

Recommendation on PMP Mode Compatible TDD Frame Structure

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None.

Purpose:

This is a response to IEEE 802.16mmr-05/001 (call for contributions: IEEE 802.16's Study Group on Mobile Multi-hop Relay) to present a compatible frame structure.

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Recommendation on PMP Mode Compatible TDD Frame Structure

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Basic Requirements

□ Support Scenarios

- ❖ Throughput Enhancement → **Target in this contribution**
- ❖ Coverage Extension → For future study

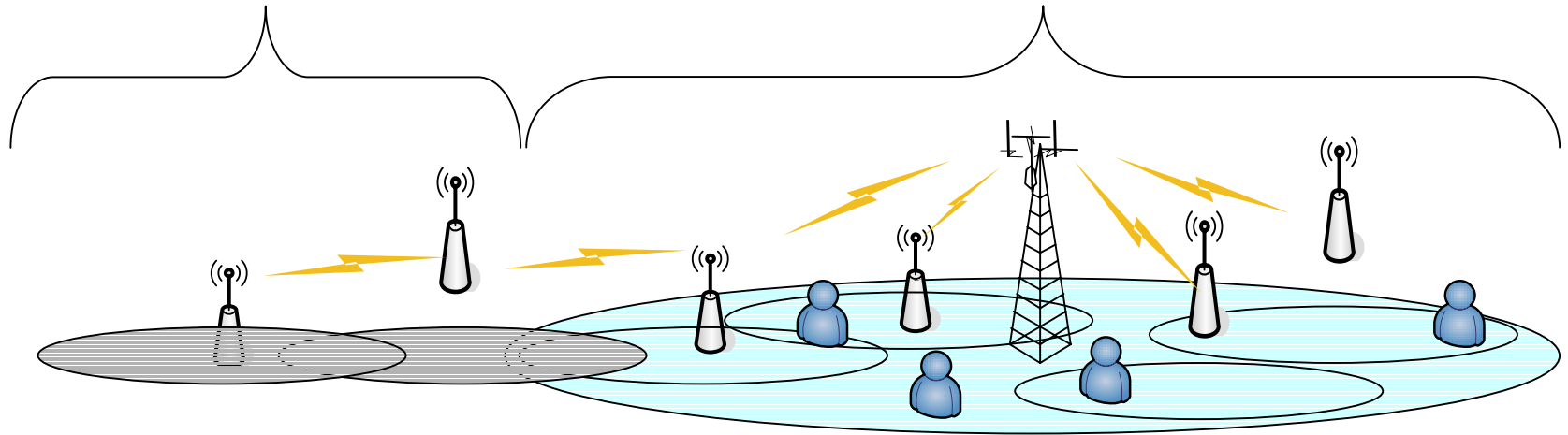
□ The proposed frame structure shall be compatible to the TDD mode with no relaying

- ❖ BS/RS and RS/MS use the same frequency, i.e., homogeneous relaying.
- ❖ From the BS viewpoint, an RS behaves the same as an SS. The transmission/reception burst is controlled by the BS.
- ❖ From the MS viewpoint, an RS just performs coverage extension and is transparent to MSs.

Scenario and Assumptions

Coverage Extension (2)

Throughput Enhancement (1)



	Coverage Extension	Throughput Enhancement
Broadcast information	BS → MS BS → RS → MS	BS → MS
Preamble for DL Sync	Provided by BS and RS	Provided by BS
Initial Ranging	MS → BS MS → RS → BS	MS → BS

Target Case

Supporting Functions for MMR

□ Frame structure

- ❖ Modified frame structure to support the operations of RSs

□ Network entry

- ❖ Support transparent RS while a MS process network entry procedure in MMR application.

□ Normal operation

- ❖ RS can relay the transmission over the air and increase link throughput.
- ❖ MMR operation between BS/RS/MS should be produced and full utilized

