



An Adaptive Frame Structure for OFDMA-based Mobile Multihop Relay Networks

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Source(s):

Jeffrey Z. Tao, Koon Hoo Teo, Jinyun Zhang

Mitsubishi Electric Research Lab
201 Broadway, Cambridge, MA 02139, USA

Voice: 617-621-{7557, 7527}

Fax: 617-621-7550

Email: {tao, teo, jzhang}@merl.com

Toshiyuki Kuze

Mitsubishi Electric Corp.
5-1-1 Ofuna Kamakura, Kanagawa 2478501, JAPAN

Voice: +81-467-41-2885

Fax: +81-467-41-2486

Email: kuze.toshiyuki@ah.MitsubishiElectric.co.jp

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Purpose:

Propose extension and enhancement to the current frame structure in order to support OFDMA-based multihop relay networks.

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Authors:

Jeffrey Z. Tao, Koon Hoo Teo, Jinyun Zhang

Mitsubishi Electric Research Lab

201 Broadway

Cambridge, MA 02139

Toshiyuki Kuze

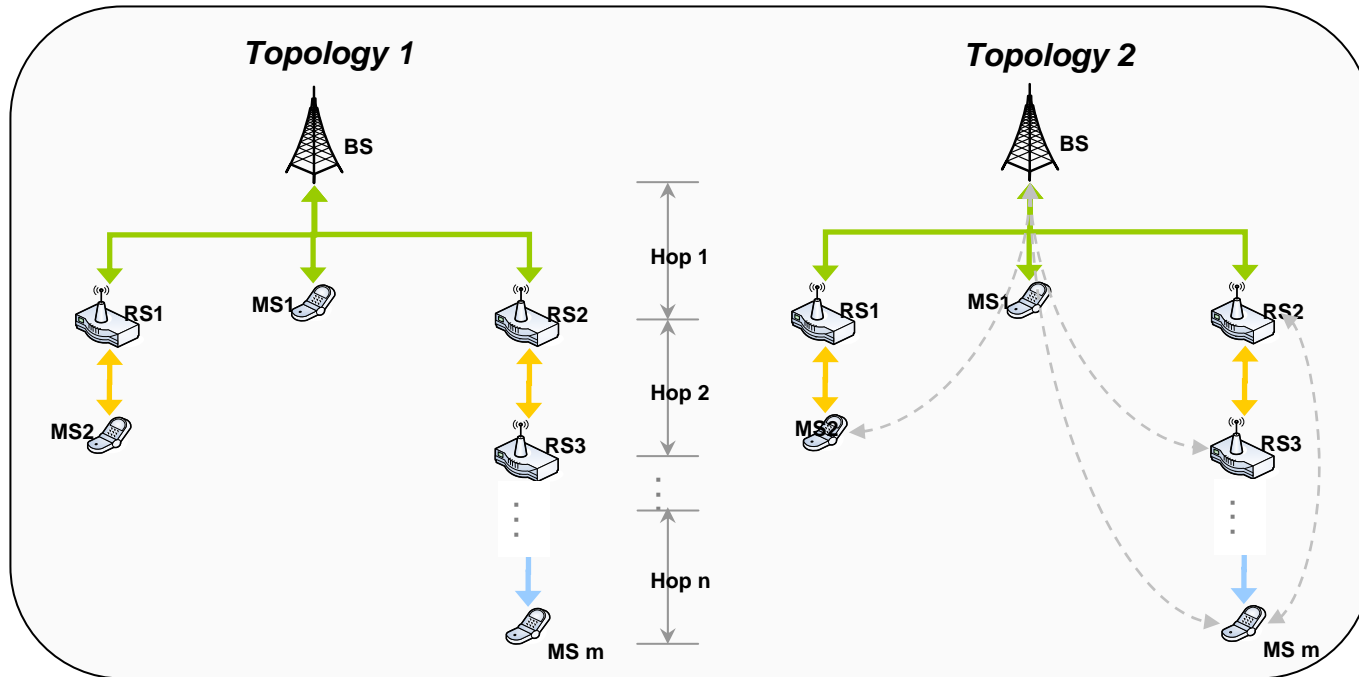
Mitsubishi Electric Corp

5-1-1 Ofuna Kamakura, Kanagawa

2478501, Japan

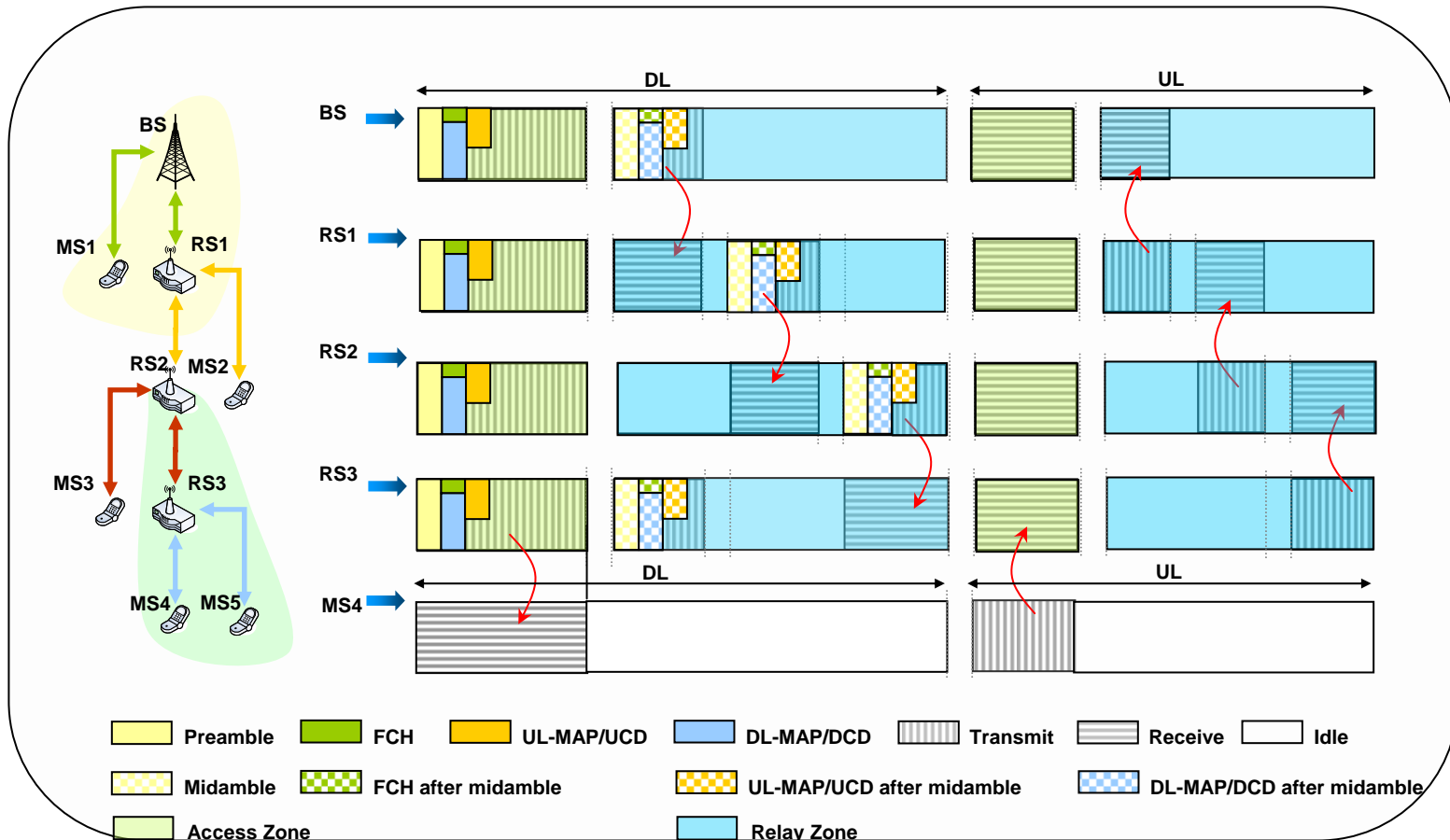
Requirements

- A general multihop relay network may assume two possible basic topologies:
 - Range extension is the primary function of relay in topology 1.
 - Relay helps improve capacity in topology 2.



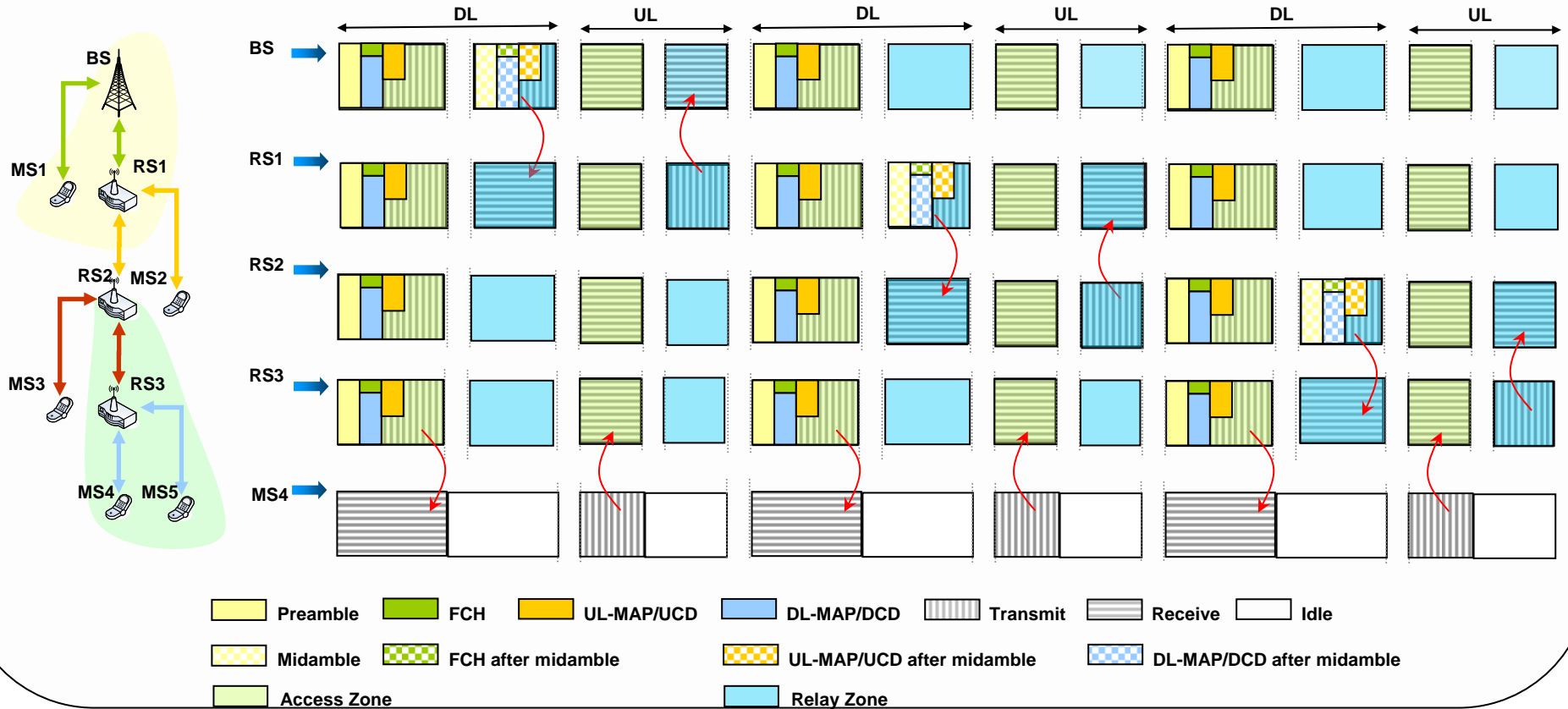
- The extended/enhanced frame structure should support following features
 - Support various network topologies
 - *Backward compatibility* with legacy MSs/SSs
 - *Flexibility* and *extensibility*
 - *Simplicity* and *efficiency*

