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Abstract	This document contains general high level and requirements for Relay TG specification. This document is a Task Group document to which the harmonized contribution document C802.16j-06/050r4 has been converted as one of the baseline documents defined during the 2nd Relay TG in Session #44.
Purpose	This document is a proposal for requirements to be considered while submitting technical proposals to Relay TG.
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Proposed Technical Requirements Guideline for IEEE 802.16j (Mobile Multihop Relay)

1. Introductory remarks

This document is submitted in response to the call for contributions on system requirements that was issued by the IEEE 802.16 Relay Task Group [1].

In this document, we provide
- general high level requirements
- a table for the mandatory requirements and
- a table for the optional requirements

In the mandatory requirements table, we further specify whether the function is mandatory for the MMR base station (MMR-BS) only, or whether it is mandatory for both MMR-BS and the relay station (RS). The term mandatory, in this document, refers to those requirements which should be fulfilled by RS and MMR-BS, as opposed to the optional requirements which may be specified by the amendment but implementations are not required to fulfil them. It is not necessarily the intention of this document to mandate the specification of all of the mandatory and optional requirements listed here in order to declare the amendment complete.

It is noted that the purpose of this requirements document, as well as the document that will eventually be adopted by the TG, will be to provide additional *guideline* for submitting proposals to Relay TG and will supplement the 802.16j PAR and 5 Criteria [2] documents, which provide the overriding requirements for Relay TG. The split into mandatory and optional parts, as well as the split of the function between MMR-BS and RS is intended to serve as an initial guideline and does not force the proponents to adhere to the split strictly.

2. General high level requirements

As a general requirement, which follows directly from the PAR and 5 criteria document, proposals to Relay TG shall not require modifications to the mobile stations (including subscriber stations). Proposals shall ensure backward compatibility with the mobile stations as specified in the legacy standard (i.e., IEEE Std 802.16-2004 and IEEE Std 802.16e-2005) to the extent that the relay operation is transparent to the mobile stations.

It is also hereby proposed that the submissions should minimize the modifications related to the MAC and OFDMA PHY as specified in the legacy standard. Proponents of contributions are encouraged to maximize the re-use of the procedures defined in the legacy standard.

As another general requirement, submitted proposals should support LOS as well as non-LOS operation for the deployment of the RS.

MMR-BS will distinguish itself from a BS, as defined in the legacy standard, in that it shall support the operations of RS, while at the same time maintaining full compliance with the legacy standard.

Hop count greater than or equal to 2 shall be supported. The specification shall consider 2-hop support mandatory while considering general multi-hop (>2) support optional.

RS shall not have mandatory requirement to support optional features as specified in the legacy standard. It is assumed that the RS will not generate user traffic of its own, but it is expected that the RS shall support the generation of control and management messages that are necessary for proper relay operation.

3. Functional requirements

The following Tables 1 and 2describe the mandatory and optional functional requirements.

* legacy: IEEE Std 802.16-2004 + IEEE Std 802.16e-2005

3.1 Mandatory functional requirements

Table 1 Mandatory Functional Requirements

Number	Name	Requirements	Subject (MMR-BS/RS)	Notes
M1	Capability management	Capabilities of RS shall be managed by MMR-BS.	MMR-BS (M) RS (M)	
M2				
M2	RS control	The specification shall define a mechanism for MMR-BS to perform topology learning in its own MMR cell as well as to control and manage RSs in the MMR cell.	MMR-BS (M)	
M4	PHY frame structure for backward compatibility with legacy 16 mobile station	The specification shall define a backward compatible frame structure that supports relay links while accommodating the legacy access links.	MMR-BS (M) RS (M)	
M5	RF part	The specification shall define OFDMA RF parameters necessary for the correct operation of the BS-RS link. RF parameters such as frequency band and channel bandwidth, as well as transmitter/receiver requirements including RS-emission and RS-susceptibility, shall be defined/specified for the BS-RS and RS-RS link.	MMR-BS (M) RS (M)	
M6	Baseband part	The specification shall define/specify baseband parameters/operation necessary for the correct operation of the BS-RS link. Baseband parameters such as FFT size, symbol CP, and baseband operations such as preamble transmission, synchronization, channel quality measurement shall be defined/specified for BS-RS link and RS-RS link.	MMR-BS (M) RS (M)	Preamble aspect TBD
M7	Flexible radio resource assignment	The specification shall provide a mechanism to support various forms of radio resource assignment.	MMR-BS (O) RS (TBD)	Sharing channels between access links and relay links, sharing