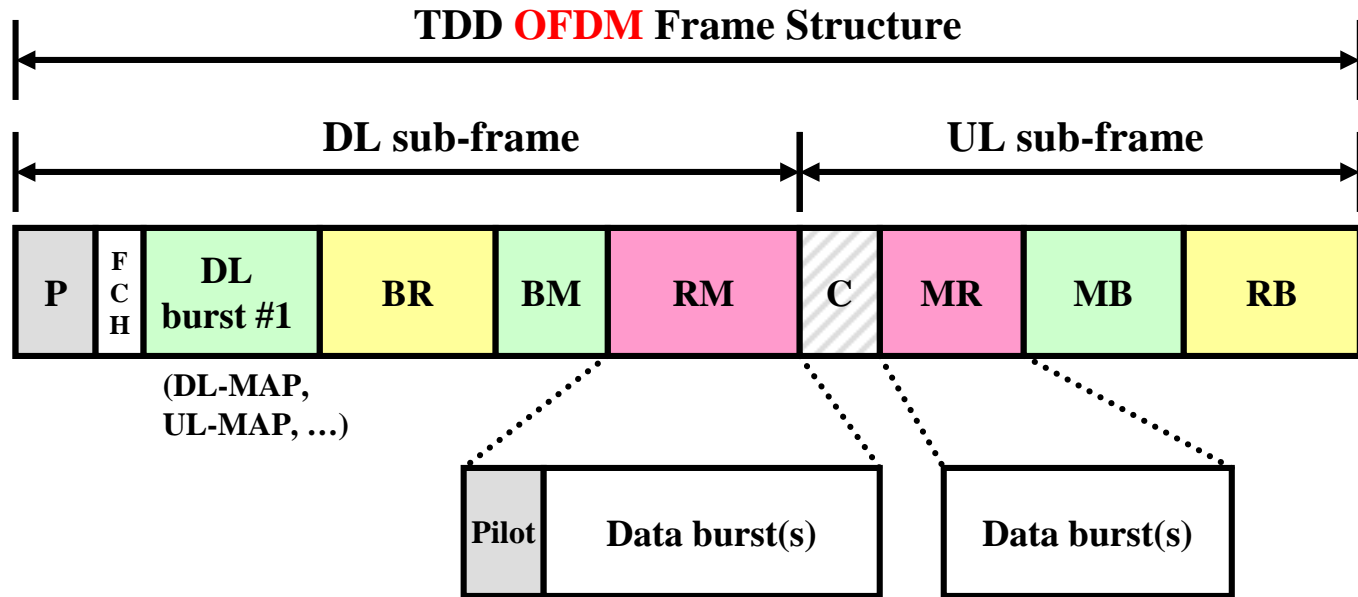
□ Synchronization

- ❖ The MSs and RSs can synchronize with BS in the proposed relay frame structure.

