and IS that are in the current diversity set may be used by FBSS capable MS to decide if MOB_MSHO-REQ should be sent. The MOB_MSHO-REQ is sent to request switching to another anchor IS or updating diversity set. When the difference between IS CINR and serving IS CINR is greater then H_Delete Threshold, the MS shall send MOB_MSHO-REQ asking to drop this IS from the diversity set. When the difference between neighbour IS CINR and serving IS CINR is less then H_Add Threshold, the MS shall send MOB_MSHO-REQ asking to add this IS to the diversity set. In each case, Anchor IS responds with MOB_BSHO-RSP with updated diversity set.

[Insert the following text at the end of subsection 6.3.22.2.1]

During the scanning interval the MS scans also all ISs from diversity set. The scanning result of ISs contained in diversity set can be used to decide about diversity set or anchor ISs update. This decision is based on the comparison of results obtained from neighbour ISs and the ISs contained in the diversity set as described in 6.3.22.3.1 and 6.3.22.3.2.

[Change table 358 as indicated]

Table 358 – DCD channel encoding

Name	Type (1 byte)	Length	Value (variable length)	PHY scope
TTG	7	2	TTG (in PSs). Used on TDD systems only	SCa, OFDMA
RTG	8	1	RTG (in PSs). Used on TDD systems only	SCa, OFDMA
$EIRxP_{IR,max}$	9	2	Initial Ranging maximum equivalent isotropic received power at BS Signed in units of 1 dBm.	All
Frame Number	15	3	The number of the frame containing the DCD message or the number of the frame of the last fragment of the DCD message if the DCD is fragmented.	OFDM
H-ARQ ACK delay for UL burst	17	1	1 = 1 frame offset 2 = 2 frame offset 3 = 3 frame offset	OFDMA
Permutation type for broadcast region in HARQ zone	19	1	0 = PUSC 1 = FUSC 2 = optional FUSC 3 = AMC	OFDMA
Maximum retransmission	20	1	Maximum number of retransmission in DL HARQ. Default value shall be 4 retransmissions.	OFDMA
Default RSSI and CINR averaging parameter	21	1	Bit #0-3: Default averaging parameter for physical CINR measurements, in multiples of 1/16 (range [1/16, 16/16], 0x0 for 1/16, 0xF for 16/16). Bit #4-7: Default averaging parameter for RSSI measurements, in multiples of 1/16 (range [1/16, 16/16], 0x0 for 1/16, 0xF for 16/16). Default value shall be 0x3.	OFDMA

Table 358 – DCD channel encoding (*continued*)

Name	Type (1 byte)	Length	Value (variable length)	PHY scope
DL AMC allocated physical bands bitmap	22	6	A bitmap describing the physical bands allocated to the segment in the DL, when allocating AMC subchannels through the HARQ MAP, or through the Normal MAP, or for Band-AMC CINR reports, or using the optional AMC permutation (see 8.4.6.3). The LSB of the first byte shall correspond to band 0. For any bit that is not set, the corresponding band shall not be used by the SS on that segment. When this TLV is not present, BS may allocate any physical bands to an SS.	OFDMA

DL region definition	34	variable	Num_ region (6 bits for the number of regions, 2 bit reserved)
			For (i = 0; i<Num_ region;i++){
			OFDMA symbol offset (8 bits)
			Subchannel offset (6 bits)
			No. OFDMA symbols (8 bits)
			No. subchannels (6 bits)
			}
			padding bits to align boundary of byte
				-

HO type support	50	1	Bit 0: HO Bit 1: MDHO Bit 2: FBSS HO Bit 3-7: *Reserved*	OFDMA
~~H_Add Threshold~~	~~31~~	~~1~~	~~Threshold used by the MS to add a neighbor BS to the diversity set. When the CINR of a neighbor BS is higher than H_Add, the MS should send MOB_MSHO-REQ to request adding this neighbor BS to the diversity set. This threshold is used for the MS that is perform MDHO/FBSS HO. It is in the unit of dB If the BS does not support FBSS HO/MDHO, this value is not set.~~	~~OFDMA~~
~~H_Delete Threshold~~	~~32~~	~~1~~	~~Threshold used by the MS to drop a BS from the diversity set. When the CINR of a BS is lower than H_Delete., the MS should send MOB_MSHO-REQ to request dropping this BS from the diversity set. This threshold is used for the MS that is performing MDHO/FBSS HO. It is in the unit of dB. If the BS does not support FBSS HO/MDHO, this value is not set.~~	~~OFDMA~~
HO Thresholds	31	1	Bit #0 - #3: H_Add Threshold Bit #4 - #7: H_Delete Threshold The thresholds are used by the MS to diversity set update. These thresholds are used only for MS that is performing MDHO or FBSS. If the MS does not support MDHO or FBSS or perform HHO, these values are not set.	OFDMA
ASR(Anchor Switch Report) Slot Length (M) and Switching Period (L)	33	1	Bit #0 - #3: M, in units of frames Bit #4 - #7: L, in units of ASR slots	OFDMA
Paging Group ID	35	2	One or more logical affiliation grouping of BS (see 6.3.2.3.55)	-

Table 358 – DCD channel encoding *(continued)*

Name	Type (1 byte)	Length	Value (variable length)	PHY scope
TUSC1 permutation active subchannels bitmap	36	9	This is a bitmap describing the subchannels allocated to the segment in the DL, when using the TUSC1 permutation (see 8.4.6.1.2.4). The LSB of the first byte shall correspond to subchannel 0. For any bit that is not set, the MS on that segment shall not use the corresponding subchannel. The active subchannels are renumbered consecutively starting from 0.	-
TUSC2 permutation active subchannels bitmap	37	13	This is a bitmap describing the subchannels allocated to the segment in the DL, when using the TUSC2 permutation (see 8.4.6.1.2.5). The LSB of the first byte shall correspond to subchannel 0. For any bit that is not set, the MS on that segment shall not use the corresponding subchannel. The active subchannels are renumbered consecutively starting from 0.	-
Hysteresis margin	51	1	Hysteresis margin is used by the MS to include a neighbor BS to a list of possible target BSs. When the CINR of a neighbor BS is larger than the sum of the CINR of the current serving BS and the hysteresis margin for the time-to-trigger duration, then the neighbor BS is included in the list of possible target BSs in MOB_MSHO-REQ. It is the unit of dB and applicable for only HHO.	All
Time-to-Trigger duration	52	1	Time-to-Trigger duration is the time duration for MS decides to select a neighbor BS as a possible target BS. It is the unit of ms and applicable only for HHO.	All
Trigger	54	variable	The Trigger is a compound TLV value that indicates trigger metrics. The trigger in this encoding is defined for serving BS or commonly applied to neighbor BSs.	-
N+1	60	1	The operator will define the N+I (Noise + Interference) based on the related RF system design calculations.	OFDM
Downlink_burst_profile for multiple FEC types	153	1	May appear more than once (see 6.3.2.3.1 and 8.4.5.5). The length is the number of bytes in the overall object, including embedded TLV items.	OFDMA
BS Restart Count	154	1	The value is incremented by one whenever BS restarts (see 6.3.9.11). The value rolls over from 0 to 255.	All

References

[1] IEEE C802.16j-06/217, “Overview of the proposal for MS MAC handover procedure in an MR network”, November 2006

[2] IEEE Standard 802.16e-2005/802.16cor1, “IEEE Standard for Local and Metropolitan Area Networks−Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems. Amendment 2: for Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands”, 2006-02-28.