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Title	Proposed Functional Requirements for IEEE 802.16 TGj	
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Re:	IEEE P802.16j call for contributions	
Abstract	This contribution proposes a draft for IEEE 802.16 TGj functional requirements	
Purpose	Review and discuss the proposed IEEE 802.16 TGj functional requirements	
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Proposed Functional Requirements for IEEE 802.16 TGj

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1. Proposal overview

We propose the functional requirements based on the capability of relay system. As described in IEEE 802.16 mobile multihop relay tutorial [1], relay capability can be classified into two, i.e. high capability (advanced) relay and low capability (simple) relay. The basic functions distinguishing the two relay capability are listed in the table below.

Functions	High capability relay	Low capability relay
Preamble transmission	Allowed	Not allowed
DL control (MAP, DCD/UCD, MOB_NBR-ADV) broadcast	Allowed	Not allowed
UL ranging processing	Allowed	Not allowed
RS-MS link control	Distributed but centrally coordinated at base station	Centralized at base station

Note that relay capability is not limited to the above two. It is allowed to set multiple relay capabilities from various combinations of functionalities.

This proposal lists up the functional requirements based on the PAR and 5 Criteria of IEEE 802.16 Task Group j [2], and classifies each requirement as either mandatory or optional function. Note that some functions are not allowed in the low capability relay station.

2. Proposed functional requirements

This chapter defines the detailed functional requirements that should be addressed in the specification of IEEE 802.16 Task Group j. The system requirements shall be consistent with the 802.16 TGj PAR and 5 Criteria and define the functionality of relay system to guarantee coverage or system capacity enhancement of the legacy 802.16 system.

Various relay capabilities are allowed in the 802.16j system. The functions of relay system regardless of the capabilities shall be backward-compatible with the legacy 802.16 system and maximize the reuse of functions in the legacy 802.16 system.

The following table describes mandatory and optional functional requirements. Note that some functions are not allowed in the low capability relay station.

M: Mandatory function

O: Optional function

Category	Name	Requirements	M	O	Notes	
Backward compatibility	Backward compatibility	The specification shall define the base station which is able to accommodate legacy 16 mobile stations as well as relay stations.	√			
Configuration	Neighbor detection	The specification shall define the relay station enables neighbor detection at initial entry.	√			
	Capability management	The specification shall define the procedures to negotiate the functionalities between base station and relay station.	√			
	Path selection metric	The specification shall define the metrics of data path establishment from base station to mobile station via relay station.	√			
	Hop limit from BS to MS	The specification shall limit the maximum hop count from base station to mobile station via relay station.	2 hop	√		
			Max. 3 hop only for fixed relay station		√	
PHY features	PHY frame structure for backward compatibility with legacy 16 mobile station	The specification shall define a frame structure for the link between the base station and the relay station, while the frame structure satisfies the backward compatibility with legacy 16 system. The frame structure shall support both relay station and the legacy 16 station in the same frame. The frame structure shall support at least one between in-band relay and multi-band relay.	√			
	Preamble transmission	The specification shall define relay station which enables to transmit the preamble.	√		Not allowed in low capability relay	
	FEC block processing	The specification shall define relay station which enables FEC block encoding/decoding.	√			
	Link adaptation mechanism	The specification shall define link adaptation function (e.g. adaptive modulation and coding scheme) in relay station.		√		
	Transmission power control	The specification shall enable transmission power control in relay station.		√		

Control information processing	System information	The specification shall define relay station which enables the neighbor information process.	MOB_NBR-ADV message re-broadcast	√		Not allowed in low capability relay
			MOB_NBR-ADV message re-formation		√	
		The specification shall define relay station which enables the channel information process.	DCD/UCD message re-broadcast	√		Not allowed in low capability relay
			DCD/UCD message re-formation		√	
	MAP information	The specification shall define relay station which enables the downlink or uplink MAP process.	DL/UL MAP message re-broadcast	√		Not allowed in low capability relay
			DL/UL MAP message reformation		√	
UL ranging processing	The specification shall define relay station which enables to process UL ranging.		√		Not allowed in low capability relay	
Scheduling	Scheduler in relay station	The specification shall define relay station which enables to schedule packet transmission.		√	Scheduling in relay station shall be either coordinated at base station or distributed operation.	
	ARQ processing	The specification shall define relay station which supports mobile station's ARQ operation.		√		
	HARQ processing	The specification shall define relay station which enables H-ARQ processing.		√	Not allowed in low capability relay.	
Data delivery via relay	Unicast data delivery	The specification shall support unicast data delivery across the relay station.	√			
	Multicast/broadcast data delivery	The specification shall multicast or broadcast data delivery across the relay station.	√		Optional for low capability relay (directed by base station).	
	MAC PDU processing	The specification shall deploy relay station which enables to configure MAC PDU.	√			
Mobility support	MS handover support	Relay station shall support the mobile station handover.	Handover negotiation message re-transmission	√		Optional for low capability relay (route change)

			Handover negotiation control (i.e. handover triggering)		√	between relay stations within the same base station coverage)
	Mobile RS handover support	The specification shall support relay station with mobility.		√		
Security	Relay security	The specification shall utilize IEEE 802.16e security mechanism or extend it to support security between base station and relay station or between relay station and mobile station.		√		
	Authentication functionality in relay station	Relay station shall be able to authenticate the management messages of mobile stations which belong to it.			√	Not available in low capability relay

3. References

- [1] IEEE802 Tutorial: 802.16 Mobile Multihop Relay, IEEE 802.16mmr-06/006
- [2] Draft P802.16j PAR and Five Criteria, IEEE 802.16mmr-06/002r1