□ RS switch

- ❖ Support ambiguous RS switch (not handoff)
- ❖ Diversity RS set add/del → FFS

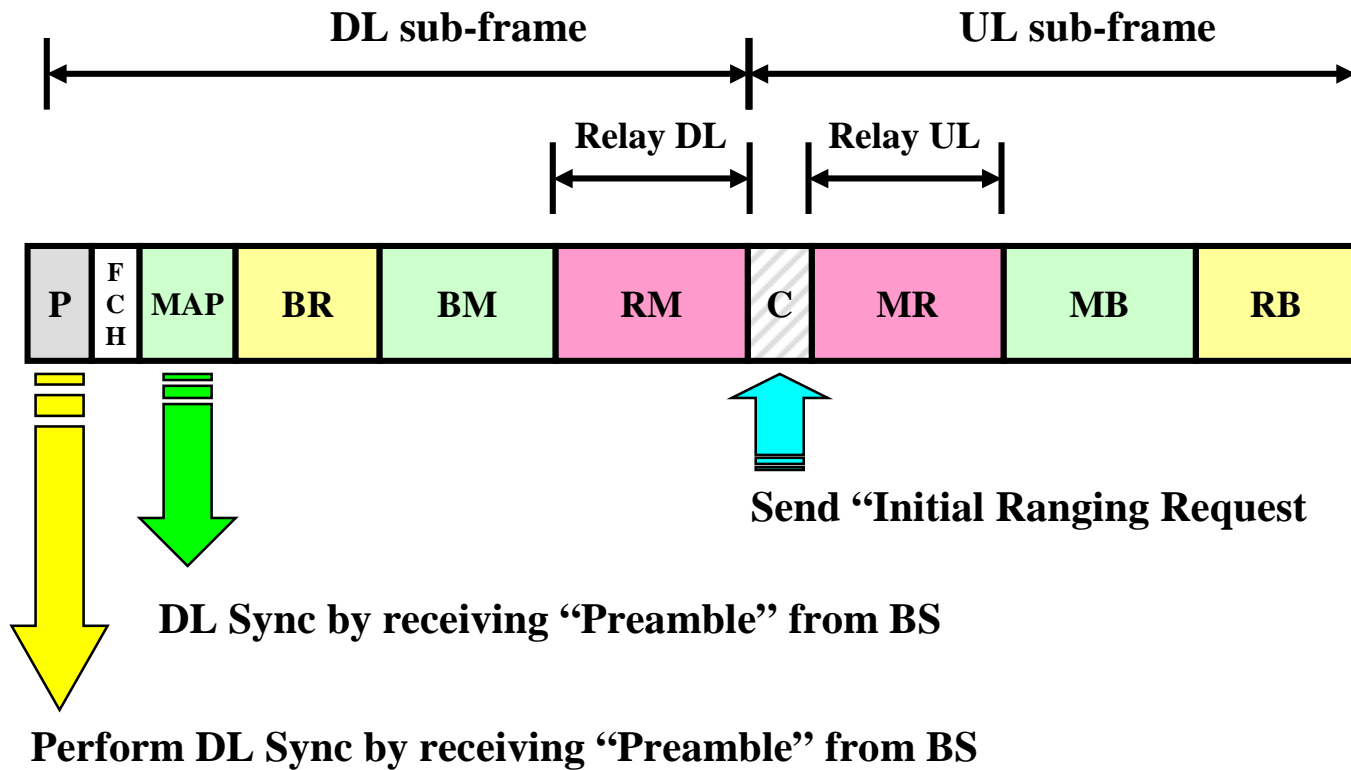
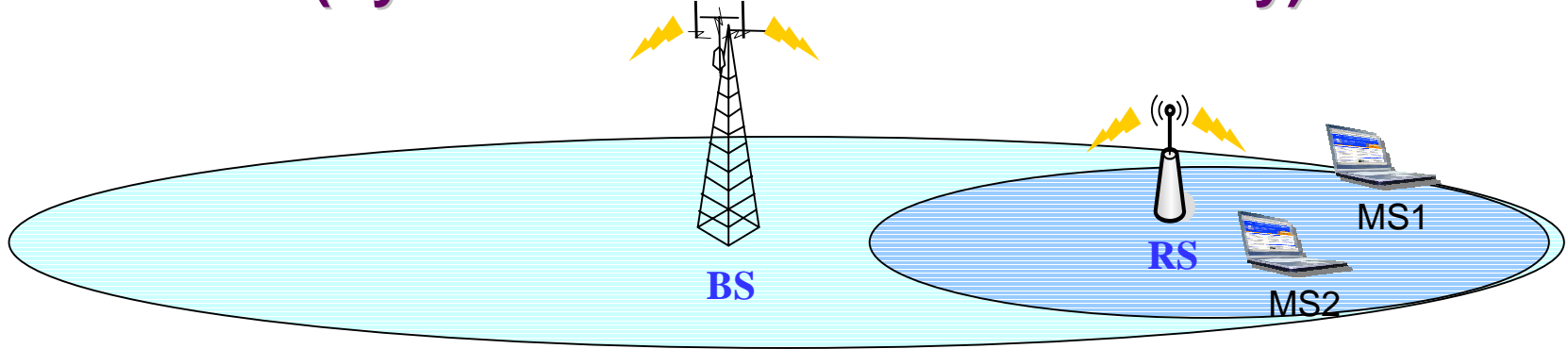
Frame Structure for Two-hop



