Proposed Frame Structure and Relay Region Indicator

IEEE 802.16 Presentation Submission Template (Rev. 8.3)

Document Number:

IEEE S80216j-06_256

Date Submitted:

2006-11-14

Source:

Changyoon Oh, Youngbin Chang, Hyunjeong Kang, Sungjin Lee, Mihyun Lee,Hyoung Kyu Lim, Jaeweon Cho, Panyuh Joo

Samsung Electronics Co., Ltd.
416 Maetan-3, Suwon, 442-600, Korea
Voice: +82-31-279-7529
Fax: +82-31-279-5130
E-mail: changyoon.oh@samsung.com

Rakesh Taori
Samsung Advanced Institute of Technology
C.P.O. Box 1142, Seoul, 100-611, Korea

Venue:

IEEE 802.16 Session #46, Dallas, U.S.A

Base Document:

C80216j-06/256, /257, /258, /260, /263

Purpose:

The purpose of this slide is to support proposed frame structure and relay region indicator.

Proposed Frame Structure and Relay Region Indicator: #06/256, #06/257, #06/258, #06/260,#06/263

Changyoon Oh, Youngbin Chang, Hyunjeong Kang, Sungjin Lee, Mihyun Lee, Hyoung Kyu Lim, Jaeweon Cho, Panyuh Joo

Samsung Electronics Co., Ltd.

Rakesh Taori

Samsung Advanced Institute of Technology

November, 2006

Outline

- Introduction
- Frame Structure for 2-hop relay
- Frame Structure for Multi-hop relay
- Frame Structure for out of band relay
- Initial relay region indicator
- Flexible relay region
- Summary

Introduction

- The frame structure for 2-hop and multi-hop relay are:
  - Simple extension of 802.16e frame structure
  - Minimize the number of transition gap
  - Dynamic change of access/relay region
  - Support various Resource Allocation
  - Support Mobile RS handover
  - Easy extension to multi-hop relay
- The frame structure for out of band
  - Reuse of .16e frame
- Initial Relay Region indicator
  - STC_DL_ZONE_IE
- Flexibility of Relay Region
  - R-FCH

Terminology

M**MR-BS Frame:** Frame structure for transmission/reception by BS
RS-Frame: Frame structure for transmission/reception by RS
Access Region: This is the region in the DL/UL subframe of the MMR-BS frame and RS frame for communicating to/from MS
Relay Region: This is the region in the DL/UL subframe of the MMR-BS frame and RS frame for communicating between BS and RS, RS and RS.
RSTG: Relay Subframe Time Gap
RFTG: Relay Frame Time Gap
R-TTG: Relay-TTG
R-RTG: Relay-RTG
R-FCH: Relay-FCH
R-DL-MAP: A MAC message that defines burst start times for both time devision multiplexing and time devision multiple access (TDMA) by a relay station on the downlink
R-UL-MAP: A set of information that defines the entire access for a scheduling interval for a relay link

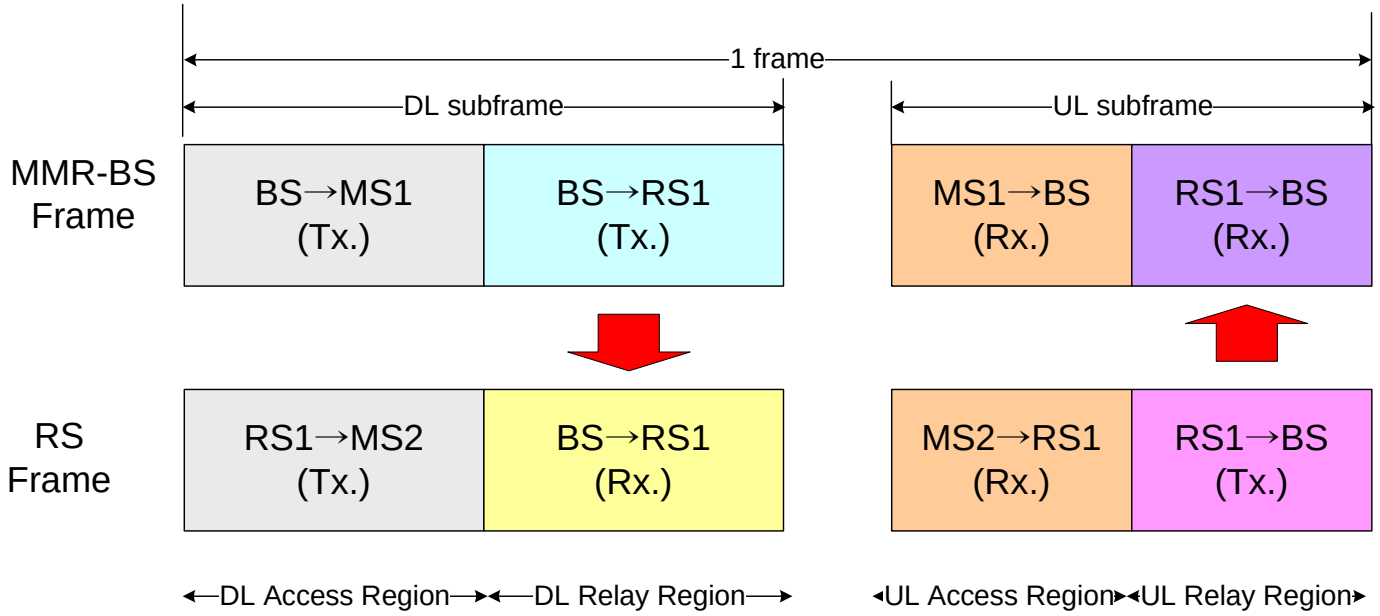
Odd-hop RS: When the number of hop between MMR-BS and RS is odd, then RS is called odd-hop RS
Even-hop RS: When the number of hop between MMR-BS and RS is even, then RS is called even-hop RS

