Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: Text for relaying support proposal, input for IEEE 802.15.7r1 Draft D0

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Abstract: This contribution presents a text for IEEE 802.15.7r1 Draft D0 on relaying support

Purpose: Text for supporting relaying proposal in IEEE802.15.7r1 Draft D0 .

5 MAC

5.5 Relaying

MAC supports optional relaying mechanism for the cases where the dedicated relay terminals are available.

5.5.1 Relay Discovery Procedure

In order to search the relays in the environment, the source broadcasts relay search request package. The relays in the environment reply with their capabilities. The source terminal collects the capabilities of the relays. The relaying capability of the destination terminal is also obtained.

The PHY measures the signal to interference and noise (SINR) on each subcarrier for each link through relay channel measurement report request mechanism. The source obtains CQI reports. The method is proprietary.
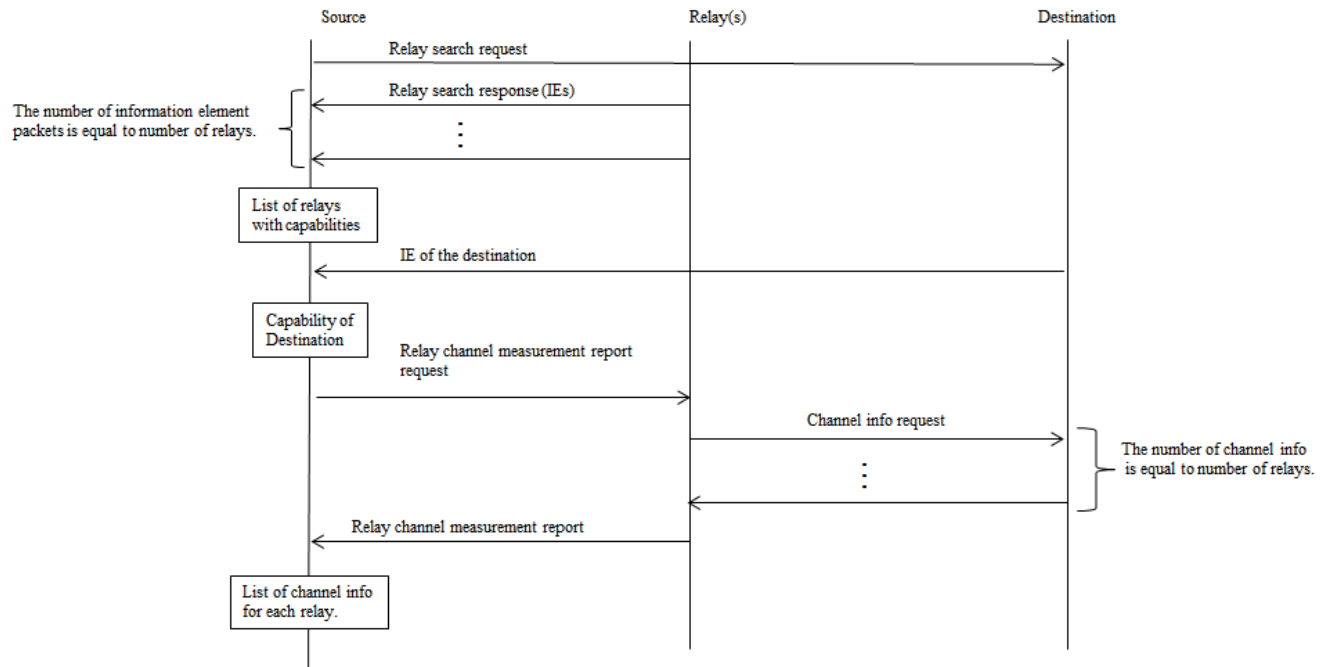

Figure X. Relay discovery procedure

Relay search request frame structure will be detailed.

Relay channel measurement report request and report frame structures will be based on PHY mode.

The IE contains the following fields.

Element ID	Length	Relay Capability Info			
		Relay Usability	Relaying mode	Duplexing Mode	Reserved
Octets:1	1	B0	B1-B2	B3-B4	B5-B6-B7

Relay usability indicates whether the terminal is capable of relaying.

B0	Relay Usability
0	Relay terminal
1	Destination terminal

Relaying mode indicates whether relay is capable of amplify-and-forward (AF) or decode-and-forward (DF) relaying modes.

B1-B2	Relaying mode
01	Only AF
10	Only DF
11	Both AF and DF
00	Reserved

Duplexing mode Indicates whether terminal (either relay or destination) is capable of full-duplex (FD) or half duplex (HD) duplexing modes.

B3-B4	Relaying mode
01	Only FD
10	Only HD
11	Both FD and HD
00	Reserved

5.5.2 Relay Selection Procedure

Relay selection procedure defines selection of the best relay and operation type among multiple relays. The relay selection procedure is based on the capabilities for each relay and CQI available at the source terminal.