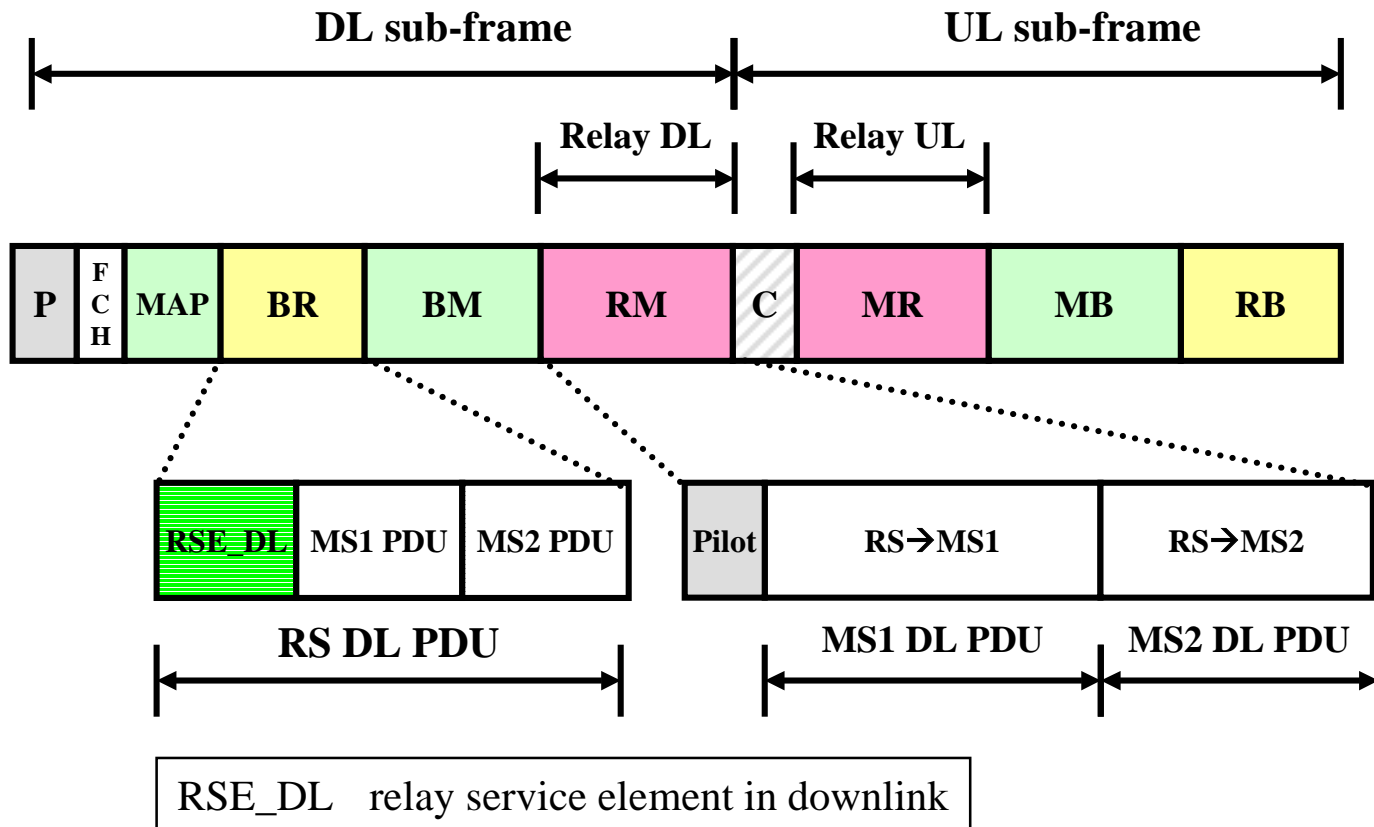
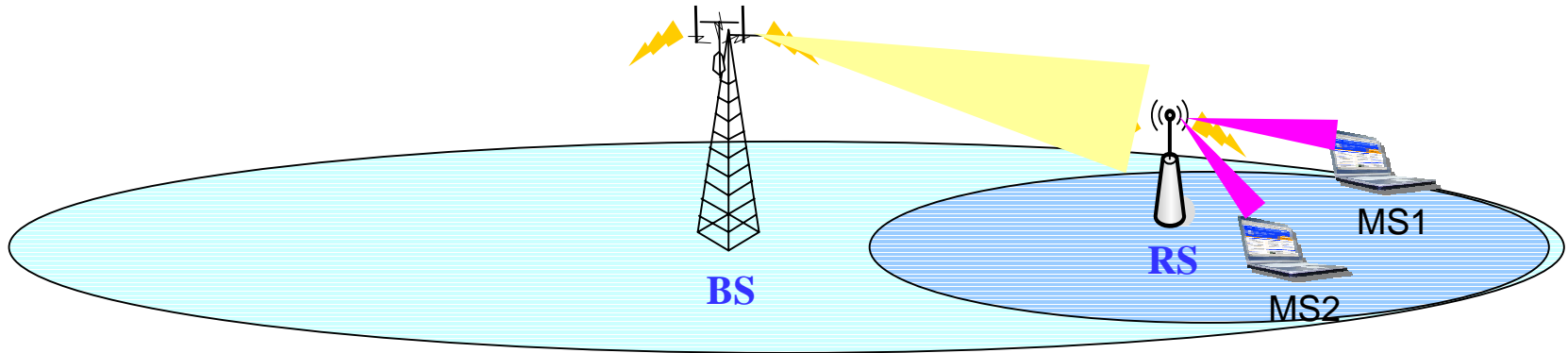
C	contention area
FCH	frame control header
P	preamble
BM	base station to mobile station
BR	base station to relay station
MB	mobile station to base station
MR	mobile station to relay station
RB	relay station to base station
RM	relay station to mobile station

- ❑ All MSs are located in the coverage of the BS so BS can directly assign resource allocation in MAP_IE and transmit control messages in by broadcast information.
- ❑ RS shall perform decode and forward the relay data within current or upcoming frame according to scheduling of BS.

