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Title	*Extension of talk-around direct communication between HR-MSs via HR-BS*
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Re:	Call for Comments on the 802.16.1a Draft AWD, IEEE C802.16n-11/0033
Abstract	This provides AWD text proposals of extending communication coverage of talk-around direct communication using infrastructure communication via infrastructure node in IEEE 802.16.1a
Purpose	To be discussed and adopted by 802.16 TGn
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Patent Policy	The contributor is familiar with the IEEE-SA Patent Policy and Procedures: <http://standards.ieee.org/guides/bylaws/sect6-7.html#6> and <http://standards.ieee.org/guides/opman/sect6.html#6.3>. Further information is located at <http://standards.ieee.org/board/pat/pat-material.html> and <http://standards.ieee.org/board/pat>.
Status	*This document does not represent the agreed views of the IEEE 802.16 Working Group or any of its subgroups*. It represents only the views of the participants listed in the "Source(s)" field above. It is offered as a basis for discussion. It is not binding on the contributor(s), who reserve(s) the right to add, amend or withdraw material contained herein.

Extension of talk-around direct communication between HR-MSs via HR-BS

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Introductions

802.16 AWD provides a talk-around direct communication that serves voice applications over MAC SAP. IP layer is not served to carry voice applications like VoIP and is not used for TDC between peer-to-peer HR-MSs. One or two hop TDC links provides MAC connectivity of traffic between voice coder and decoder. When a voice coder generates a voice packet and sends it to MAC SAP as MAC SDU. A MAC layer at an HR-MS transmits MAC SDUs to corresponding MAC layer at a peer HR-MS. The MAC layer at the peer HR-MS provides MAC SDUs for voice decoder.

Generally RTP/IP is a transport protocol over IP protocol for voice application for infrastructure communication. The infrastructure communication requires network entities like IP related servers including DHCP server, AAA server, application server, network nodes, etc. A HR-BS is connected to a backbone network and exchange messages with network entities. When an HR-MS establishes a service flow for an application at an air interface, the HR-BS establishes a service flow at a wireline interfaces and interacts with network entities.

For disaster relief we can easily assume that an HR-BS has lost its connection to backbone network. When the HR-BS does not exchange messages with network entities and fails to interact with network entities, the HR-BS can provide MAC connectives with HR-MSs under HR-BS service coverage. An HR-MS uses this MAC connectivity to exchange voice packets as incidental operations in use cases including disaster relief.

This contribution provides an extension of talk-around direct communications between HR-MSs using MAC connectivity by HR-BS. An HR-MS uses MAC layer functions only without interacting with network entities and establishes a service flow that is served by MAC connectivity only. Voice packets are served by a MAC SAP without IP layer and are carried to a corresponding MAC SAP via an HR-BS. This contribution adds the followings:

- HR-BS broadcasts backbone status in AAI-MM-ADV message.

- When HR-BS fails to connect to backbone network, MAC layer connection is used to establish an extension of TDC via HR-BS.

- This extension of TDC continues to work after connection recovery to backbone network. But HR-BS does not establish new extension of TDC when backbone connection is available.

- When HR-BS does not connect to backbone network, all HR-MSs supporting extension function of TDC shall wait for a Blind Page Advertisement message every cycle. An HR-MS may initiate to establish a service flow. An HR-MS shall respond to the Blind Paging Advertisement message having the HR-MS's addresses for TDC and establish a corresponding service flow. An HR-BS carries voice packets over these service flows.

- The extension of TDC for group communication is FFS. (Out of scope of this contribution)

Proposed Text for the 802.16n Amendment Working Document (AWD)

Note:

The text in **BLACK** color: the existing text in the 802.16n Amendment Draft Standard

The text in **RED** color: the removal of existing 802.16n Amendment Draft Standard Text

The text in **BLUE** color: the new text added to the 802.16n Amendment Draft Standard Text

[---Start of Text Proposal---]

[Remedy1: Modify the following text in Section 6.12.4 in the 802.16.1a AWD]

6.12.4 Support for standalone network

For WirelessMAN HR Advanced air interface, when HR-BS lost the connectivity to the backbone network and the neighboring HR-BSs, the network nodes under the coverage of this HR-BS shall form a standalone network. The local connectivity shall be provided for the mobile stations within the coverage of Base station. When the Base Station loses the backbone connection, the established service flow between mobile stations within the coverage of the base station shall be maintained.