Figure X shows the best relay selection algorithm based on predefined constraint and performance metrics. The transmitter calculates the constraint metric for each relay with operating modes HD-AF, HD-DF, FD-AF and FD-DF. Then, the transmitter decides the best relay together with an operating mode that satisfies the constraint (will be detailed).
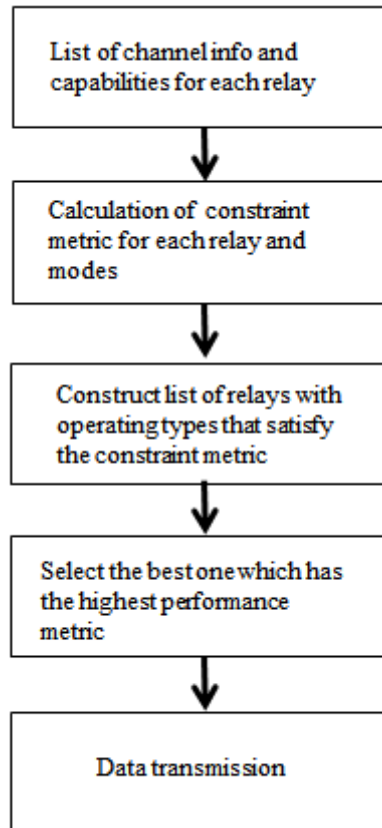
Figure X. Selection algorithm for relaying device

5.5.3 Relay Link Setup (RLS) Procedure

Following the selection of the relay to be used between the source and destination terminals, RLS request frame is send to the selected relay. The RLS Request frame includes the capabilities and the AIDs of the source, the destination and the relay transfer parameter set. Upon receiving the RLS Request frame, the relay shall transmit an RLS Request frame to the destination containing the same information as received within the frame body of the source RLS Request frame. RLS response frame indicates whether the terminal can participate in the RLS. Finally, the source transmits the RLS announcement that indicates the RLS procedure was successfully completed.
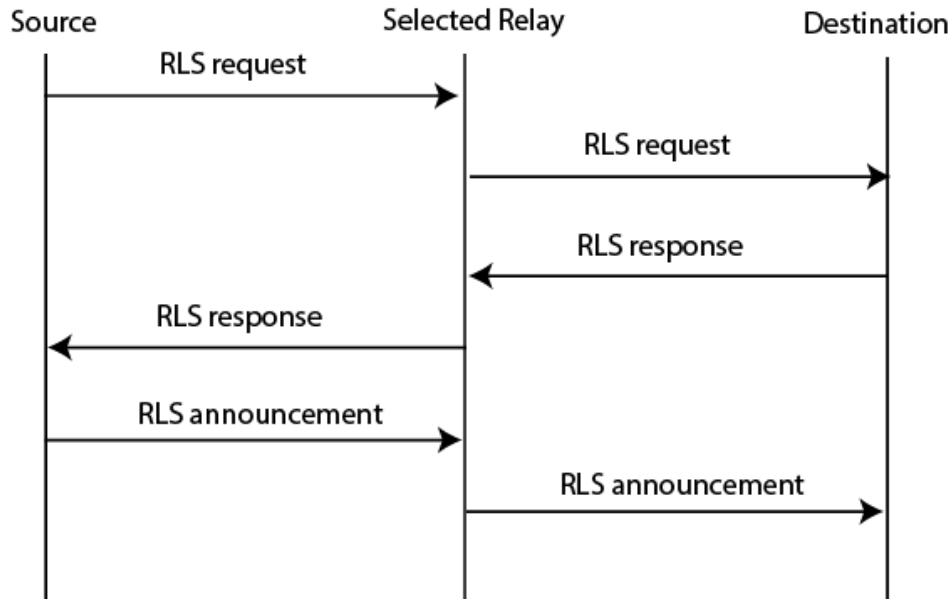
Fig X. RLS procedure

RLS request frame structure will be detailed.

RLS response frame structure will be detailed.

RLS announcement frame structure will be detailed.

5.5.4 Frame exchange rules

will be detailed.

6 PHY Layer

6.6 Relaying (Optional)

Relaying operation supports half duplex (HD) and full duplex (DF) duplexing modes as well as amplify and forward (AF) and decode and forward (DF) relaying modes. Relaying operation uses three bits (13-14-15) in the Advanced Modulation Header to indicate the used modes.
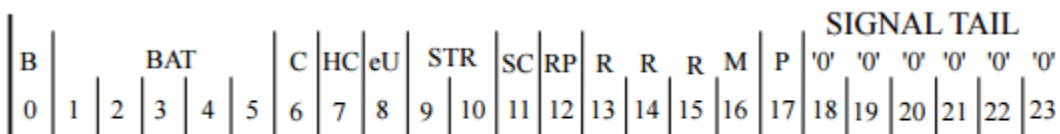

Figure 7.1.2.3.2.1: Advanced Modulation Header format.

B13	Relaying Operation
0	OFF
1	ON

B14-15	Relaying and Duplexing mode
00	FD-AF
01	FD-DF
10	HD-AF
11	HD-DF

6.6.1 Amplify and Forward (AF)

AF relaying can operate in either FD or HD modes. In FD-AF, the relay amplifies the received signal and simultaneously retransmits it. In HD-AF, the frame exchange is performed in two periods. In the first period, the source shall transmit a frame to relay (and the destination where the direct link is available). The relay terminal stores the received signal until the start of second period. In the second period, the relay transmits the amplified signal.

6.6.2 Decode and Forward (DF)

DF relaying can operate in either FD or HD modes. In FD-DF, the relay decodes and re-encodes the received signal and promptly transmits it. In HD-DF, the frame exchange is performed in two periods. In the first period, the source shall transmit a frame to relay (and the destination where the direct link is available). The relay terminal decodes and stores the received signal until the start of second period. In the second period, the relay transmits the encoded signal. In both HD-AF and HD-DF modes, synchronization information between the two periods is in form of start and stop signals (signal tail), before and after each unit of transmission.

Acknowledgment