Intra-frame mid-amble transmission



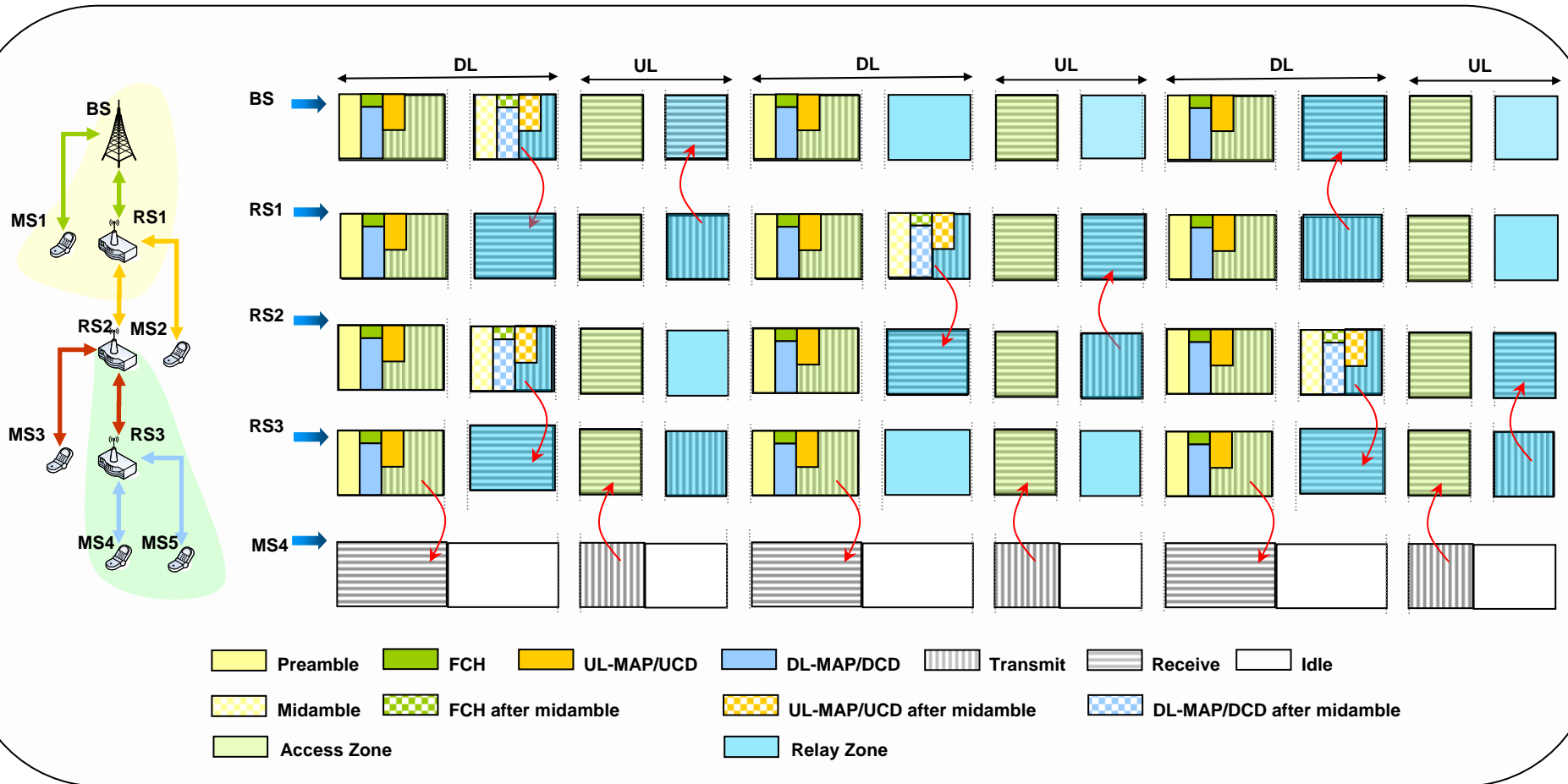
- The frame structure consists of access and relay zones
- In the access zone, the format of *preamble* and key management messages (e.g., *FCH*, *DL-MAP*, *DCD*, *UL-MAP*, *UCD*) should be understood by the legacy MSs/SSs
- Relay zones contain the mid-amble and relay mapping information
- Sub-frame consists of more than one relay zones for low latency applications