Frame structure for 2-Hop Relay #06/256

Design Summary

Feature	Benefit
One Access link and One Relay link in a frame	• Minimize transition gap overhead
Access link is followed by Relay link	RS to MS link (access region) comes first in the DL/UL subframe • MS backward compatibility
Flexibility in division of Access and Relay regions	Increase in resource utilization
Preamble for BS/RS to MS	(RS to MS link): amble transmission at the beginning of frame • MS backward compatibility
Postamble for BS/RS to RS	(MMRBS/RS to RS link): amble transmission at the end of relay region : relay link synchronization • fixed amble location
	Coexistence of .16e system and .16j system

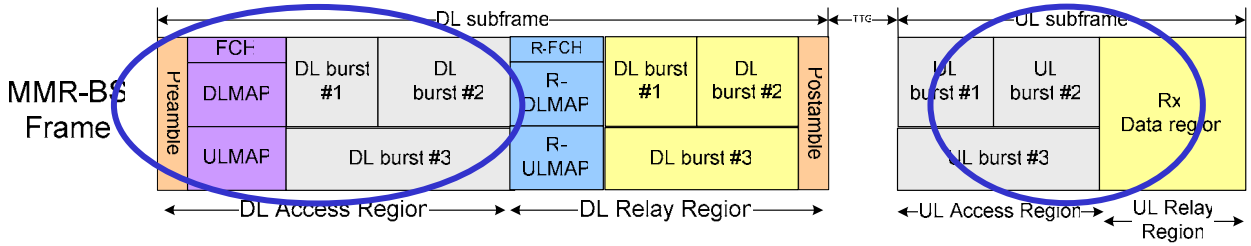
Operation of MMR-BS/RS Frame



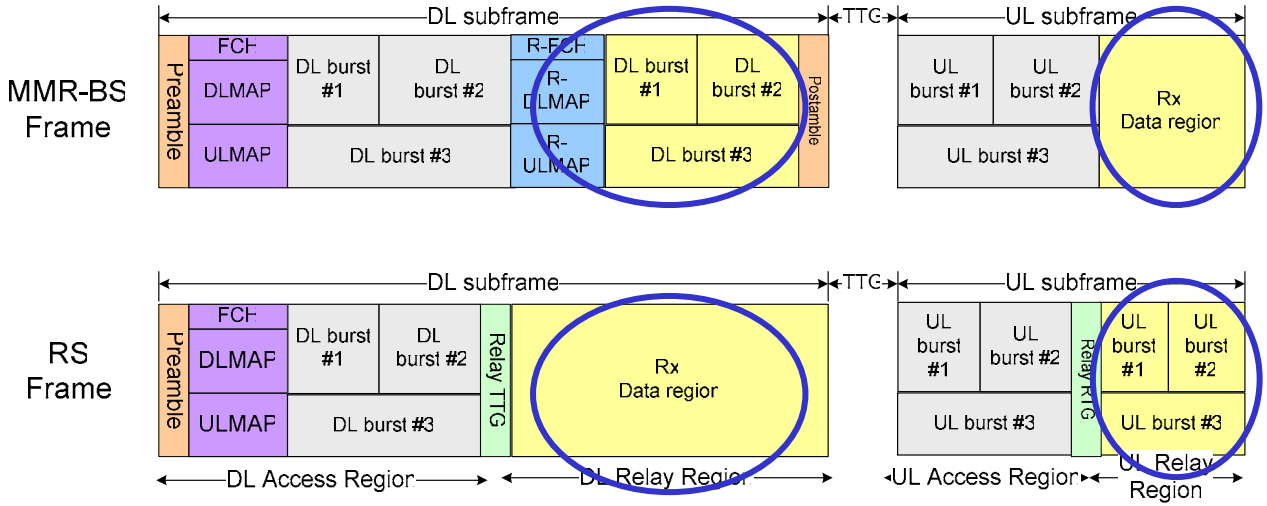
Operation in the relay region of DL/UL subframe

MMR-BS/RS Frame

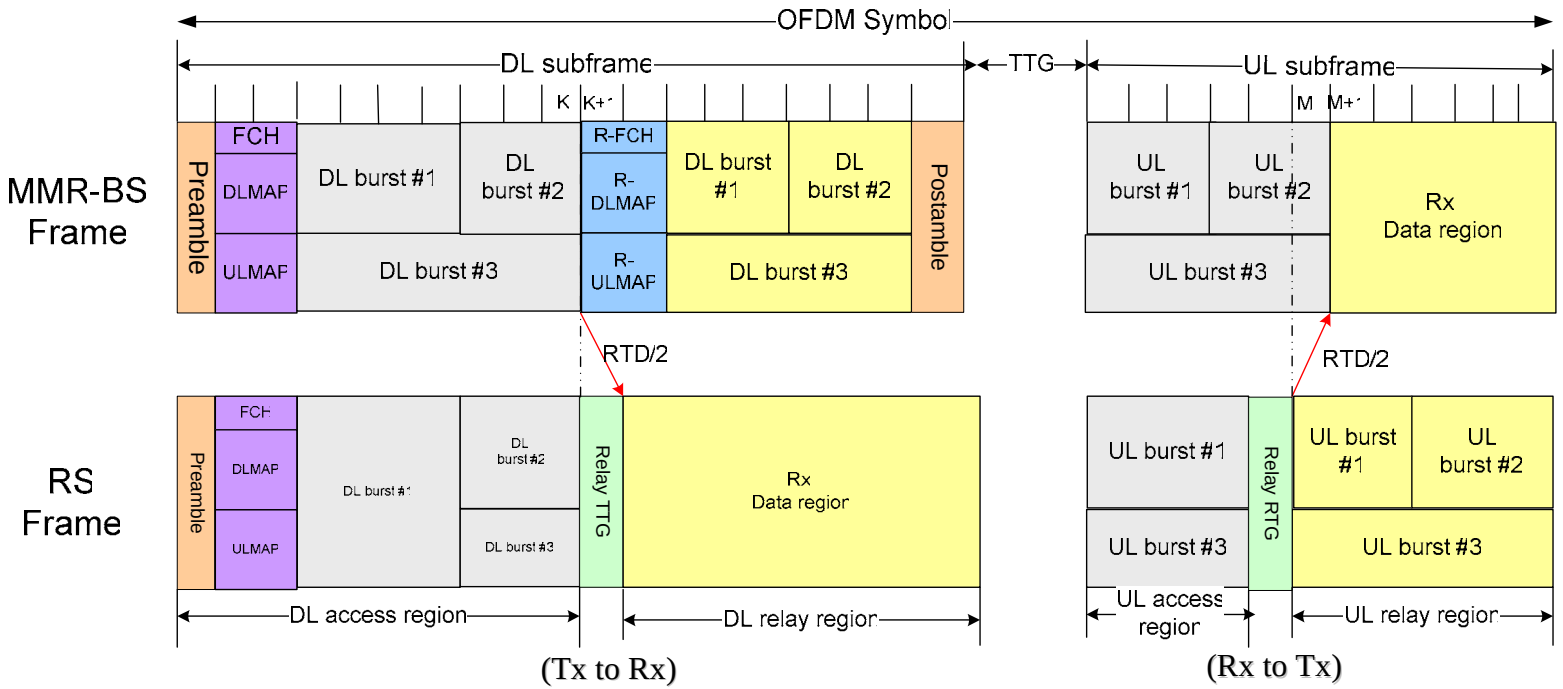
RS performs initial network entry in the access region of the MMR-BS frame as an MS does:



