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Abstract	Some clarifications for the virtual group operation. Harmonized with 07/422.	
Purpose	Review and adopt	
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# On the RS Grouping Concept

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*NSN*

## Introduction

During the March 2007 meeting, the concept of virtual relay grouping for centralized scheduler has been introduced in [2], which allows an RS to be part of a group of RSs in order to extend the coverage area of a certain RS, as well as to increase the channel diversity order.

## Some clarifications

The current mode of operation as defined in the baseline document is confusing and mixes the operation of transparent with non-transparent relays.

We think that the following clarifications simplify the understanding and the mode of operation for the virtual group relay.

An RS group:

- Shall operate under centralized scheduler, and shall serve only MSs in order to cope with the mobility issues and HARQ that are difficult under centralized scheduling.
  - UL HARQ operation for RS group is case of more than two hops is not feasible. When MS sends UL HARQ burst in frame N, it expects DL ACK/NAK bitmap IE at-most in the frame N+ 3. In case of virtual grouping, UL ACK/NAK bitmap IE for MSs has to be generated by MR-BS (status of UL HARQ burst reception at each RS in the group could be different and therefore RS can not generate and transmit DL ACK/NAK bitmap IE to MS). If 1 frame offset is assumed for ACK transmission and HARQ burst relaying then it is not possible to support UL HARQ for more than 2 hops.
- May have assigned a BSID value for the entire virtual group, so that the MSs perceives the entire group as a single RS.
- Shall do data forwarding on per CID basis and not on per MS basis. RS does not know which CIDs belongs to which MSs. Even if MR-BS provide this information to RSs, advantages of data forwarding per MS basis are not clear.

The following comments have been addressed in this version:

172 – How can arrange RSs to transmit the same MAP? This was addressed by the second bullet in the proposed text.

175 – What is the group parent of the virtual group- defined in this proposal.

122 - Rename Virtual RS group to RS group - done

264 – Changes to the virtual RS group handover. This is taken into consideration in 262 (Superseded by 262)

19 - The definition of the shared non-transparent RS – not needed.

174 – Proposing several changes to RS group concept. This is included in this document during the harmonization process.

176 – group parent is not defined: The super-ordinate node is defined. The network entry procedure for RS group members has been modified to address this.

L432 – Definition includes MR-BS – addressed. Criteria might not be included. No need to change.

L433 – Multicast ID for the MR-BS when it is a member of the RS group: Now MR-BS is not a member of the group.

L434 – This is about macro-diversity procedure being different from the 16e and MS would not be able to recognize it. But since two RSs transmit the same data when scheduled to do the macro-diversity, this has no issue.

L430- The parent RS is not defined - Now this is defined.

018 – Define the new RS category and associated procedures for the Non-transparent RS in the virtual group – This has been fully addressed in the document and not necessary to introduce a new RS type.

## Specification changes

*[Change the 1<sup>st</sup> bullet point in section 6.3.9.16.3.1 RS grouping]*

- A group of RSs form an ~~Virtual~~ RS group as decided by the MR-BS based on criteria (e.g. potential interference that they cause to each other) which is implementation dependent, in order to achieve some of the following benefits:
  - To reduce the number of handovers when an MS crosses the boundaries of different RSs. Note, the coverage of an RS is small so, even with a moderate number of RSs there can be lot of handovers.
  - To increase the data rate when the MSs in an area receive adequate signal levels for the preamble, FCH and MAPs but the data rate is low.
  - When needed to enable an RS in a location where the segment allocation is not possible due to interference from all other segments, which could cause high interference to broadcast messages.
  - When several RSs are closely located or move together so that the co-operation is beneficial.

*[Change the 2<sup>nd</sup> bullet point in section 6.3.9.16.3.1 RS grouping]*

- Each RS is assigned an individual unicast RSID and a multicast RSID as the RS group ID. The multicast RSID is the same for all members in the group. With these two separate IDs, the RS can be managed individually or as a group. These IDs are unique within the associated MR-BS. The association of an RS to an RS group is configured using RS Config REQ message (see section 6.3.2.3.67). The multicast RSID is used for messages that are addressed to all the members of the RS group, and the unicast RSID is used for the individual members of the RS group. The MS network entry procedure follows the 6.3.9.16.3.1.1. The MS handover procedure follows 6.3.22.5.2. For an transparent (or non-transparent) RS group all the other procedures follow the procedures for the transparent (or non-transparent) RS. For example, if the RS group is non-transparent, the MAPs for the individual RSs will be received by the RSs according to the associated procedure defined for a non-transparent RS using the multicast RSID (see section 6.3.28.1).