Inter-frame mid-amble transmission



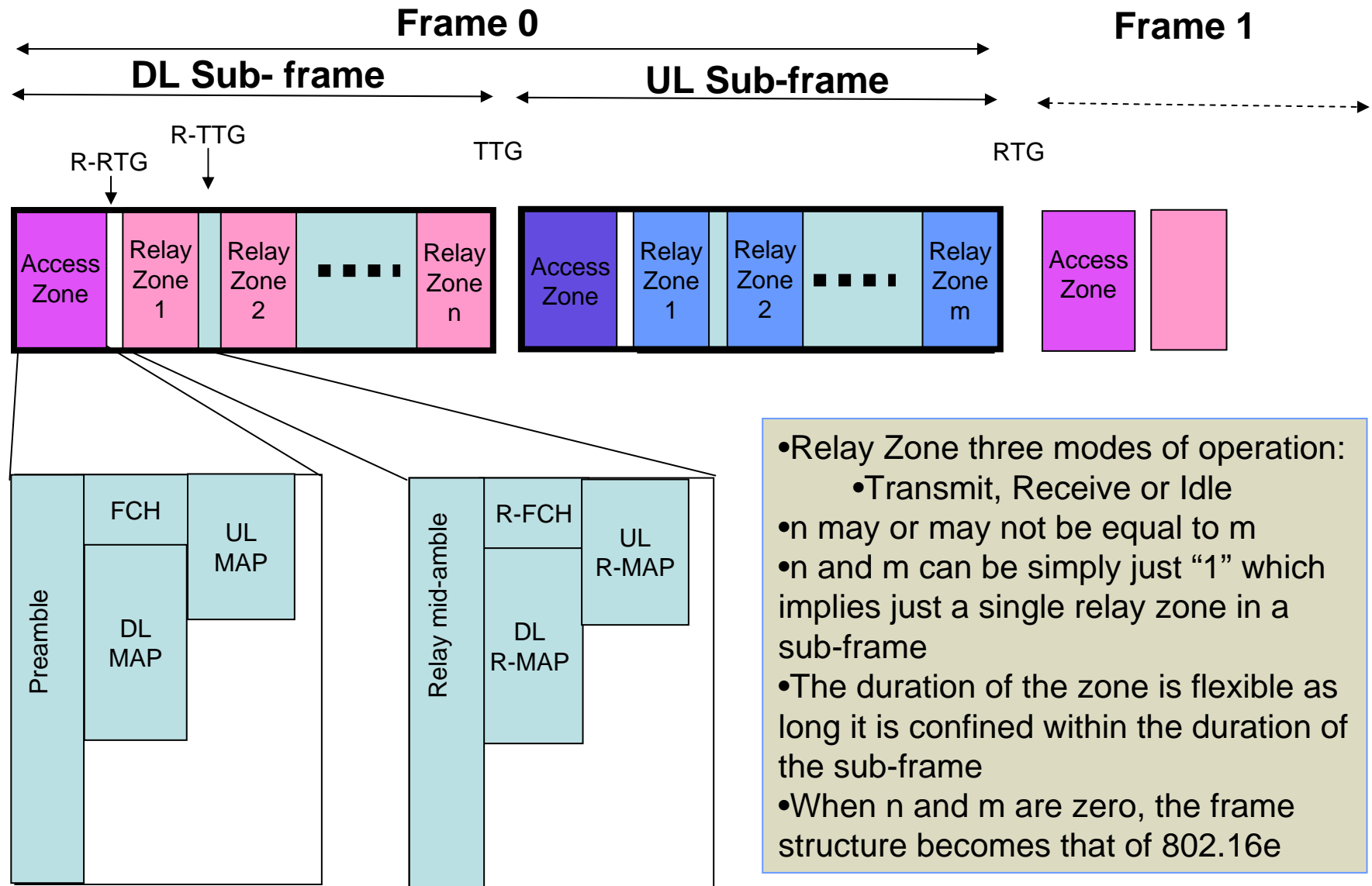
Each sub-frame consists of one relay zone only. This is the extended version of the intra-frame frame structure where interference among the MR-BS and RS can be avoided