After completion of initial network entry, RS communicates with MMR-BS in the relay region:

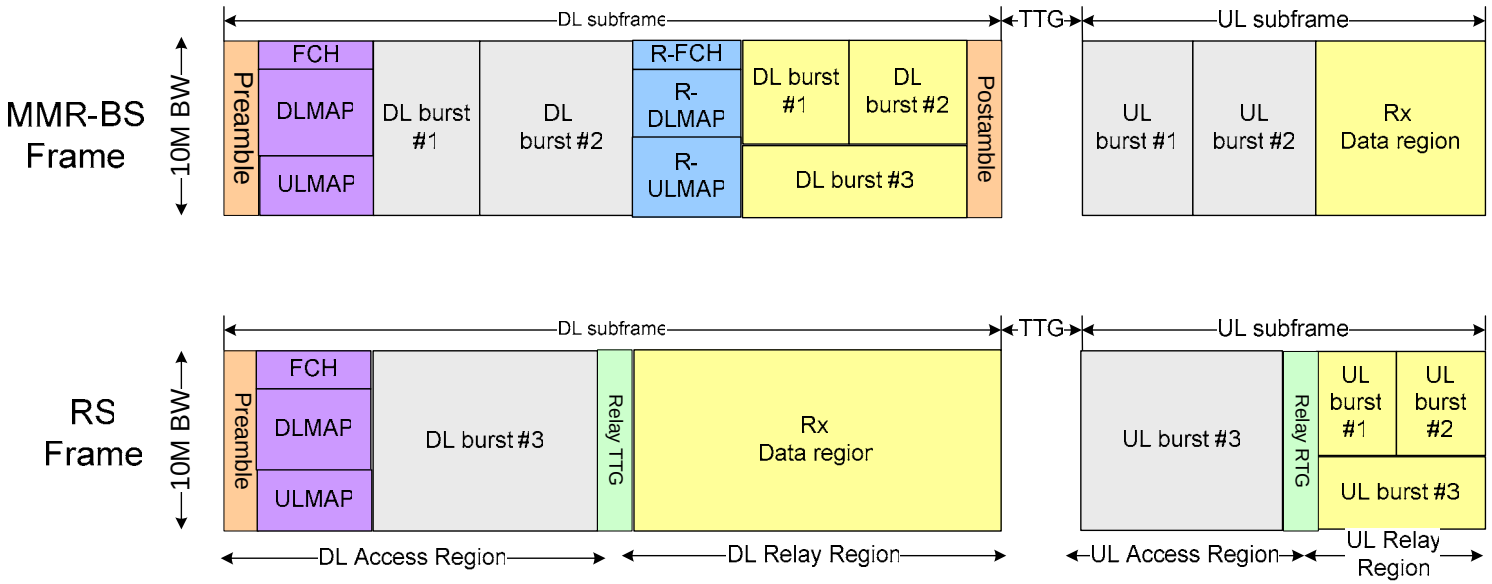


Transition Gap



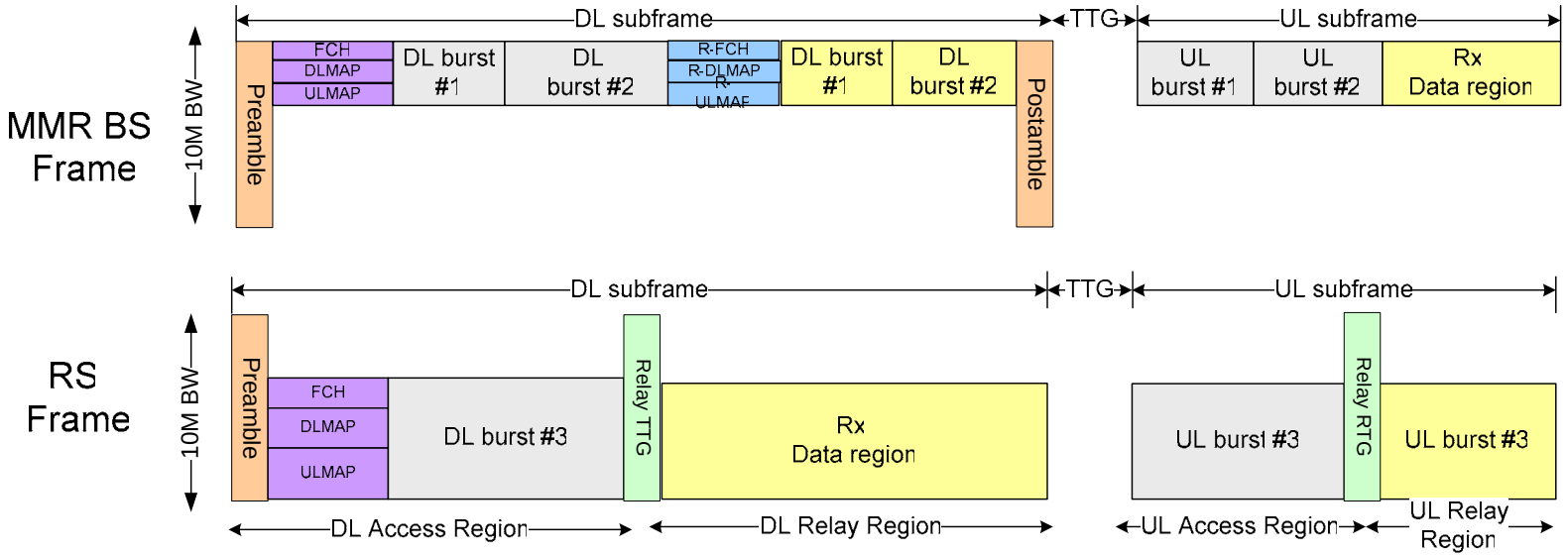
- Transition Gap is needed at RS's frame
  - Due to TX/RX switching time and round trip delay
  - 1 symbol gap is enough
- To reduce overhead due to the transition gap, the number of TX/RX switching should be minimized

