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Re:	This is a response to IEEE 802.16mmr-05/001(call for contributions: IEEE 802.16's Study Group on Mobile Multi-hop Relay)
Abstract	This document give 4 recommendations on design 802.16 TGe PMP mode backward compatible frame structure, an example is included.
Purpose	The purpose of this document is to give recommendations on design new mobile multi-hop relay frame structure.
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Recommendation on Design 802.16 TGe PMP mode backward compatible Frame Structure

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Introduction

This contribution presents some recommendations on the design of new relay frame structure which should be backward compatible to 802.16 TGe pmp mode. These recommendations may be useful when the RS & BS share same frequency band.

Figure 1 give example of fix relay network. The BS has wired backhaul; RS can relay BS's downlink traffic to SS & relay uplink traffic to BS. The BS & RS share same frequency.

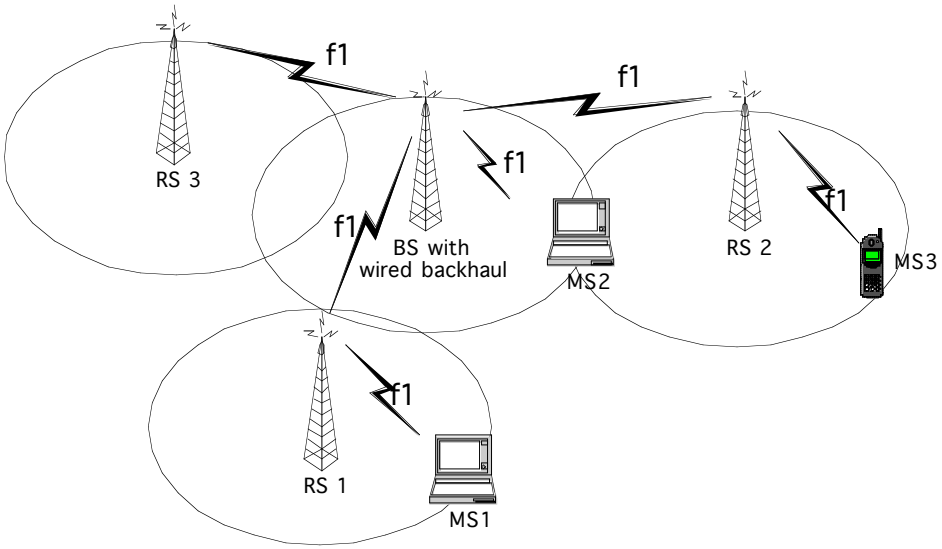

Figure 1 fix relay network

Assumption

Related assumptions should be described firstly.
A1: Interference free
In case of BS & RS share same frequency band, the RS and BS should not transmit different signal at same sub-carrier and same time.

A2: The BS and RS accommodate 2 types of MS:
TGe PMP mode type MS
New relay mode MS

Recommendations

R1: The BS & RS shall have a PMP type frame structure.

The 802.16 TGe PMP mode MS have no knowledge the existence of relay station, so the MS suppose the BS & RS should have preamble at the beginning of each frame, then there is a FCH. And then a DL_MAP message.

R2 RS shall keep synchronize with BS

To avoid ICI, RS shall keep carry frequency synchronize with BS
To avoid ICI, RS shall keep symbol frequency synchronize with BS

R3 RS could have same preamble as that of the BS

As described in A1, The RS & BS should be interference free, that make they should have same permutation, as a result, the cell ID should be same, by default, the preamble of them should be same.

A benefit is that the mobile station need not do handover in the relay cluster, but there should be a mechanism to find the right RS forward traffic to MS.

R4 the broadcast channel could occupy same radio resource.

The broadcast channel such as UCD, DCD, UL_MAP, FPC, CLK_CMP can relay to RS firstly, then broadcast at same radio resource.
The ranging sub-channel can share same radio resource.

Example

Figure 2 gives an example of frame structure in TDD mode.
The joint-frame in Figure 2 is corresponding to the conventional frame in 16e pmp mode.
There are 2 sub-frame in the joint-frame. Sub-frame A is used to support relay between BS & RS. Sub-frame B is used for cell coverage.
The preamble transmitted by BS in sub-frame A could be different with that transmitted in sub-frame B.
In sub-frame B, BS & RS transmit same preamble at same time.