Inter-frame mid-amble transmission



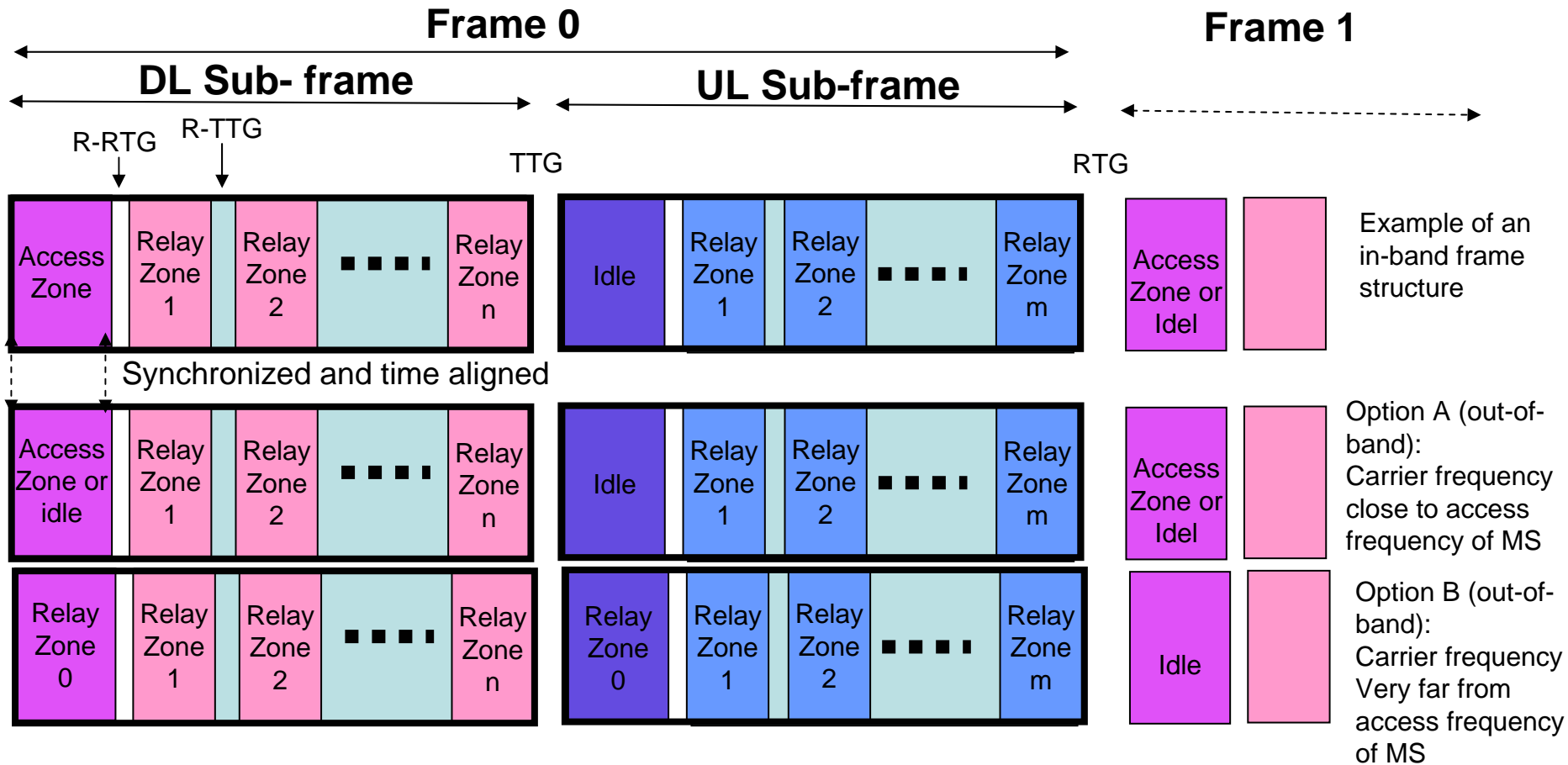
This frame structure illustrate the frequency reuse and flexibility of the zonings

The Proposed in-band Frame Structure



- Relay Zone three modes of operation:
 - Transmit, Receive or Idle
- n may or may not be equal to m
- n and m can be simply just "1" which implies just a single relay zone in a sub-frame
- The duration of the zone is flexible as long it is confined within the duration of the sub-frame
- When n and m are zero, the frame structure becomes that of 802.16e