Implementation #1: PUSC with all subchannels



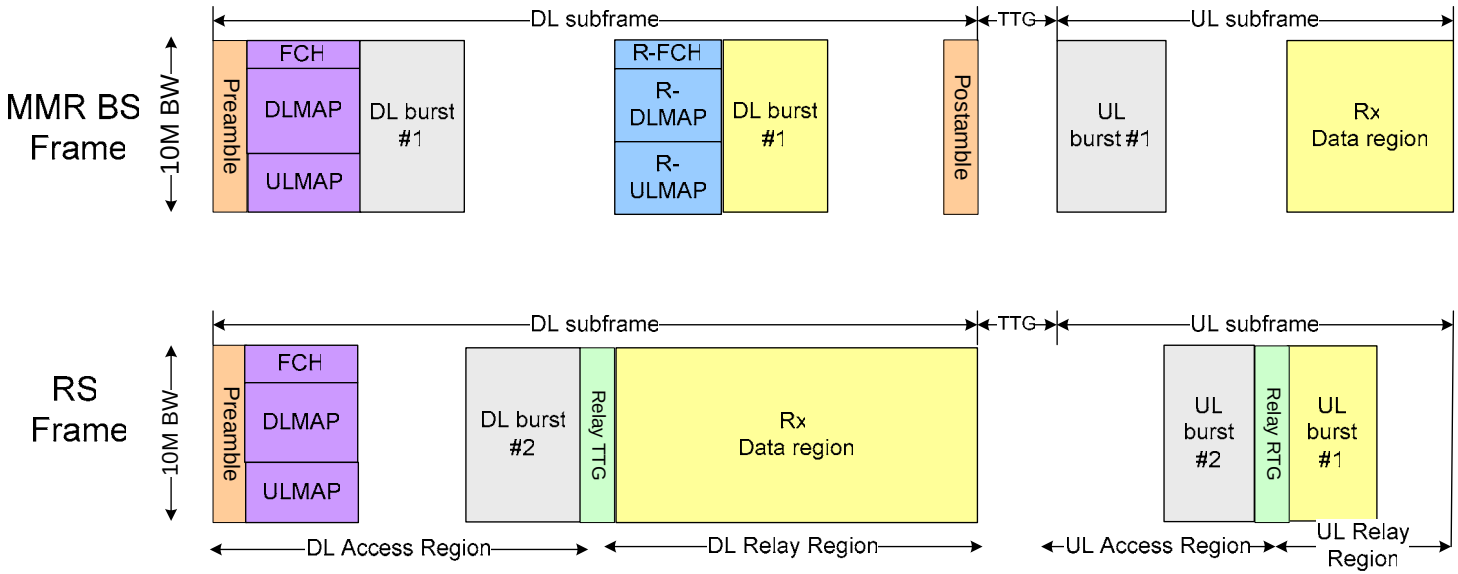
- Maximize radio resource with utilizing all subchannels

MMR-BS and RS Frame
Implementation #2: PUSC with segmentation



- Avoid interference with frequency division manner

MMR-BS and RS Frame Implementation #3: time scheduling



- Avoid interference with time scheduling (time division manner)

