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Re:	A response to a Call for Technical Proposal, http://www.ieee802.org/16/relay/docs/80216j-07_013.pdf
Abstract	We provide editorial changes on 6.3.9.16.3.1 and clarifications on RS grouping concept regarding the network entry, topology configuration and data forwarding.
Purpose	To incorporate the proposed text into the P802.16j Baseline Document (IEEE 802.16j-06/026r3)
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Some Clarifications on Virtual RS Group Concept

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1 Introduction

Some characteristics of the Virtual RS-group is currently summarized in the baseline document. In this contribution, we clarify several issues related to creation/capability/configuration of virtual RS group. We also provide minor editorial text change for 6.3.9.16.3.1 in the baseline document.

2 Definitions

The following definitions are provided for the RS grouping concept:

- Non-transparent group: The parent of the group is not a member of the group. Hence, the group employs a different preamble from that of the parent.
- Group peer leader: The non-transparent RS in the non-transparent RS Group which transmits the preamble/FCH/MAP at all frames.
- Transparent group: The RS group in which the parent is also a member of the group. The group employs the same preamble as the parent.
- Group parent leader: The parent of a transparent RS group which transmits the preamble/FCH/MAP at all frames.

If an RS group includes an MR-BS, than the RS members of the group may be imagined as the second hop non-transparent RSs. If the group leader is a non-transparent RS, then this group leader may be imagined as a non-transparent RS at the j^{th} hop, and all other members as a transparent RS either at j^{th} hop, or at the $(j+1)^{th}$ hop. Two examples are provided in Figure 1.

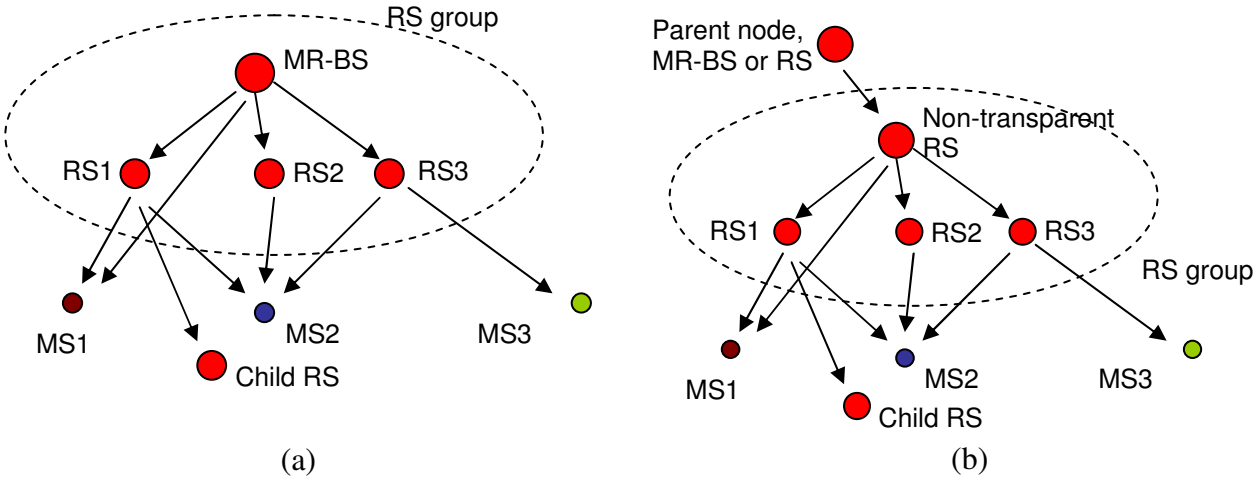

Figure 1 Examples for RS group topology

3 Network Entry to the RS Group

MS Network entry: The procedures in 6.3.9.16.1 or 6.3.9.16.2 is followed. The only difference is that, the MS may observe a superposition of preamble/FCH/MAP from the RS group members as it starts synchronization to the preamble signal.

