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Title	OFDMA Ranging within the AAS Relay Zone.	
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Re:	Working Group Letter Ballot Recirc #28c, Technical Comments and Contributions regarding IEEE Project P802.16j; Draft Amendment P802.16j/D4.	
Abstract	This contribution describes the messaging/signaling sequence within the AAS Relay Zone to accomplish ranging and bandwidth request and grant.	
Purpose	This document provides the necessary access messaging to properly accomplish ranging and bandwidth request/grant within the AAS Relay Zone for Direct Signaling mode of operation.	
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## OFDMA Ranging within the AAS Relay Zone

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This document describes the OFDMA Ranging within the AAS Relay Zone.

### Background

Direct Signaling operation within the relay zone provides a method of initial and periodic ranging adding enhanced range and multiuser interference cancellation for relay stations using the AAS Direct Signaling Zone. The codeword selection and bandwidth request/grant differ from non-AAS zone ranging, but all MAC Management messaging within the allocation is handled the same as OFDMA ranging in section 6.3.10.3.

Section 6.3.10.3.1.1 of Draft P802.16j/D4 describes the unique steps for MR-BS and RS Ranging, but does not describe added steps required for accomplishing ranging within the AAS Relay Zone.

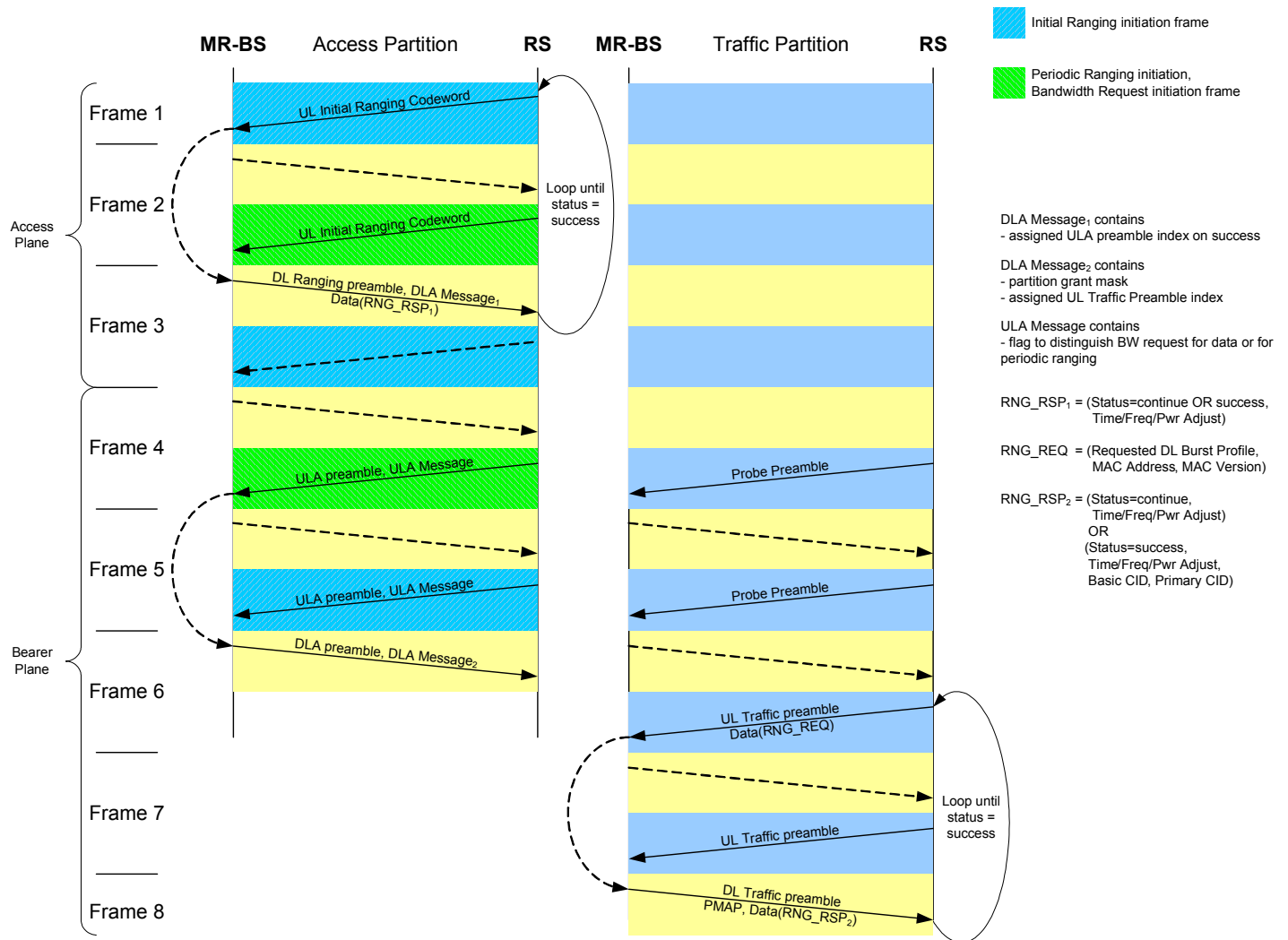
### Proposed Solution

The proposed solution is to add a new section 6.3.10.3.1.1.1 to describe the added (and common steps) of OFDMA ranging within the AAS Relay Zone.