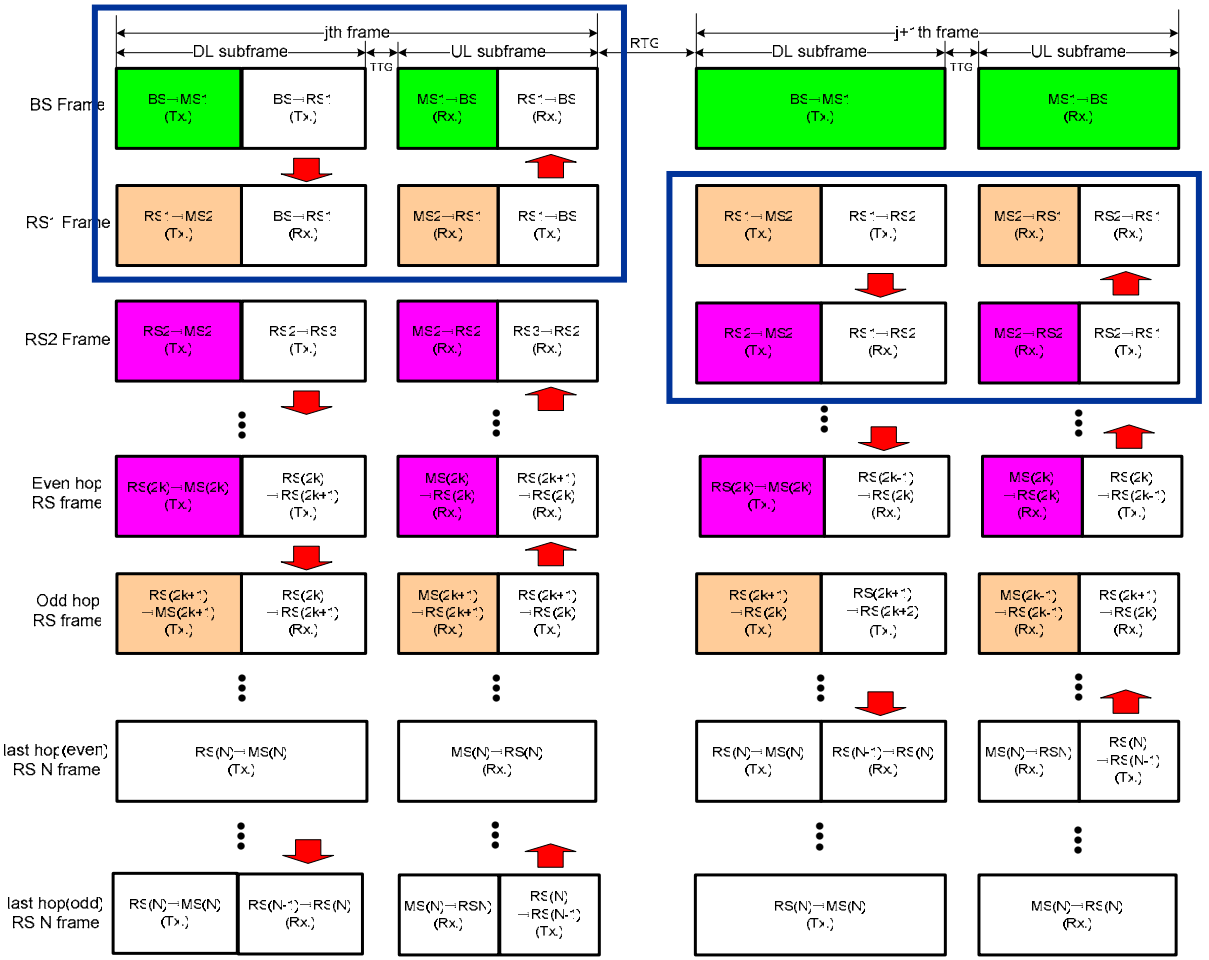
Frame structure
for multi-hop relay
#06/257

Design Summary

- Easy extension of 2-hop relay frame structure

- 2-frame unit
  - which allows fat pipe both for relay and access region in DL/UL subframe
  - Support coexistence of .16e system and .16j system
  - Support (DL subframe:UL subframe)=(1:1),…,(2,1),..,(3:1)
  - Support MS to RS link with minimum throughput requirement
  - Minimize the number of transition gap
  - Relax burden for fast processing to relay within 1 frame

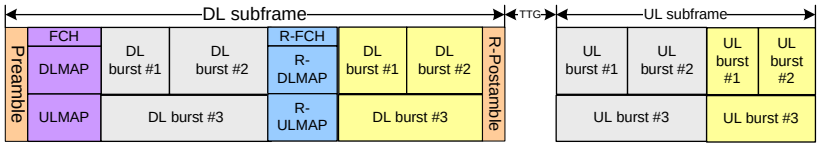
Operation of MMR-BS/RS frame



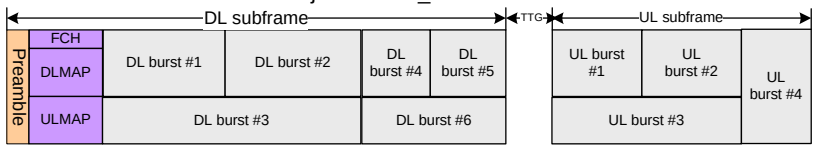
Operation of multi-hop relay frame in 2-frame unit