Each RS group member has the DL/UL MAP, thus, during the initial ranging process, each RS group member can monitor the CDMA ranging codes from subordinate nodes; however, network entry process is governed by the group peer leader or the group parent leader. Other members of the group forwards RNG-REQ message to the group peer/parent leader with their Unicast RSID on RS basic CID if the ranging codes are received with sufficient signal quality, and then they proceed with the procedure in 6.3.9.16.1. The group peer/parent leader (if not an MR-BS) performs the procedure in 6.3.9.16.2 after it receives the ranging codes or RNG-REQ from the member RSs.

RS Network Entry: If the RS is in MS mode of operation, it starts with the regular MS network entry procedures above. After network entry, RS resumes normal operation. It reports 16e preamble and R-amble measurements to MR-BS and MR-BS may request this RS to implement R-amble monitoring scheme so that the neighbor RSs can perform measurements from this RS and report to the MR-BS. After collecting all measurements, the MR-BS configures the RS.

4 Topology Configuration

Topology configuration/reconfiguration may be performed during low-traffic periods, e.g., midnight, which we refer as ‘topology configuration window’. All RSs are assigned R-ambles that can be employed to measure radio environment. RSs perform measurements and report them to the MR-BS. The MR-BS determines the network

topology by configuring the RSs as transparent RS, non-transparent RS, peer/group leader, and member of an RS group.

On the other hand, it may also be necessary to perform topology configuration during normal operation time, e.g., on-going topology configuration. During an on-going topology configuration, member RSs are configured not to transmit preamble/FCH/MAP to avoid inaccurate signal measurements that can be caused by superposition of multiple signals. A RS may monitor either the 16e preamble (if it is a network entry), or R-amble (if it is during normal operation) and report to the MR-BS. The MR-BS configures the RS.

An MR-BS may prevent the new entries to the RS group. This is referred as 'group closure phase' during which time no new members are allowed to enter the group. The member RSs can be configured to transmit preamble/FCH/MAP during this period.

In some cases, the members of the RS group may be assigned as a serving RS for another RS outside the group. This may be performed during the topology configuration window period by the MR-BS based on the signal measurements. During on-going configuration, the measurements based on the 16e preamble and/or R-amble can be employed to perform this. During the group closure period, the measurement/report methods based on UL signal measurements can be used.

5 Cooperative Diversity and Selective Forwarding

RS group may coexist with cooperative diversity protocol. That is, members of an RS group may be configured to transmit a space-time code (through RS-CDC message).

An RS-group shall also be enabled for selective forwarding. For example, in Figure 1.a., assume RS1 serves to MS1 and RS3 serves to MS3 (e.g., because the associated wireless links are very good). In that case, RS1 may only need to forward the data for MS1, and RS3 to MS3, although both RS1 and RS3 have the traffic data for both mobiles. This can reduce the unnecessary interference and resource usage at both RSs. Note that there may another MS, e.g., MS2, which can receive signals from all RS1, RS2, and RS3 and perform RF diversity combining. An RS group already enables that sort of transmission.

In order to enable the RS group to perform the selective forwarding, we propose to couple the members of the RS group with the associated subordinate node(s). This coupling is implementation specific (e.g., potential interference, load balance, DL/UL link qualities, etc..) and can be performed during the network entry of an MS/SS and during normal operation. For an MS served by a RS group or member of a RS group, this coupling simplifies the handover process significantly since the handover is within the members of RS group which is enabled by this coupling procedure.

During the topology discovery and topology update, the group peer/parent leader can be informed with the connections it is associated with. For example, after a network entry through the RS group, the topology and the routing table on the group peer/parent leader may be updated by the MR-BS.

6 Text Changes

++++Start text ++++++++++++++

[Modify 6.3.9.16.3.1 as follows]

[Replace the following text in Subclause 6.3.9.16.3.1 as indicated below]

• When the virtual RS group includes an MR-BS, all the RSs in the virtual group shall either transmit the same preamble, FCH and MAP as the MR-BS or they all do not transmit any preamble/FCH/MAP.