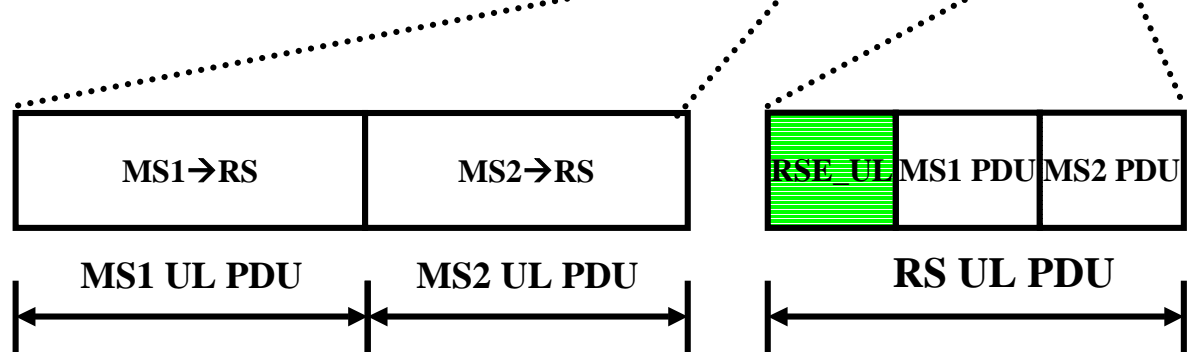
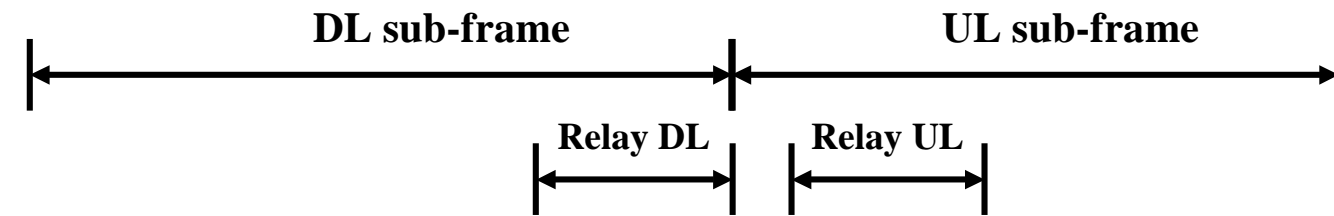
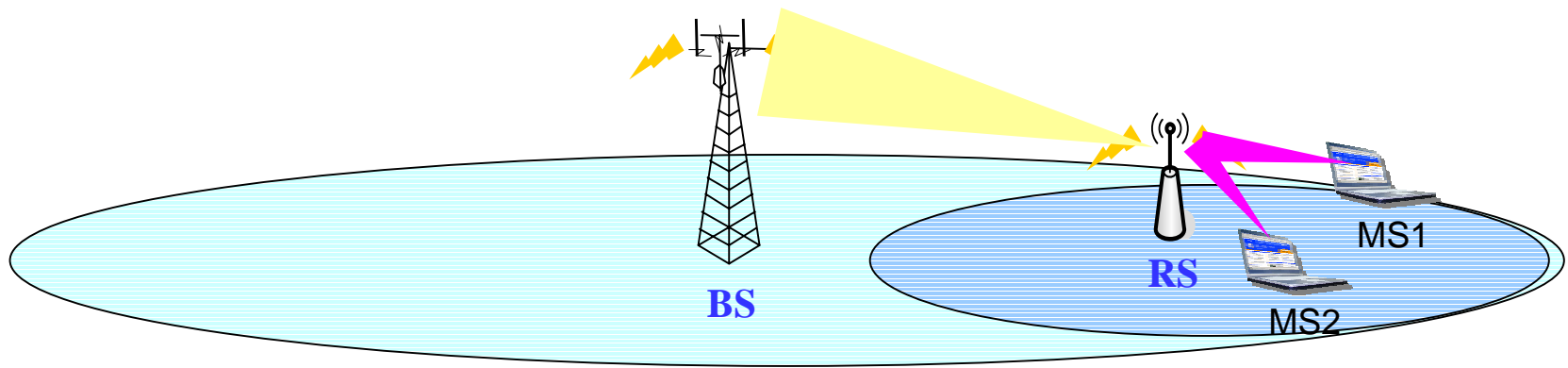
Example of Two Hop Relaying (Synchronization & Network Entry)