MMR-BS/RS frame

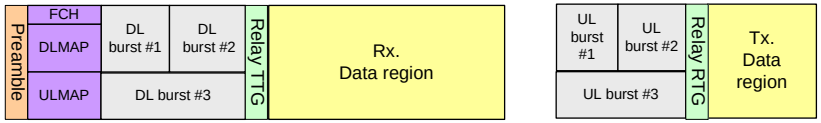
jth MMR_BS frame



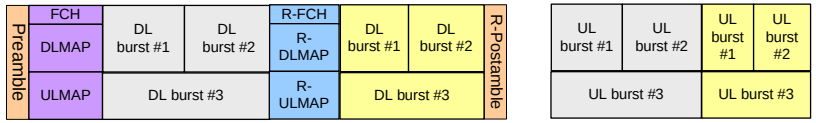
j+1th MMR_BS frame



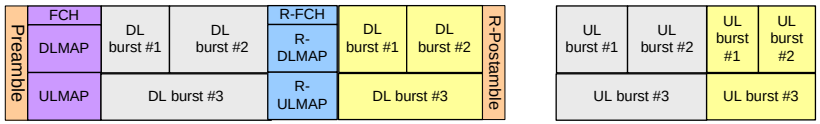
jth Odd hop RS frame



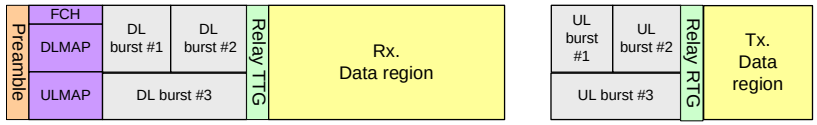
j+1thOdd hop RS Frame



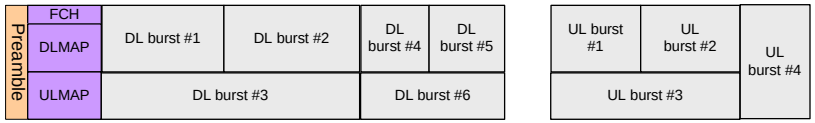
jth Even hop RS frame



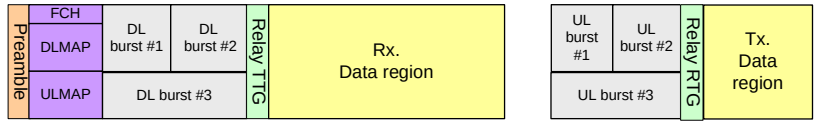
j+1th Even hop RS frame



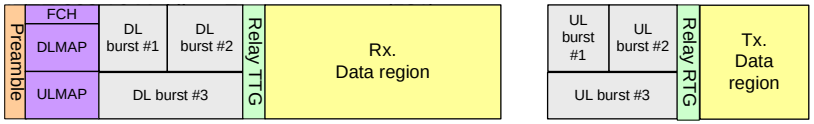
jth last hop (odd) RS frame



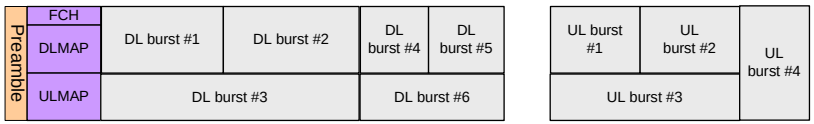
j+1thlast hop(odd) RS frame



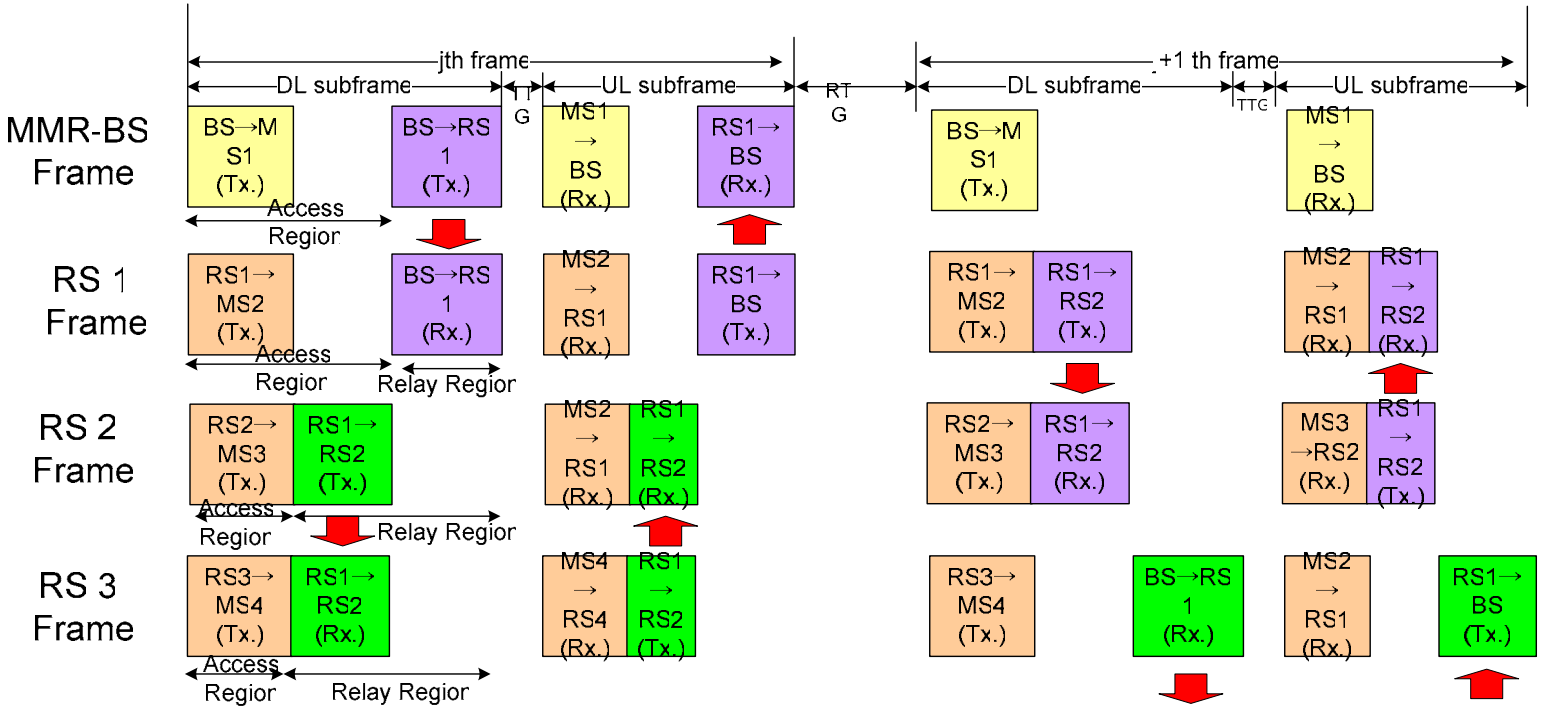