[Delete the following text in Subclause 6.3.9.16.3.1 as indicated below]

~~• Different RS groups shall transmit different preambles.~~

[Insert the following text in Subclause 6.3.9.16.3.1 as indicated below]

• Selective forwarding capability within RS group: For DL, the members of an RS group may be associated with MSs/SSs or RSs such that they may forward traffic data for only their associated subordinate nodes. This may be done per terminal or per transport connection basis. In this way, by specifying scheduling times, two RSs belong to the same RS group may transmit to two different MSs/SSs in the same time. In addition, in a similar way it may be scheduled such that the multiple RSs in the RS group may transmit to the same MS to exploit macro-diversity. This is achieved by keeping a mobile list or CID list associated with each RS and RS would look for the data bound to its associated MSs and forward them in the assigned times under a centralized scheduling scheme.

For the UL, diversity combining of the information received by the members of RS group can be performed, or the UL signaling can be designed such that several member RSs may receive data from multiple mobiles at the same time. This is possible by maintaining a list of MSs or CIDs which are associated with each RS and forwarding those messages in a specified resource unit (time and frequency). When the MS is same and the resources are the same, it is equivalent to macro-diversity. When the resources are same but the MSs are different that is equivalent to selective parallel transmission.

Each time handover occur or a new MS joins an RS, the RSs CID list is updated to keep track of the MSs which are associated with a particular RS.

[Insert the following definitions to Section 3]

3.103 Group parent leader: The member RS or MR-BS in a RS group which is responsible for transmitting the preamble/FCH/MAP. The RS group employs the preamble of group parent leader.

3.104 Group peer leader: The member RS in a RS group which is responsible for transmitting the preamble/FCH/MAP. The RS group employs group peer leader leader's preamble which is different from the parent of the RS group.

[Insert Subclause 6.3.9.16.3.1.1]

6.3.9.16.3.1.1 MS Network Entry Procedures

Each RS group member has the knowledge of DL/UL MAP, thus, during the initial ranging process, each RS group member can monitor the CDMA ranging codes from subordinate nodes; however, network entry process is leaded by the group peer leader or the group parent leader. Other members of the group forwards RNG-REQ message to the group peer/parent leader with their Unicast RSID if the ranging codes are received with sufficient signal quality, and perform the procedure in 6.3.9.16.1. The group peer/parent leader (if not an MR-BS) performs the procedure in 6.3.9.16.2 after it receives the ranging codes or RNG-REQ from the member RSs.

[Insert Subclause 6.3.9.16.3.1.2]

6.3.9.16.3.1.2 RS Network Entry Procedures

If the RS in MS mode of operation, it starts with the regular MS network entry procedures in 6.3.9.16.3.1.1. After network entry, RS resumes normal operation. The RS reports 16e preamble measurements to MR-BS and MR-BS may request this RS to implement R-amble monitoring scheme so that the neighbor RSs can perform measurements from this RS and report to the MR-BS. After collecting all measurements, the MR-BS configures the RS.

[Insert Subclause 6.3.9.16.3.1.3]

6.3.9.16.3.1.3. Topology Configuration

The configuration of RSs as non-transparent/transparent/member/peer leader/parent leader RS may be performed either as an ongoing process during normal operation, or within a specified period, called as ‘topology configuration window’. The creation, maintenance and modification of an RS group may be performed during these two periods. Topology configuration may be based on signal quality measurements, e.g., using R-amble monitoring schemes described in the standard. The MR-BS collects measurement reports regarding the link qualities and configure the RSs as transparent/non-transparent RSs, group peer leader, group parent leader, or member RS.

During an ongoing topology configuration, the member RSs are configured not to transmit preamble/FCH/MAP. The potential RS monitors 16e preamble or R-ambles and reports to the MR-BS. The MR-BS configures the RS.

During the ‘group closure period’, no new RSs can be configured as a member of this RS group. During the closure period, the members of the RS group can be configured to transmit preamble/FCH/MAP and R-amble.

Members of an RS group can be configured as serving station to an RS outside the group. During the topology configuration window period and on-going topology configuration period, the MR-BS may use R-amble or 16e preamble measurements to perform this configuration, while during group closure phase, the UL signal measurements may be employed.

During the periods other than the group closure periods, the RS group may be updated (e.g., acceptance of a new member RS, removal of a member RS from the group, change of parent/peer leader) based on the R-amble or 16e preamble radio measurements.