### Detailed Solution

#### Overview

The initial ranging message sequence for an entering RS shows the migration from the Access partition utilizing the DLA for bandwidth grant and physical layer control to a traffic partition as part of a burst allocation where the PMAP is then used for bandwidth grant and physical layer control. The initial ranging message sequence for an RS entering the network in the AAS Relay zone is as follows:



## Proposed Text Changes

Add new Subclause 6.3.10.3.1.1.1:

### 6.3.10.3.1.1.1 MR-BS and RS behavior during contention-based initial ranging within AAS Relay Zone

Initial Ranging codewords are processed every other frame (odd frames) and periodic ranging codewords are processed on the interleaving frames (even frames). These frames are called Initial Ranging Initiation Frame and Periodic Ranging Initiation Frame respectively

A RS that wishes to perform initial ranging utilizing the AAS Relay Zone shall take the following steps:

- The RS, after acquiring downlink synchronization and uplink transmission parameters, shall select an Initial Ranging Initiation Frame using the random backoff. The random backoff shall use a binary truncated exponent algorithm. After selecting the Initial Ranging Initiation Frame, the RS shall choose an Initial Ranging Code (from the Initial Ranging domain described in AAS Relay Messaging section 8.4.4.7.2.3.4) using a uniform random process. The selected Initial Ranging Code is transmitted in the selected Initial Ranging Initiation Frame within the Access partition of the AAS Relay Zone..
- The MR-BS cannot tell which RS sent the OFDMA ranging request; therefore, upon successfully receiving an Initial Ranging code, the MR-BS shall transmit a DLA preamble that has a one to one correspondence to the received ranging code. This information is used by the RS that sent the ranging code to identify the ranging response message that corresponds to its ranging request. The DLA preamble is followed by a DLA message followed by the RNG-RSP MAC Management Message. The DLA message and ranging response message contain all the needed adjustment (e.g., time, power, and possibly frequency corrections) and a status notification. The DLA Message

physical layer adjustments fields may optionally be used for reduced turnaround time. (as described in the AAS Relay access messaging section 8.4.4.7.2.3.4.2). Upon receiving a ranging response message with Continue status, the DLA Message will contain an assigned unique ULA Access codeword index.

- Upon receiving a ranging response message with Continue status, the RS shall continue the ranging process as done on the first entry (using random selection of a periodic ranging initiation frame rather than random backoff) with the assigned access code. The next step is to use the assigned ULA access code to perform the periodic ranging steps to complete the initial ranging process. The periodic ranging stage requires a bandwidth request to accommodate transmission of MAC Management messages. The access code is used as the ULA preamble and the bandwidth request is performed by filling in the appropriate fields of the ULA Message (as described in the AAS Relay access messaging section 8.4.4.7.2.3.4.1). In this case the ULA fields include:
  - Transport CID is ignored for ULA purpose of 0x1 (Ranging bandwidth request)
  - PEM is set to the mask of the set of partitions that were probed for bandwidth request. For ranging purpose, this will be at least 3 partitions.
  - Probe codeword index is set to the randomly selected probe codeword from the probe codeword pool.
  - Q depth is left empty for ULA purpose of 0x1 (Ranging bandwidth request)
  - ULA purpose is set to 0x1 (Ranging bandwidth request)
- When the MR-BS receives an initial-ranging code that requires no corrections, the MR-BS shall provide BW allocation for the RS using the DLA bandwidth grant so the RS can send an RNG-REQ message. The DLA also contains a unique UL transport preamble codeword index used for transmitting all further messaging in the allocated bandwidth. It is optional for the MR-BS to send an RNG-RSP message with status "Success". (Note that while the bandwidth request/grant mechanism for the RNG-REQ/RNG-RSP is different for Direct Signaling within the AAS Relay zone, all MAC management messaging is handled according to the same procedure described in 6.3.10.3.)
- The initial ranging process is completed after the RS receives an RNG-RSP message, which includes a valid Basic CID (following a RNG-REQ transmission within the bandwidth granted via the DLA Message). If this RNG-RSP message includes "continue" indication, the ranging process should be continued using the periodic ranging mechanisms.
- If the RNG-RSP includes an Offset Frequency Adjustment pointing to another channel and it is larger than the value required for a channel bandwidth offset, the RS should synchronize with the new channel indicated in the RNG-RSP.
- The timeout required for RS to wait for RNG-RSP, following or not following bandwidth grant via the DLA message, is defined by T3.
- Using the OFDMA ranging mechanism, the periodic ranging timer is controlled by the RS, not the MR-BS.
- Adjustment of local parameters (e.g., Tx power) in an RS as a result of the receipt (or nonreceipt) of a RNG-RSP is considered to be implementation-dependent with the following restrictions:
  - 1) All parameters shall be within the approved range at all times.
  - 2) Power adjustment shall start from the initial value selected with the algorithm described in 6.3.9.5 unless a valid power setting is available from nonvolatile storage, in which case this value may be used as the starting point.
  - 3) Power adjustment shall be capable of being reduced or increased by the specified amount in response to RNG-RSP messages.
  - 4) If, during initialization, power is increased to the maximum value  $PTX\_IR\_MAX$  (without a response from the MR-BS) or to its maximum capability (without a response from the MR-BS), it shall wrap back to the minimum.
- On receiving an RNG-RSP, the RS shall not transmit until the RF signal has been adjusted in accordance with the RNG-RSP and has stabilized.

An RS that wishes to perform periodic ranging utilizing the AAS Relay Zone shall take the following steps:

- Periodic ranging utilizes the assigned ULA preamble for access and performs the steps above starting from the transmission of the assigned ULA and the transmission of the bandwidth request for ranging purpose.