The Proposed Out-of-band Frame Structure



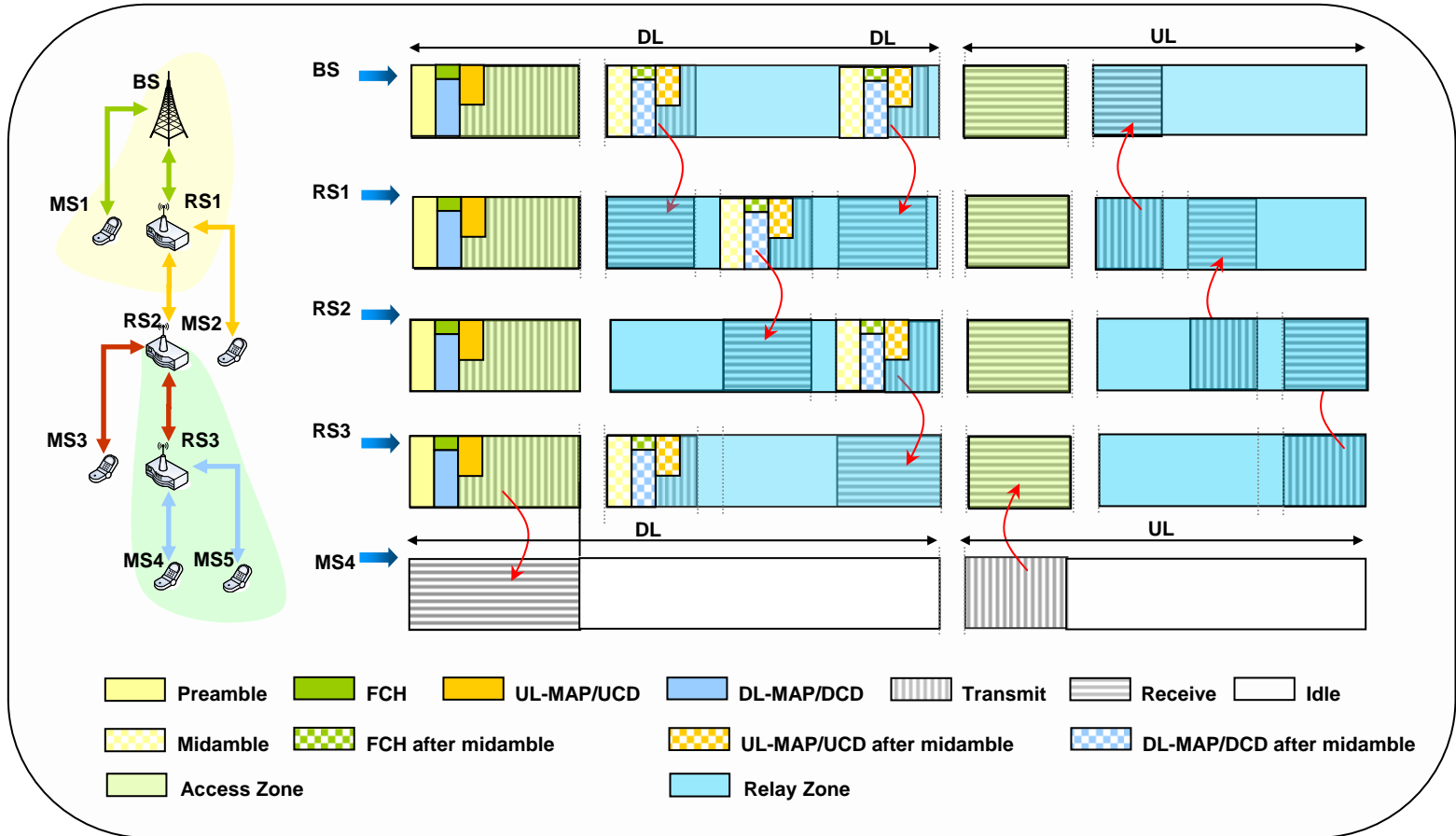
- A different radio at different frequency for relay network
- Relay Zone three modes of operation:
 - Transmit, Receive or Idle
- n may or may not be equal to m
- The duration of the zone is flexible as long it is confined within the duration of the sub-frame
- When n and m are zero, the frame structure becomes that of 802.16e
- For Option A, the duration of the Access Zone has to be synchronized with the Access Zone of the in-band frame structure

Summary

- Backward compatible to 802.16e, simple and flexible
- Frame structure consists of Access and Relay zones
- In band and out of band relay operation
- Number of relay zones per sub-frame depends on latency requirements
- Frequency reuse depends on levels of RF interference
- Frame structure serves various topology and communication needs
- Cater to both centralized and distributed schedulers