jth last hop (even) RS frame



j+1th last hop(even) RS frame



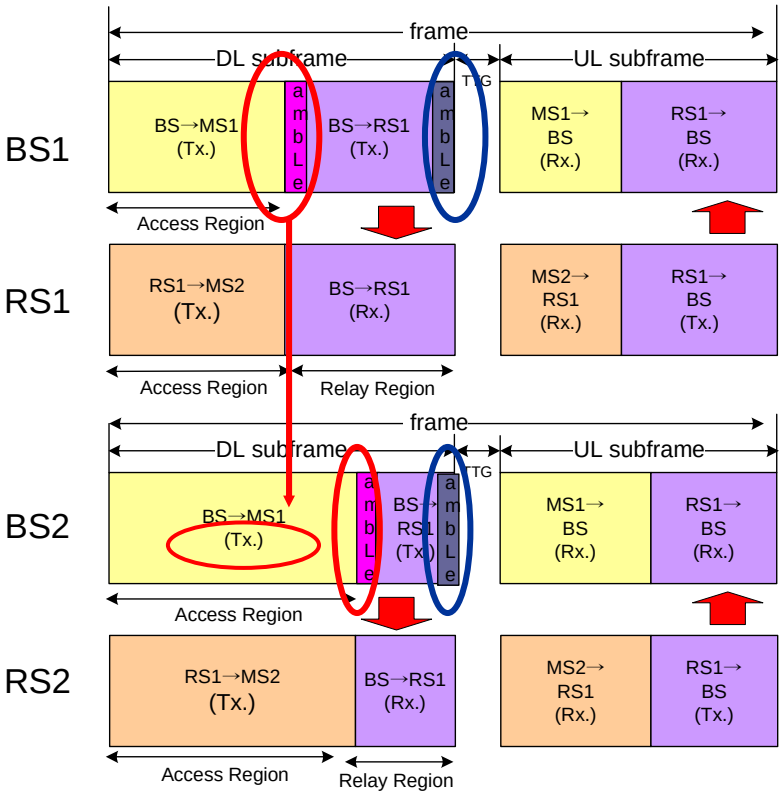
Implementation: time scheduling



- Avoid interference with time scheduling (time division manner)

Benefit of Postamble over Midamble

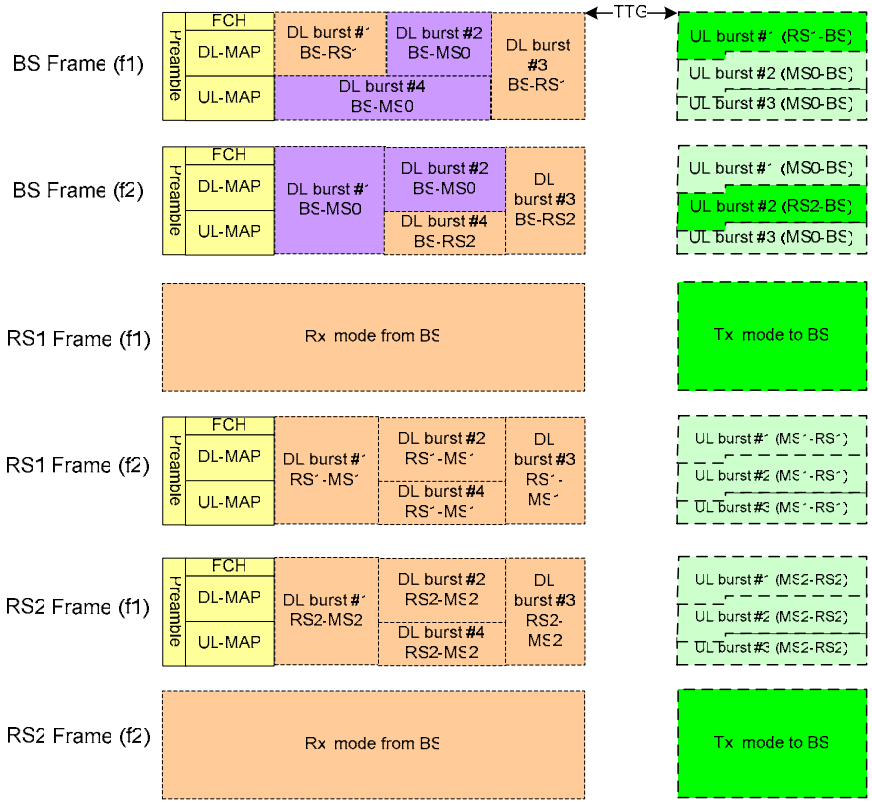
-For Dynamic change of relay region-

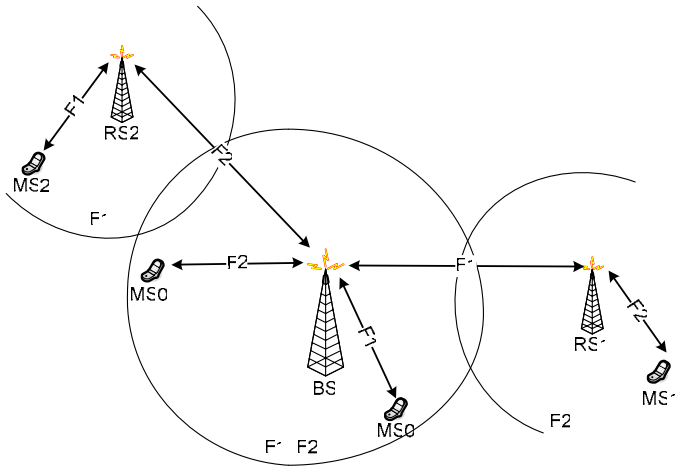


- Avoid Interference from boosted power (amble) to data
- Reliable CINR measurement
- Easy for quick cell search at mobile RS
- Easy for periodic channel measurement of neighbor at fixed RS

