Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Relay zone structure definition**
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Re:	Call for technical proposals 802.16j-06/034
Abstract	This contribution provides a text proposal that defines the structure of the relay zone in the downlink subframe. This builds on the current frame structure text accepted in meeting #46 that introduce the concept of a relay zone within a subframe, but did not provide a definition of the structure of the relay zone in the downlink. In summary the proposed structure is very similar to that employed by a MR-BS (or BS) in the access downlink link zone.
Purpose	For discussion and approval of inclusion of the proposed text into the P802.16j baseline document.
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Relay zone structure definition

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Introduction

The two-hop in-band TDD frame structure proposal for non-transparent relay [1] accepted into the baseline document [2] in meeting #46 introduces the concept of a relay zone in both the downlink and uplink subframe. A number of such relay zones can exist in both subframes. Further, in order to provide support for more than two-hop relaying it is proposed in [3] to allow a relay zone to be used for either a transmission or reception interval, but not both.

The current text in the baseline document provides the basic starting point for frame structure for supporting two and potentially multi-hop relaying. However, further clarification is required for the purposes of ensuring interoperability as the structure that may be employed at a transmitter of a relay zone in the downlink subframe needs definition (i.e. at the MR-BS or RS that is transmitting in a R-DL interval).

To this end, the text proposal in this contribution provides the required definition of the relay zone structure from a high-level point of view. The structure is defined to be similar to that used by the existing BS as defined in IEEE Std. 802.16 for the first mandatory zone in the downlink. Further detailed clarification will be required beyond this to describe the actual composition of the various elements within the zone, and some this clarification is the subject of a further contribution [4].

Proposed downlink relay zone structure

The main elements in the first zone on the access downlink are the frame start preamble, FCH and DL-MAP and UL-MAP messages, as depicted by the figure in Section 8.4.4.7.2.1 of the baseline P802.16j document [2] and Figure 218 of the IEEE 802.16-2004 standard. This is followed by data bursts.

In this contribution it is proposed that a similar structure is adopted for the first relay zone in the downlink, as it is assumed that due to the fact the RS will be transmitting its own frame start preamble, FCH and MAP messages at the same time the MR-BS is transmitting this information, it will not be able to receive information about the relay zones in the frame in the access zone interval. Therefore, such control information is provided at the start of the first relay zone, which is essentially the mandatory zone for the case of supporting at a minimum two-hop relaying. The definition of the structure of further relay zones transmitted from the MR-BS (or RS in the more than two-hop case) can be signaled in the first downlink relay zone preventing unnecessary overhead.

Figure xxx in the following section depicts the proposed structure for the relay zone in the downlink. As shown it contains an optional relay zone preamble [5], followed by a mandatory R-FCH, R-DL-MAP and optional R-UL-MAP message. This is followed by the data bursts.

Note that it is proposed that two different types of relay amble be supported, the first is the optional relay zone preamble and the second is the optional relay postamble. The rationale for adopting this approach and details on the positioning are provided in a separate contribution [5].

The R-FCH message is essentially used for signaling the modulation and coding scheme applied to the DL-MAP as well as the message length, in a similar manner to the FCH. The DL-MAP and UL-MAP messages then define the structure of the relay zones transmitted in the DL subframe and received in the UL subframe respectively at the device that is sending the messages.

In order to capture this structure into the baseline document, the text in the following section is proposed for incorporation into the baseline document.

Proposed text changes

[Insert new subclause at the end of Section 8.4.4.7.2:]

8.4.4.7.2.x Downlink relay zone

The first relay zone in the downlink subframe shall contain the information that defines the structure of all relay zones in a frame. The first relay zone may start with a zone start preamble, followed by a mandatory R-FCH. If the zone start preamble is absent then the first relay zone shall start with the mandatory R-FCH. The R-FCH contains the DL Frame Prefix described in Section 8.4.4.3, and specifies the length of the mandatory R-DL-MAP message that immediately follows the DL Frame Prefix and the coding used for the R-DL-MAP message. The R-DL-MAP message may be followed by an R-UL-MAP message. The R-FCH and R-MAP messages shall be transmitted in a PUSC zone. The structure of the first relay zone in the downlink is illustrated in Figure xxx.

Figure xxx – Structure of the first relay zone in the downlink.
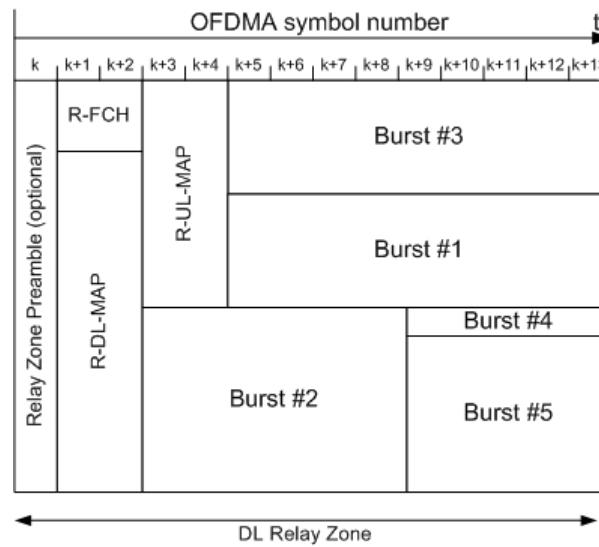
References

[1] Chenxi Zhu et al., "Frame Structure to Support Relay Node Operation", IEEE C802.16j-06/233r8, 16 November 2006.

[2] IEEE 802.16 Relay TG, "Baseline Document for Draft Standard for Local and Metropolitan Area Networks Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems: Multihop Relay Specification", IEEE 802.16j-06/026r1, 1 December 2006.

[3] Hart, M. and Viorel, D., "Frame structure for support of multihop relaying", IEEE C802.16j-07/012, 8 January 2007.

[4] Hart, M. et al., "Signaling support for two-hop and multihop frame structure", IEEE C802.16j-07/013, 8 January 2007.

[5] Hart, M. et al., "Relay amble position", IEEE C802.16j-07/xxx, 8 January 2007.