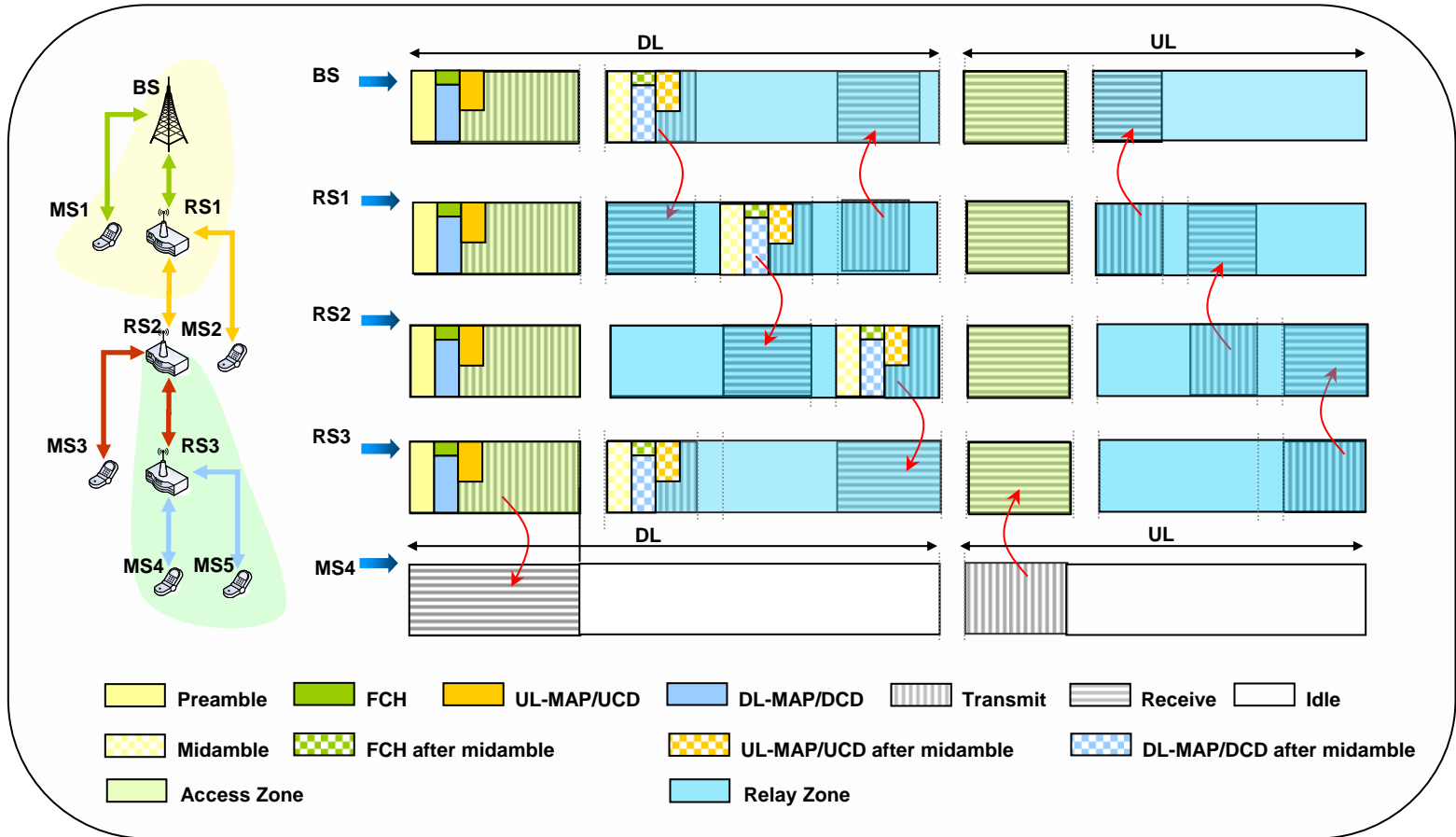
- The minor revisions/extensions of the zone concept, and the information elements described above enable the frame structure to support wide variety of communication needs and network topology/scenarios.