Example of Two Hop Relaying (DL Relay)



Example of Two Hop Relaying (UL Relay)



RSE_UL relay service element in uplink

Relay Service Element (RSE)

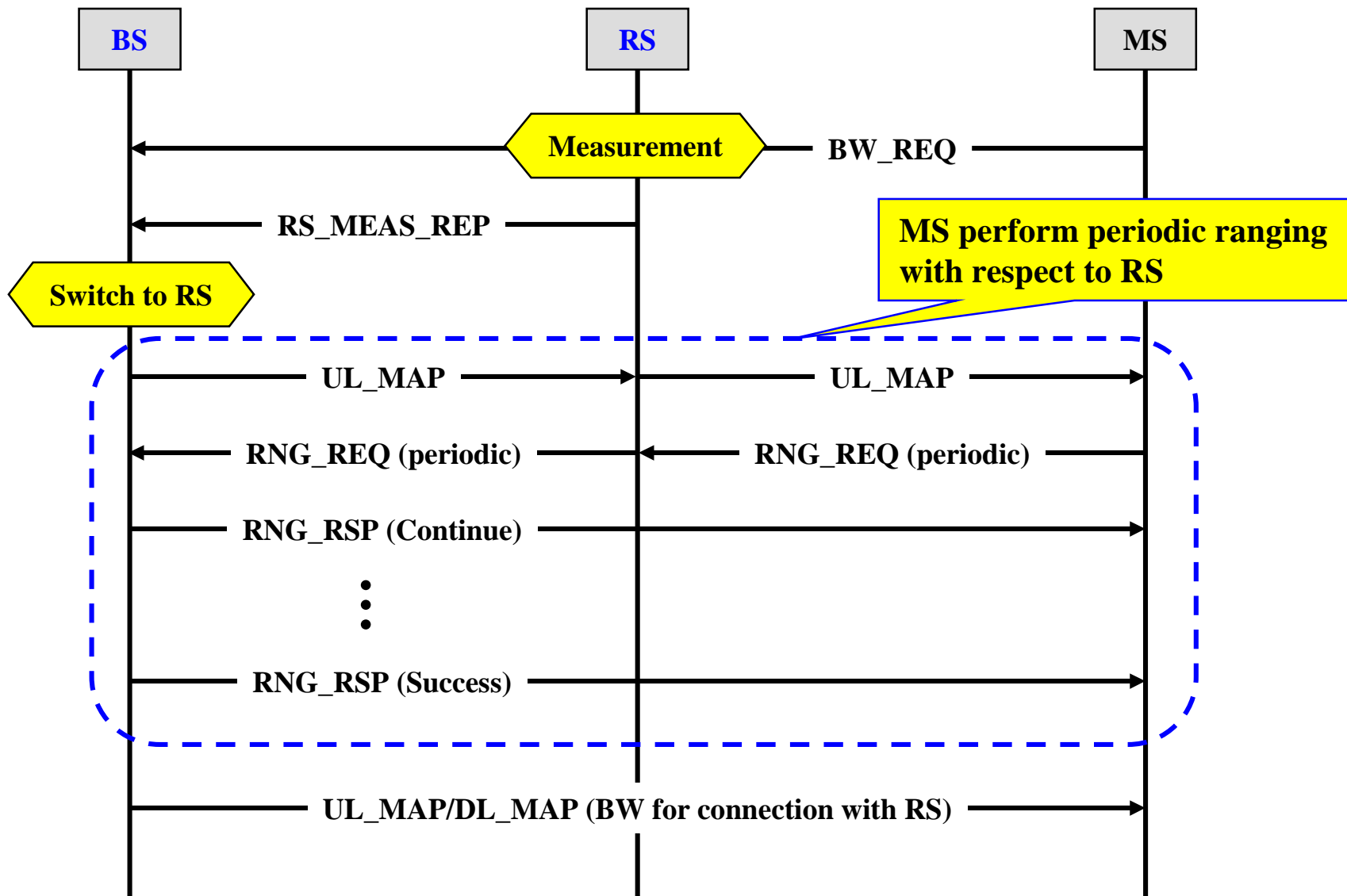
□ RSE_DL (relay service element in downlink)

- ❖ Relay service CID for an RS
- ❖ The relayed MS info including
 - The downlink relaying service CIDs and their DL burst profiles of the MSs served by the RS.
 - The uplink relaying service CIDs and their UL burst profiles of the MSs served by the RS.