When backbone connectivity is lost, the MAC connectivity is provided among HR-MSs within BS's coverage

6.12.4.1 Backbone status management advertisement

When backbone connectivity is available, an HR-BS shall notify HR-MSs of its backbone availability and broadcast AAI-MM-ADV message with Action Type == 0b101 periodically.

When backbone connectivity is not available, an HR-BS shall notify HR-MSs of its backbone unavailability and broadcast AAI-MM-ADV message with Action Type == 0b100 periodically. After the HR-BS loses connection to a backbone network, packets on all the transport connection established for infrastructure communication using IP layer are not sent/received from/to the backbone network.

6.12.4.2 MAC local connectivity establishment

When an HR-MS receives AAI-MM-ADV message with Action Type == 0b100, it may initiate to establish a MAC service flow that is a service flow having MAC layer function only. The MAC service flow is used to exchange packets between peer MAC entities. An HR-BS receives packets from a MAC service flow and sends packets to a other MAC service flow. An HR-MS exchanges packets with a corresponding HR-MS using two MAC service flow.

The HR-MS sends AAI-DSA-REQ message with a TDC target address of DCTID to the HR-BS. The HR-BS and the HR-MS exchange AAI-DSA-RSP/ACK message to establish a MAC service flow. If the target HR-MS is active and its TDC target address is stored in the HR-BS, the HR-BS initiates to establish a MAC service flow using AAI-DSA-REQ message with a TDC source address of DCTID to the target HR-MS. And the HR-BS and the HR-MS exchange AAI-DSA-RSP/ACK message exchange to establish a MAC service flow. If not

having information of the TDC target address, the HR-BS needs to confirm whether the target HR-MS with the TDC target address is available or not.

The HR-BS broadcast AAI-SA-BPAG-ADV message to perform a blind paging that is a paging but is not based on HR-MS availability located under HR-BS coverage. When the HR-BS needs to establish a MAC connection for MAC local service flow and has no information of a target HR-MS with a TDC target address, it sends AAI-SA-BPAG-ADV message in the blind paging offset within the blind paging cycle. When the target HR-MS receives the AAI-SA-BPAG-ADV message with its target DCTID, it may be two status, active (associated to the HR-BS) or idle (unassociated to the HR-BS). If active, the HR-MS shall notify the HR-MS of its DCTID using AAI-SA-BPAG-ACK message. If idle, the HR-MS shall trigger network reentry procedure using AAI-RNG-REQ/RSP message with Ranging Purpose Indicator == 0b1111, Extended Ranging Purpose Indicator == 0b0001, and no authentication. After the blind paging and/or network reentry procedure, the HR-BS initiates to establish a MAC service flow using AAI-DSA-REQ/RSP/ACK message.

The HR-MS derives the start of the blind paging interval based on the blind paging cycle and the blind paging offset. The blind paging listening interval shall start at the superframe whose number $N_{superframe}$ meets the following codition:

$$N_{superframe} \text{ modulo } Blind\ Paging\ Cycle == Blind\ Paging\ Offset$$

The length of the paging listening interval is one superframe per paging cycle.

6.12.4.3 Extension of talk-around direct communication

An HR-MS transmits a TDC MAC PDU as MAC SDU to MAC SAP of MAC service flow. Using mapping a MAC service flow to other MAC service flow, an HR-BS sends the MAC SDU each other. When a corresponding HR-MS receives the MAC SDU, it passes the TDC MAC PDU to TDC MAC layer.

The HR-MS exchanges TDC MAC PDUs with the corresponding HR-MS to perform MAC function of talk-around direct communication described in section 6.12.2.3.

6.12.4.4 MAC local connectivity deletion

After HR-MSs terminate talk-around direct communication using MAC service flows, they deletes MAC service flows using AAI-DSD-REQ/RSP messages.