Intra-frame midamble transmission



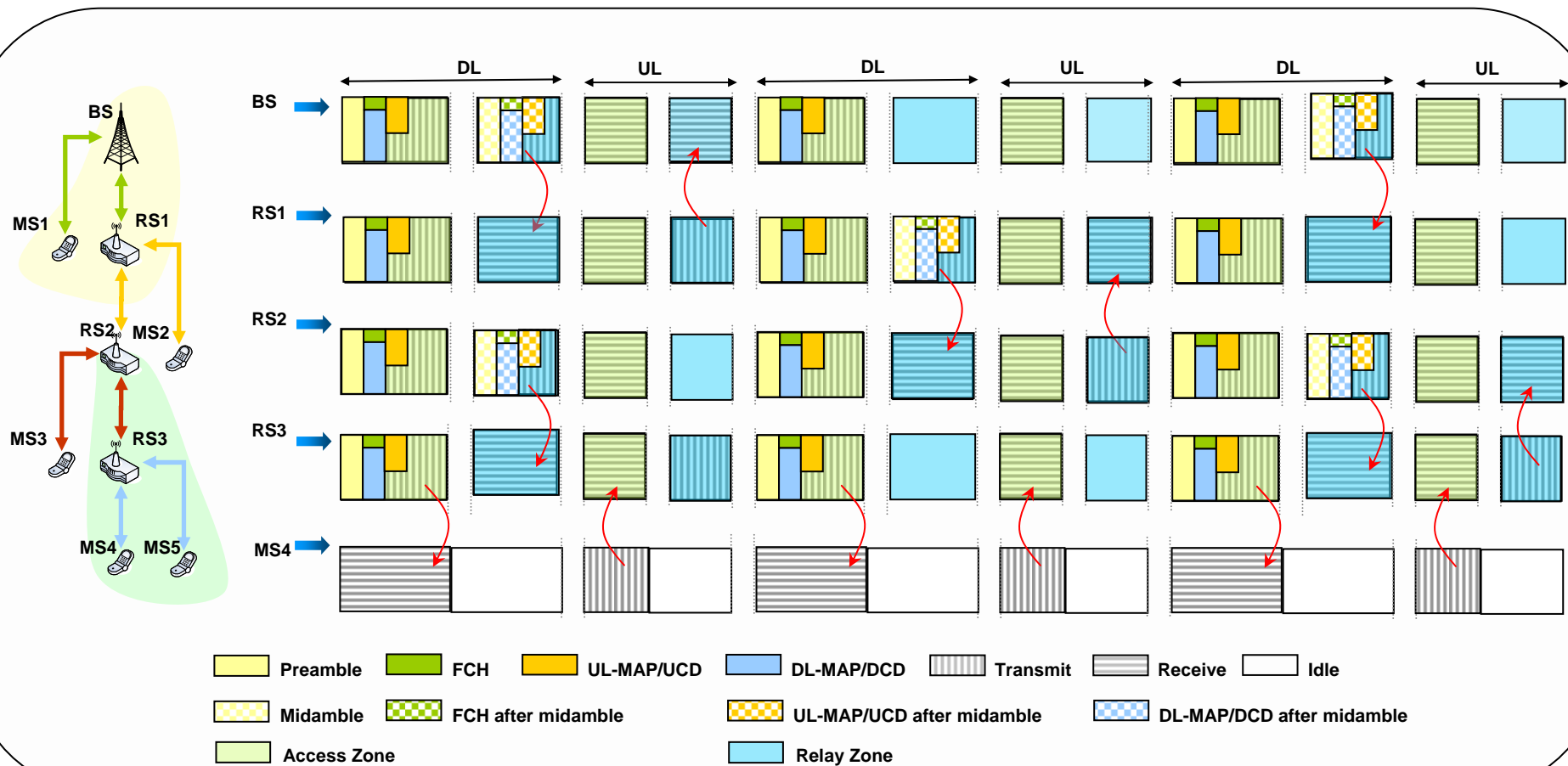
With frequency reuse

Intra-frame midamble transmission



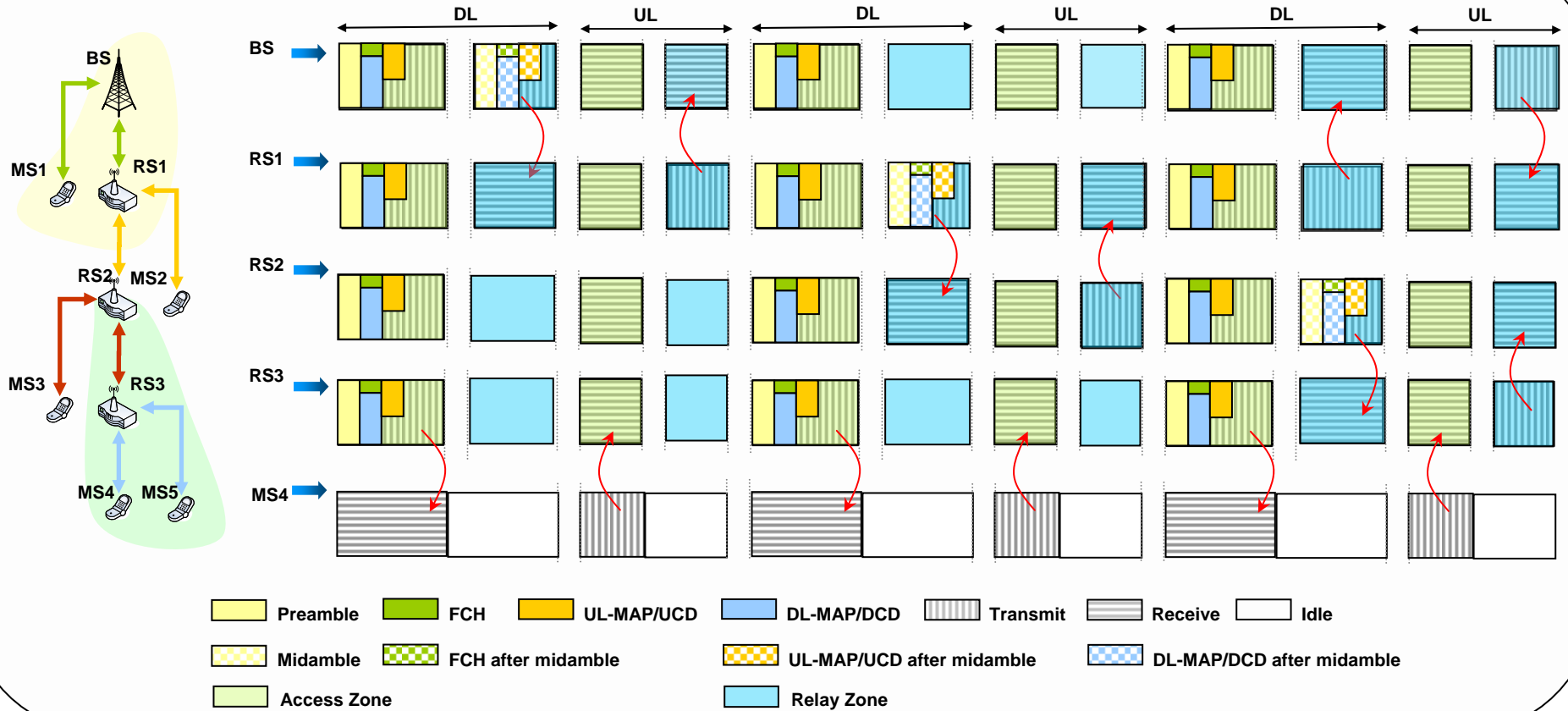
With frequency reuse

Inter-frame midamble transmission



With frequency reuse

Inter-frame midamble transmission



With frequency reuse