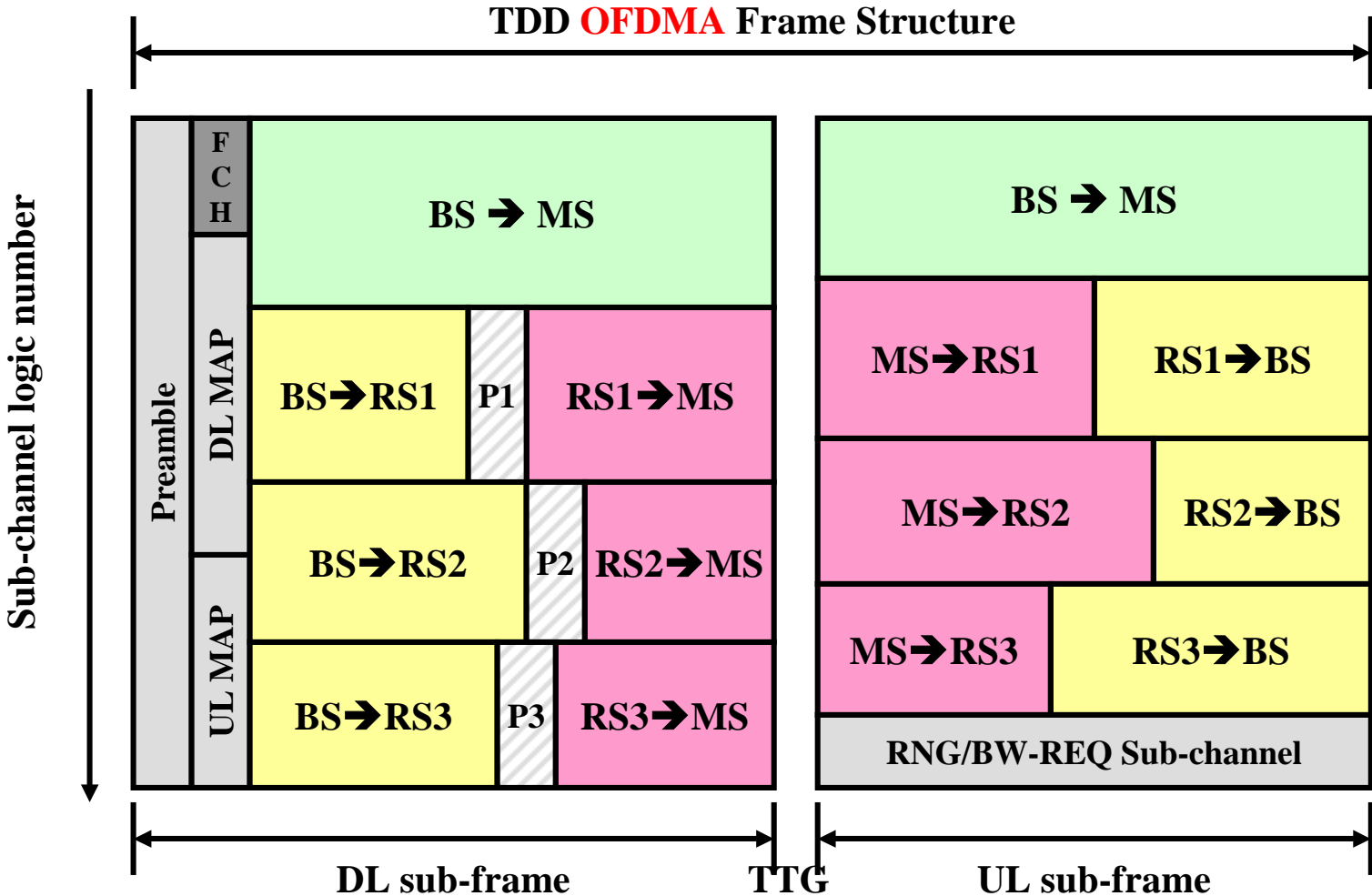
□ RSE_UL (relay service element in uplink)

- ❖ Relay service CID for an RS
- ❖ Uplink measurements for existing/candidate relayed MSs.