*[Change the 3<sup>rd</sup> bullet point in section 6.3.9.16.3.1 RS grouping]*

- ~~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 or MAP. When an MR-BS is not included in the virtual group, one of the RSs in the virtual group is a~~

~~non-transparent RS and all the others shall either transmit the preamble, FCH and MAP of the said non-transparent RS or they all do not transmit preamble, FCH and MAP. The radio resources may be shared by these RSs for data burst transmission. The existence of the group is totally transparent to its MS(s). The RS group has a superordinate station (non-transparent RS or MR-BS) that is the superordinate station of all RSs in the group. All the RSs in the RS group shall either transmit the same preamble, FCH and MAPs or they all do not transmit any preamble, FCH or MAPs. The MR-BS or the superordinate station carries out resource control and scheduling for the RS group. The non-transparent RS group may be assigned a BSID parameter value. The RS group shall serve only MSs. The radio resources may be shared by the RSs members of the RS group for data burst transmission. The RSs members of the non-transparent RS group shall transmit with the same EIRP parameter value, decided by the MR-BS.~~

*[Change the 6<sup>th</sup> bullet point in section 6.3.9.16.3.1 RS grouping]*

- Data forwarding within RS group: For DL, the members of an RS group may be configured to forward traffic data for only specific subordinate terminal nodes. This may be done on ~~a per terminal or per transport~~ connection basis. In this way, by specifying scheduling times, two RSs belonging to the same RS group may transmit to two different MSs/SSs at the same time. In addition, transmissions may be scheduled such that multiple RSs in the RS group may transmit to the same MS to exploit macro-diversity. This scheduling may be achieved under a centralized scheduling scheme by keeping an MS list or CID list associated with each RS. Each RS would look for the data bound to its subordinated stations or data coming from the subordinate stations in the uplink and forward in the assigned times indicated in the MAP. The list may be updated by the RS\_Member\_List\_Update message defined in 6.3.2.3.89. If the RS Member List Update message is not provided by the superordinate RS to the RSs members of the RS group, then all RSs members of the group shall transmit according to the MAPs received, without using the per CID transmission.

*[Change the 8<sup>th</sup> bullet point in section 6.3.9.16.3.1 RS grouping]*

- Each time a handover occurs or a new terminal joins an RS group, the ~~RSs CID/Terminal list of CIDs for RSs in the group is may be~~ updated to keep track of the connections/terminals which are associated with a particular member RS.

*[Changes in section 6.3.9.16.3.1 RS grouping]*

[Remove any instance of word “virtual” in the text.]

*[In section 6.3.9.16.3.1.1 make the following changes]*

Each member of the RS group ~~member~~ shall monitor the CDMA ranging codes from subordinate nodes. ~~If the group parent is not a member of †~~The members of the transparent RS group, ~~then RS group members shall follow follow~~ the procedures in 6.3.9.16.1.

For the non-transparent RS group the MS scans the DL channel and establishes the synchronization with the preamble send by the RS group, then obtains the transmit parameters from the UCD message as described in 6.3.9.1 through 6.3.9.4. After this, the MS entry procedure continues as described in 6.3.9.16.1 from 2<sup>nd</sup>

~~paragraph onwards except the fact that the RNG-RSP message mentioned in the 5<sup>th</sup> paragraph is relayed through the RS group using the basic CID. If the group parent is a member of the RS group, then the RS group members other than the parent shall follow the procedure in 6.3.9.16.1, and the parent (if not MR-BS) shall follow the procedures in 6.3.9.16.2.~~

*[In section 6.3.2.3.89 make the following changes]*

[Remove any instance of word “virtual” in the text.]

*[Change 1<sup>st</sup> paragraph as following]*

The superordinate station ~~of the virtual~~ RS group ~~parent~~ may transmit RS\_Member\_List\_Update message as a multicast message to update the ~~virtual~~ group members with the details of the traffic burst they shall forward. This message ~~is~~ may be transmitted whenever there is a change in the connection list of the RS group members ~~due to their movement or movement of their subordinate nodes.~~

*[In Table 183ae change the Notes related to Configured\_para\_type (4<sup>th</sup> entry in the table) as following]*

b0 = 1: data forwarding on a per CID basis

b0 = 0: RSs in the group shall forward all data ~~forwarding on a per terminal basis~~

b1 – b3: reserved

*[In Table 183ae change the Notes related to N\_CID (9<sup>th</sup> entry in the table) as following]*

~~If b0 of Configured\_para\_type=1, number of CIDs whose data is to be forwarded by the RS group member~~

~~If b0 of Configured\_para\_type=0, number of terminals (the first hop MSs or RSs from the group member) involved with the list update~~

*[In Table 183ae change the Notes related to CID (11<sup>th</sup> entry in the table) as following]*

~~If b0 of Configured\_para\_type = 1, transport~~ CIDs involved with the list update

~~If b0 of Configured\_para\_type = 0, the basic CIDs involved in the list update~~

*[In Table 183ae change the Notes related to Add\_Remove (12<sup>th</sup> entry in the table) as following]*

b0 = 1: Add CID/~~terminal~~ to the forwarding list

b0 = 0: Remove CID/~~terminal~~ from the forwarding ~~the~~ list

*[Below Table 183ae delete the description of Config\_para\_type]*

#### **Configured\_para\_type**

~~The LSB bit indicates whether selective forwarding is enabled on a per CID basis, or on a per terminal basis.~~

