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Source(s)	Okuda Masato Voice: +81-44-754-2811 Fujitsu Laboratories LTD. Fax: +81-44-754-2786 Kamikodanaka 4-1-1, Nakahara-ku okuda@jp.fujitsu.com Kawasaki, Japan. 211-8588 Yuefeng Zhou, Mike Hart Voice: +44 (0) 20 8573 4444 Fujitsu Laboratories of Europe Ltd. FAX: +44 (0) 20 8606 4539 Hayes Park Central Hayes Yuefeng.zhou@uk.fujitsu.com Middlesex., UB4 8FE, UK Mike.hart@uk.fujitsu.com
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Abstract	
Purpose	
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MAC-PDU Reconstruction at RS

Masato Okuda, Yuefeng Zhou and Mike Hart
Fujitsu

Introduction

 This contribution proposes fragmentation and packing support at RS.

 In the relay systems, burst profile of relay and access link are usually different. RS is expected to use higher modulation and coding rate to communicate with the MR-BS, since it will be deployed in LOS environment in many cases. On the other hand, MS does not always use high modulation and coding scheme in mobile environment. Due to difference of burst profile, link capacity of access and relay link will be also different.

 Figure 1 shows an example of relay frame structure. Let's assume DL access and relay zone use QPSK-1/2 and 64QAM-1/2, respectively. Table 1 shows capacity of each link based on the above assumption.

 According to the table 1, RS can send 1350 bytes of data including MAPs on its access link, while it can receive 4050 bytes of data on its relay link. In this case, when RS receives 1500 bytes of MAC-PDU on relay link, it cannot relay the MAC-PDU to the MS on its access link without fragmentation.

 In centralized scheduling relay systems, MR-BS knows burst profile on both relay and access link. So, RS may not need to perform fragmentation since MR-BS can do. However, in distributed scheduling relay systems, fragmentation at RS is necessary since MR-BS does not know burst profile of MS under RS.
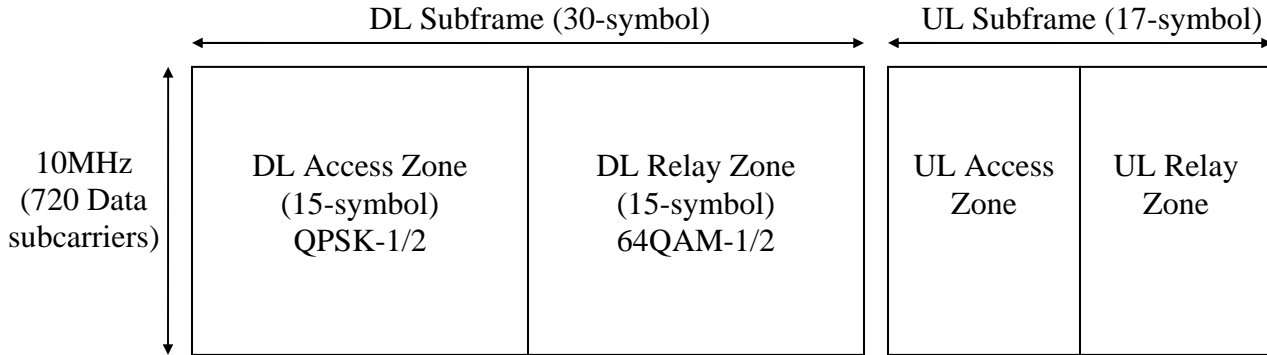

Figure 1: An example of relay frame structure

Table 1 Example of Capacity comparison

	DL Access Zone	DL Relay Zone
Capacity (# of Bytes in a frame)	1350	4050

 In the case of uplink stream, the RS receives small size of MAC-PDUs which will be fragmented by MS to accommodate small link capacity. Since larger PDUs have less overhead due to the MAC header, it improves bandwidth usage efficiency that RS packs several fragmented PDUs into one PDU and sends it to the MR-BS on the relay link.

In summary, fragmentation and packing at RS solves the problem and improves bandwidth efficiency.

[Security Consideration]

RS needs to decrypt and/or encrypt MAC-PDUs in order to reconstruct MAC-PDUs of encryption-applied connections. Security issue will be discussed in another contribution.

However, not all connections are supposed to be encrypted. So, we should not preclude fragmentation or packing at RS due to the security issue.

Specific Text Changes

Add the following words at the end of the last sentence in the first paragraph in 6.3.3.3 (Fragmentation):
6.3.3.3 Fragmentation
Fragmentation is the process by which a MAC SDU is divided into one or more MAC PDUs. This process is undertaken to allow efficient use of available bandwidth relative to the QoS requirements of a connection's service flow. Capabilities of fragmentation and reassembly are mandatory for BS and SS/MS, and optional for RS.

Add the following words at the end of the last sentence in the first paragraph in 6.3.3.4 (Packing):
6.3.3.4 Packing
If packing is turned on for a connection, the MAC may pack multiple MAC SDUs into a single MAC PDU. Packing makes use of the connection attribute indicating whether the connection carries fixed-length or variable-length packets. The transmitting side has full discretion whether or not to pack a group of MAC-SDUs in a single MAC PDU. The capability of unpacking is mandatory for BS and SS/MS. The capabilities of packing and unpacking are optional for RS.

References
[1] IEEE802.16e-2005