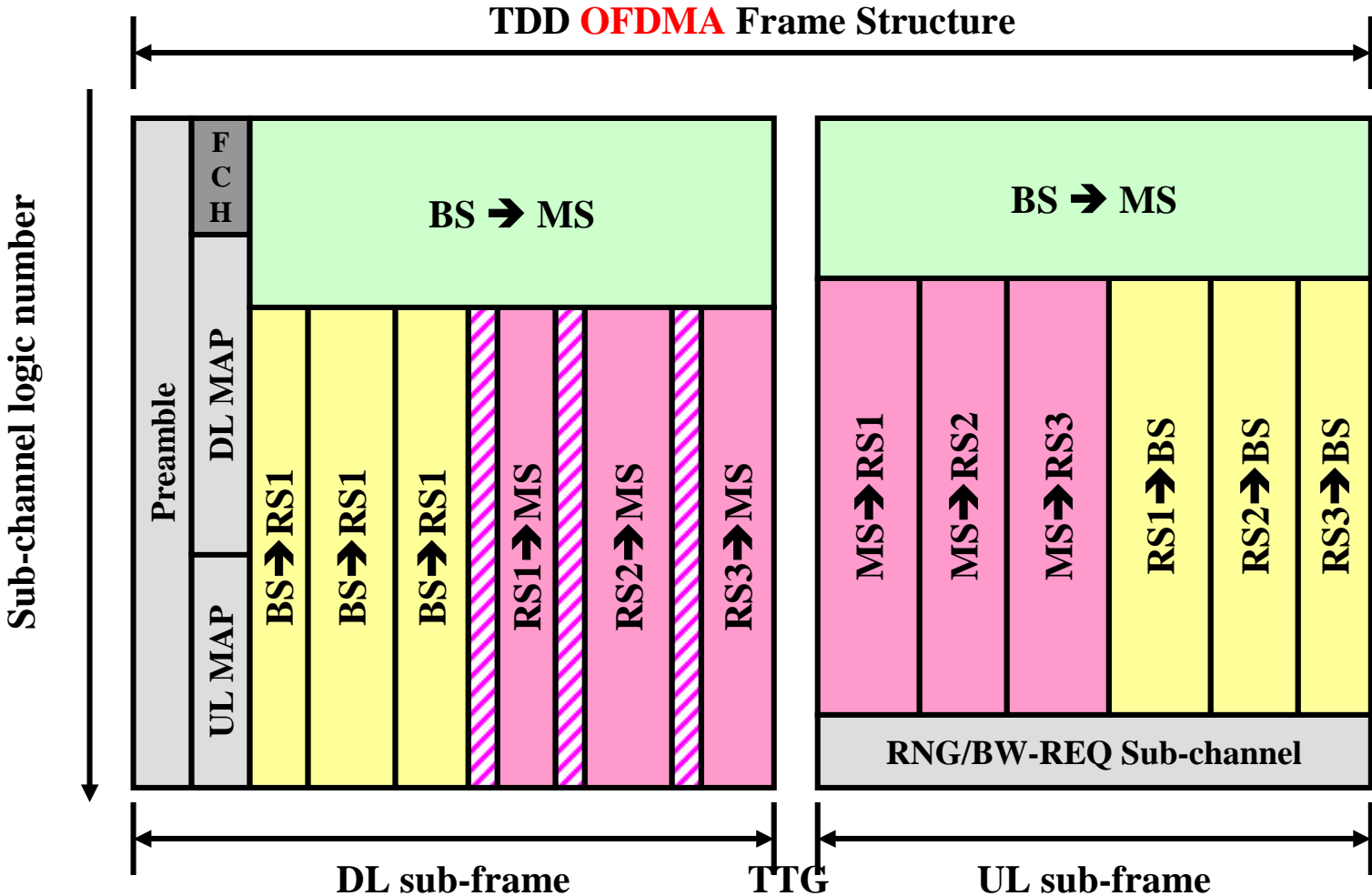
Access Relay Services (by BW_REQ)



OFDMA Frame Structure for Two-hop (FDM)



OFDMA Frame Structure for Two-hop (TDM)



Summaries

- ❑ **Based on assumption of “all MSs located in BS coverage”, a PMP mode compatible TDD frame structure for two hop relay is proposed.**
- ❑ **RS is fully transparent from view of MS.**
 - ❖ DL synchronization and network entry process are the same as the relayless case.
 - ❖ RS support UL measurement for BS to determine RS selection.
 - **No effort on MS.**

References

- ❑ **IEEE C80216mmr-05/005r2, Fang-Ching Ren, Chang-Lung Hsiao, Yu-Ching Hsu, and Wern-Ho Sheen, A Recommendation on PMP Mode Compatible Frame Structure**
- ❑ **IEEE: S802_16mmr-05/019, Naftali Chayat and Ran Yaniv, PHY aspects in MMR-enabled networks**