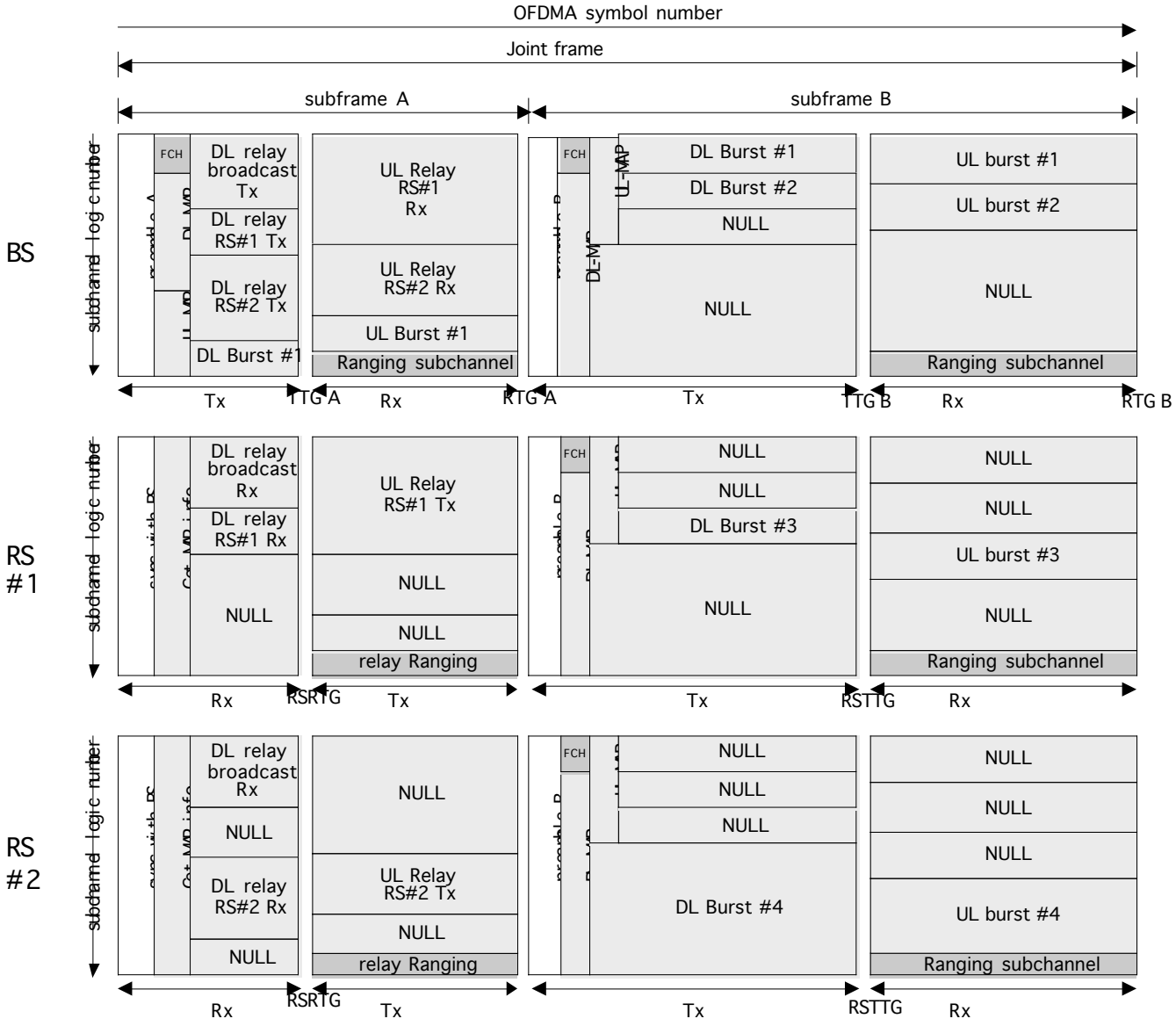

Figure 2 relay frame structure

Relay process

An example of relay process could be described as following:

Downlink relay

BS->RS
S1. BS transmits preamble A at first symbol of sub-frame A
S2. RS#1 receives preamble A & sync with BS
S3. BS transmits FCH, DL-MAP, UL-MAP
S4. RS#1 receives FCH, DL-MAP, UL-MAP get its map message
S5. BS#1 transmits broadcast message
S6. BS#1 transmits downlink traffic data for RS#1 at defined burst
S7. RS#1 receives broadcast message which may include information of broadcast message of sub-frame B
S8. RS#1 receives downlink traffic data for RS#1
RS->MS
S9. RS#1 transmits preamble B at first symbol of sub-frame B
S10. MS receive preamble & sync with RS#1

S11. RS#1 transmits FCH, DL-MAP, and UL-MAP, which is already relayed to RS #1 at S6
S12. MS receive FCH, DL-MAP, UL-MAP get its map message
S13. RS#1 transmits downlink traffic data for MS at defined burst
S14. MS receives downlink traffic data for MS at defined burst

Uplink relay

MS->RS
S1. MS receives FCH, DL-MAP, UL-MAP get its map message in sub-frame B;
S2. MS transmits uplink traffic data for RS#1 at defined burst in sub-frame B;
S3. RS#1 receives uplink traffic data in sub-frame B;
RS->BS
S4. RS#1 receives FCH, DL-MAP, UL-MAP get its map message in the following sub-frame A;
S5. RS#1 transmits uplink traffic data at defined burst in following sub-frame A;
S6. BS receives the uplink traffic data at defined burst in following sub-frame A;

Further explanation

The example given can be classified as dummy relay which defined in [2]. As describe in [2], the delay is unavoidable, but is predicable.

Reference

[1] Call for Contributions IEEE 802.16's Study Group on Mobile Multi-hop Relay.
[2] IEEE C80216-05/015, Concepts for 802.16-based Mobile Multi-hop Relay Networking