When HR-MSs deregisters, all the MAC service flows may be deleted

6.12.4.1.1 Backbone enable notification

When backbone connectivity is available, the HR-BS shall notify HR-MSs of its availability. The transport connections may be recovered from their unavailable status.

An HR-BS exchanges the BBE-REQ/RSP message with HR-MSs on unicast control connections.

An HR-BS broadcasts the BBE-CMD message to all the HR-MSs under BS's coverage.

6.12.4.1.2 Backbone disable notification

When backbone connectivity is not available, the HR-BS shall notify HR-MSs of its unavailability. After backbone disables, all the transport connections on which packets transfer to network are not available.

An HR-BS exchanges the BBD-REQ/RSP message with HR-MSs on unicast control connections.

An HR-BS broadcasts the BBD-CMD message to all the HR-MSs under BS coverage.

6.12.4.2 Maintenance of local connectivity

For maintenance of local connectivity, all the HR-BSs shall maintain a network topology table of HR-MS/HR-RS within its coverage area. The network topology table shall be updated periodically by broadcasting a STN-REQ message from HR-BS and receiving acknowledgement message STN-ACK from HR-MS or HR-RS within its coverage area.

6.12.4.3 Entry process for standalone network

The HR standalone network with WirelessMAN HR Advanced air interface shall allow the entry of an unassociated HR-MS into the standalone network and establish the connection with standalone network HR-BS. The unassociated HR-MS is referred to the HR-MS which is not associated with any Base Station.

[Remedy2: Modify the following updates in Table 683 of Section 6.2.3 in the 802.16.1a AWD]

Table 26 - MAC control messages

No.	Functional Areas	Message names	Message description	Secuirty	Connection
…	…	…	…	…	…
TBD	Backbone Enable	AAI-SA-BBE-REQ	Backbone Enable Request		Unicast
TBD	Backbone Enable	AAI-SA-BBE-RSP	Backbone Enable Response		Unicast
TBD	Backbone Disable	BBD-REQ	Backbone Disable Request		Unicast
TBD	Backbone Disable	BBD-RSP	Backbone Disable Response		Unicast
TBD	Backbone Enable	AAI-SA-BBE-CMD	Backbone Enable Command		Broadcast
TBD	Backbone Disable	BBD-CMD	Backbone Disable Command		Broadcast
…	…	…	…	…	…
TBD	Standalone	AAI-SA-BPAG-ADV	Blind Page Advertisement Message		Broadcast
TBD	Standalone	AAI-SA-BPAG-ACK	Blind Page ACK message		Unicast

[Remedy3: Modify the following updates from Section 6.2.3.1 in the 802.16.1a

AWD]

6.2.3.1 AAI-RNG-REQ

[Change Table 684 in section 6.2.3.1 as indicated:]

Table 27 - AAI-RNG-REQ message field description

Field	Size (bits)	Value/Description	Condition
Ranging Purpose Indication	4	0b0000 = Initial network entry 0b0001 = HO reentry 0b0010 = Network reentry from idle mode 0b0011 = Idle mode location update 0b0100 = DCR mode extension 0b0101 = Emergency call setup (e.g., E911) 0b0110 = Location update for updating service flow management encodings of E-MBS flows 0b0111 = Location update for transition to DCR mode from idle mode 0b1000 = Reentry from DCR mode, coverage loss or detection of different ABS restart count. 0b1001 = Network reentry from a Legacy BS 0b1010 = Zone switch to MZONE from LZONE 0b1011 = Location update due to power down. 0b1100 = Interference mitigation request to a CSG Femto ABS when experiencing interference from the CSG Femto ABS 0b1101 = NS/EP call setup 0b1110 = HR multicast service flow update 0b1111 = ~~Network reentry for FBIS operation~~Extended Ranging Purpose	-

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		Indication	
Extended Ranging Purpose Indication	4	0b0000 = Network reentry for FBIS operation 0b0001 = Network reentry from idle mode for extension of TDC. 0b0001~0b1111 = reserved	
…	…	…	…

[Remedy4: Modify the following updates from Section 6.2.3.31 in the 802.16.1a AWD]

6.2.3.31 AAI-System Configuration Descriptor (SCD) message

[Add following rows in the end of Table 714 in 6.2.3.31 as indicated:]