Frame structure
for out of band relay
#06/258

Frame Structure for out of band





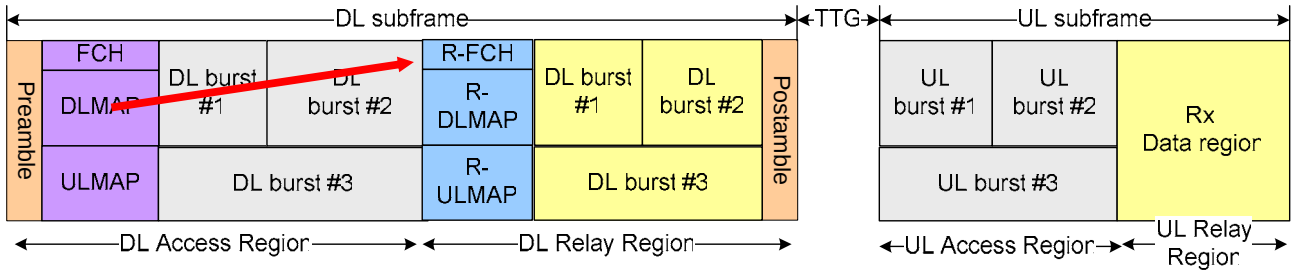
- .16e frame structure can be reused for out of band

Initial Relay Region Indicator #06/260

Initial Relay Region Indicator

After completing its initial network entry in access region,

- DL relay region: ‘STC_DL_ZONE_IE’ indicates DL relay region
- UL relay region: R-ULMAP assigns ‘allocation start time’ and ‘No. OFDMA symbols’



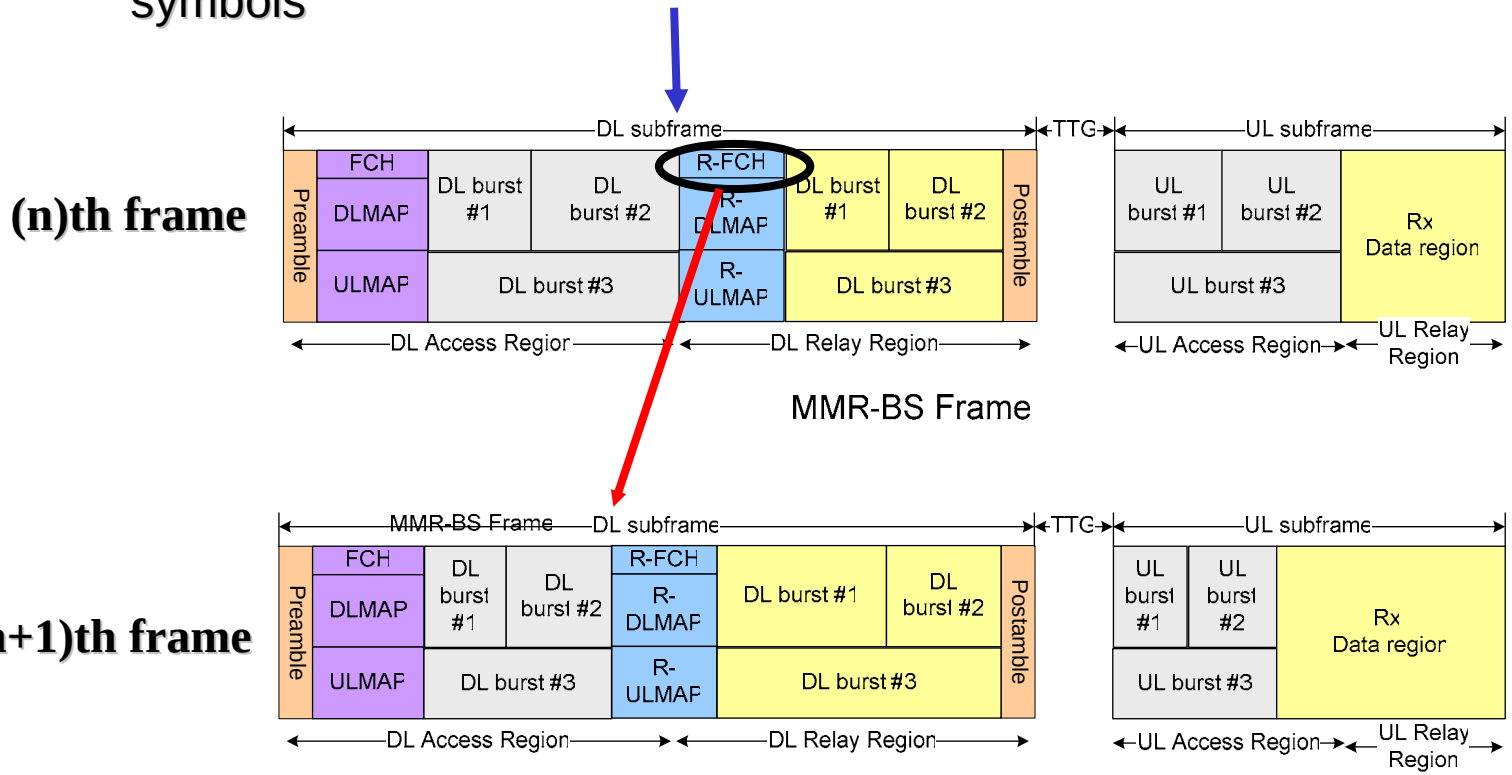
MMR-BS Frame

Flexibility of Relay Region #06/263

Flexibility of Relay Region

Time resources of access region and relay region may be changed.

- DL relay region: R-FCH indicates ‘offset’ of the starting point of DL relay region
- UL relay region: R-ULMAP assigns ‘allocation start time’ and ‘No. OFDMA symbols’



Summary

- Frame Structure for 2-hop
  - Access region precedes relay region
  - Fixed amble location (relay link)
- Frame Structure for multi-hop
  - Easy extension of 2-hop relay frame
  - 2-frame unit
- Frame Structure for out of band
  - Reuse of .16e frame structure
- Initial Relay Region Indicator
  - STC_DL_ZONE_IE
- Flexibility of Relay Region
  - R-FCH