				channels between multiple relay links, using different channels for different links, frequency reuse between access links and relay links, etc.
M8	Duplexing Mode	The specification shall support either TDD or FDD for relay link	MMR-BS (M) RS (M)	
M9	RS network entry	The specification shall define network entry process for RS.	MMR-BS (M) RS (M)	
M10	MS network entry support	RS shall support network entry process for MS.	MMR-BS (M) RS (M)	
M11	Scheduling	The specification shall provide signaling to support MAC scheduling of data and control message transmission on relay and access links.	MMR-BS (M) RS (M)	Scheduling may be centralized, distributed, or a hybrid thereof.
M12	Bandwidth request and allocation	MMR-BS shall support the bandwidth request and allocation mechanism for RS.	MMR-BS (M) RS (O)	
M13	QoS support	The specification shall support QoS as defined in the legacy 16 system for multi-hop.	MMR-BS (M) RS (TBD)	
M14	Unicast data delivery	The specification shall support unicast data delivery via RS.	MMR-BS (M) RS (M)	
M15	MAC PDU processing	RS shall support MAC PDU processing.	MMR-BS (M) RS (TBD)	
M16	Control information processing	The specification shall enable RS to process and forward the DL and UL control information.	MMR-BS (M) RS (O) MOB_NBR-	DL and UL control information

			ADV is TBD	includes DL/UL-MAP, DCD/UCD, MOB_NBR-ADV.
M17	Connection management	The specification shall support MS connections (i.e., CIDs) for multi-hop.	MMR-BS (M) RS (O)	
M18	MS handover support	RS shall support MS handover.	MMR-BS (M) RS (M)	
M19	Relay security	The specification shall define security mechanisms to ensure security between MMR-BS and RS, and between RSs and between RS and MS.	MMR-BS (M) RS (M)	

3.2 Optional functional requirements

Table 2 Optional Functional Requirements

Number	Name	Requirements	Subject (MMR-BS/RS)	Notes
O1	Relay path selection	The specification shall define a mechanism to set up and maintain multi-hop paths.	MMR-BS (O) RS (O)	There can be centralized and distributed approaches to determine a relay path.
O2	Multicast/broadcast data delivery	The specification shall support multicast and broadcast data delivery via RS.	MMR-BS (O) RS (O)	
O3	ARQ support	The specification shall support ARQ of MS via RS.	MMR-BS (O) RS (O)	
O4	HARQ support	The specification shall support HARQ of MS via RS.	MMR-BS (O) RS (O)	
O5	Mobile RS handover support	The specification shall support RS with mobility and its subordinate MSs.	MMR-BS (O) RS (O)	
O6	Handover decision for subordinates stations	The specification shall allow the handover decision originated by a serving RS or MMR-BS on behalf of moving stations.	MMR-BS (O) RS (O)	

O7	MMR-BS authentication	The specification shall permit RS to authenticate MMR-BS when it joins an MMR network.	MMR-BS (O) RS (O)	
O8	PHY parameters	The specification shall allow an RS to use different PHY parameters on the relay and access links when they operate on the different RF frequency channels..	MMR-BS (O) RS (O)	
O9	Multiple antenna support	The specification shall allow the use of multiple antennae to enhance spectral efficiency of the system or extend the coverage.	MMR-BS (O) RS (O)	This includes MIMO, beamforming, transmit diversity, etc.
O10	CQICH	The specification shall enable RS to allocate a CQICH subchannel to support fast feedback quality report and AMC	MMR-BS (O) RS (O)	
O11	Cooperative relay	The specification shall enable RS to participate in cooperative relay.	MMR-BS (O) RS (O)	
O12	Location information	The specification shall support RS to perform location update.	MMR-BS (O) RS (O)	
O13	Power saving	The specification shall support sleep/idle mode.	MMR-BS (O) RS (O)	
O14	**Neighbor Detection**	The specification shall enable the RS to detect its neighbor stations including the status and quality of radio link to each neighbor.	RS (O)	A neighbour station could be RS or MMR-BS.
O15	**Multiple Relay Path**	The specifications shall support the creation of more than one multi-hop path between an MMR-BS and MS.	MMR-BS(O) RS (O)	

4. References

[1] Call for Comments and Contributions IEEE 802.16 Relay Task Group, IEEE 802.16j-06/006.
[2] Draft P802.16j PAR and Five Criteria, IEEE 802.16mmr-06/002r1.