Table 27 - AAI-SCD message field description

Blind Paging Offset	12	Indicates the number of TDC frames used for blind paging offset	Present if need in HR-Networks
Blind Paging Cycle	4	Indicates the number of TDC frames with that a blind paging listening interval repeats	Present if need in HR-Networks

[Remedy5: Modify the following updates from Section 6.2.3.47.1 in the 802.16.1a AWD]

6.2.3.47.1 AAI-DSA-REQ

[Change Table 740 as indicated:]

Table 83 - AAI-DSA-REQ message field description

Field	Size (bits)	Value/Description	Condition
…………	……	………	……
CS Specification parameter	8	0: Reserved 1: Packet, IPv4 2: Packet, IPv6	Present if needed

		3: Packet, IEEE 802.3/Etherneta	
		4: Reserved	
		5: Reserved	
		6: Reserved	
		7: Reserved	
		8: Reserved	
		9: Reserved	
		10: Reserved	
		11: Reserved	
		12: Reserved	
		13: Reserved	
		14: Packet, IPb	
		15: Multiprotocol flow	
		16–17: Reserved	
		18: Talk-around DC	
		19-255: Reserved	
		(a: Classifiers for IEEE 802.1Q VLAN tags may be applied to service	
		flows of this CS type)	
		(b: SDUs for service flows of this CS type may carry either IPv4 or IPv6 in the payload)	
……………	……	………	……
inner IPv6 Flow	8	Label IPv6 Flow Label of inner IP header	Present if needed
Source DCTID	24	Indicates a source HR-MS addresses for talk-around DC	Present if needed
Target DCTID	24	Indicates a target HR-MS addresses for talk-around DC	Present if needed
} //End If (Packet Classification			

Rule)			
…………	……	………	……
}			

[Remedy6: Modify the following updates from Section 6.2.3.65.41 in the 802.16.1a AWD]

6.2.3.65.41 BBE-REQ

An HR-BS transmits a BBE-REQ message to notify HR-MSs of backbone connection availability on unicast control connection.

6.2.3.65.42 BBE-RSP

An HR-MS transmits a BBE-RSP message in response to a received BBE-REQ.

6.2.3.65.43 BBD-REQ

An HR-BS transmits a BBD-REQ message to notify HR-MSs of backbone connection unavailability on unicast control connection.

6.2.3.65.44 BBD-RSP

An HR-MS transmits a BBD-RSP message in response to a received BBD-REQ.

6.2.3.65.45 BBE-CMD

An HR-BS transmits a BBE-CMD message to broadcast backbone connection availability.

6.2.3.65.46 BBD-CMD

An HR-BS transmits a BBD-CMD message to broadcast backbone connection unavailability.

[Remedy7: Add the following Section 6.2.3.65.41 in the 802.16.1a AWD]

6.2.3.65.51 AAI-SA-BPAG-ADV

Table 763sa1 – AAI-SA-PAG-ADV message field description

Field	Size (bits)	Value/Description	Condition
For (i=0; i<Num_BPAG; i++)		Num_BPAG indicates the number of blind	

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{		paging items	
DCTID	24	Indicates a target HR-MS address for talk-around direct communication	
Action code	1	Used to indicate the purpose of the AAI-SA-BPAG-ADV message 0b0: send AAI-SA-BPAG-ACK message if active or perform network reentry if idle 0b1: reserved	
}			

6.2.3.65.52 AAI-SA-BPAG-ACK

An HR-MS sends the AAI-SA-BPAG-ACK message in response to AAI-SA-BPAG-ADV message.

Table 763sa2 – AAI-SA-PAG-ADV message field description

Field	Size (bits)	**Value/Description**	**Condition**
Target DCTID	24	Indicates a target HR-MS address for talk-around direct communication	
Target MAC address	24	Indicates a target HR-MS MAC address for infrastructure communication	

[---End of Text Proposal--]

References

[1] IEEE C802.16n-11/0242, "Extension of talk-around direct communication between HR-MSs via HR-BS."

[2] IEEE 802.16n-11/0033, "WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems; Enhancements to Support Higher Reliability Operations."