Slides for "Multi-phase Frame Structure Proposal"

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Purpose:

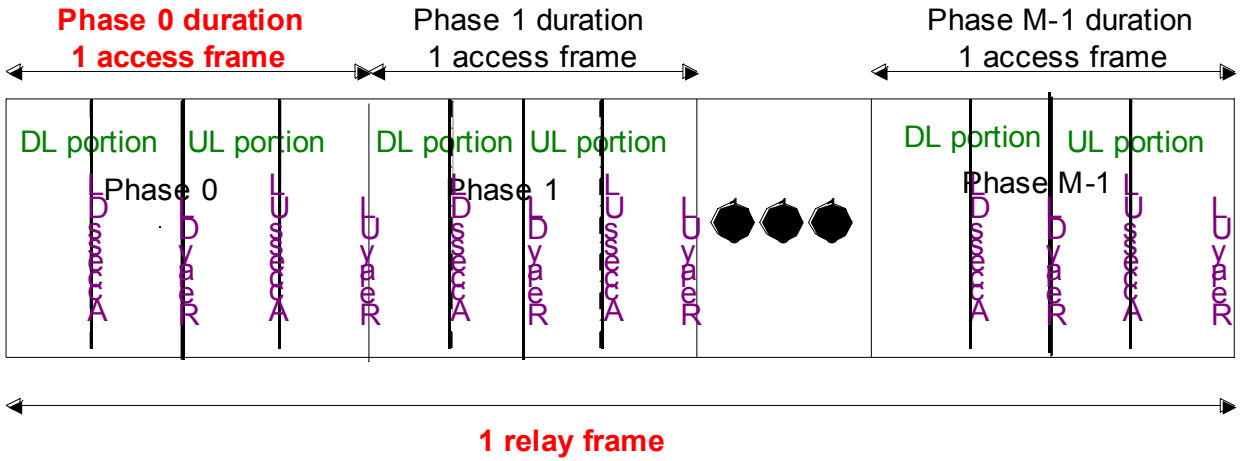
The purpose of this slide set is to introduce our contribution C802.16j-06_275.

Configurable Frame Structure Features and Benefits

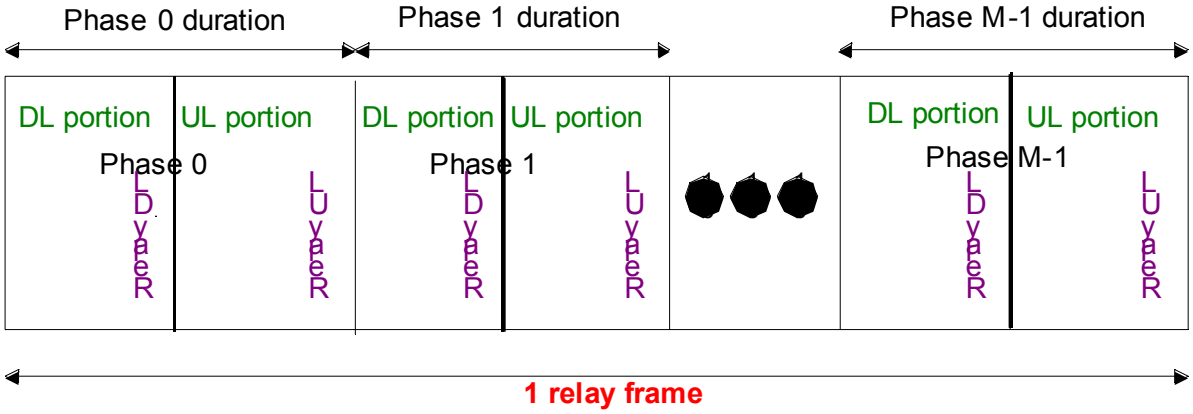
- We propose a configurable frame structure that:
  - Supports both in-band and out-of-band relay using any frequency allocation scheme
  - Supports 2 hop deployment with optimized configuration
  - Supports in-band multi-hop with optimized configuration with 5 ms access frame
  - Provides flexibility for out-of-band case
    - Simplest configuration looks like 802.16e frame structure
    - Allows sharing of channel between multiple relay links
- Key Feature – Multiple phases:
  - Control of interference between RSs
    - Configurable number of Tx/Rx regions for relays sharing a channel
      - Allows tradeoff of overhead and latency for reduced interference and lower complexity
      - Don’t assume directional antennas or coordinated scheduling will solve all problems
  - Support for pure tree as well as tree-like topology with multiple paths between MR-BS and RS.

Configurable Frame Structure

In Band Relay

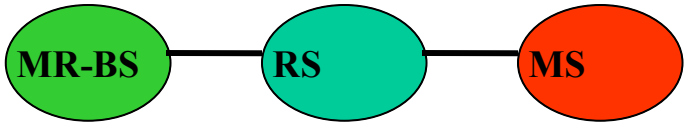


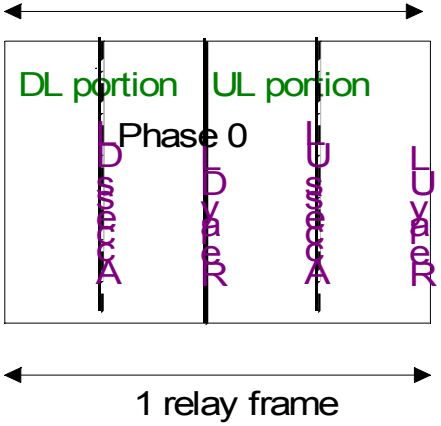
Out of Band Relay



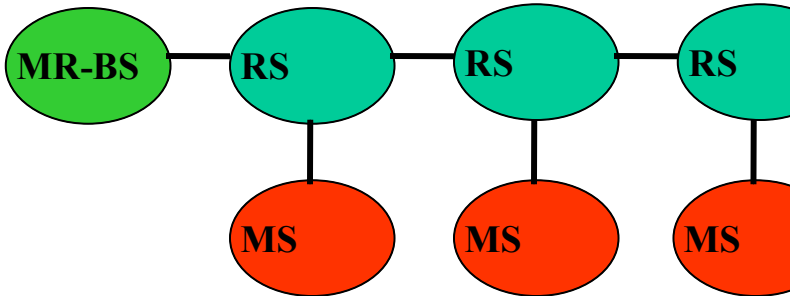
Example Configurations

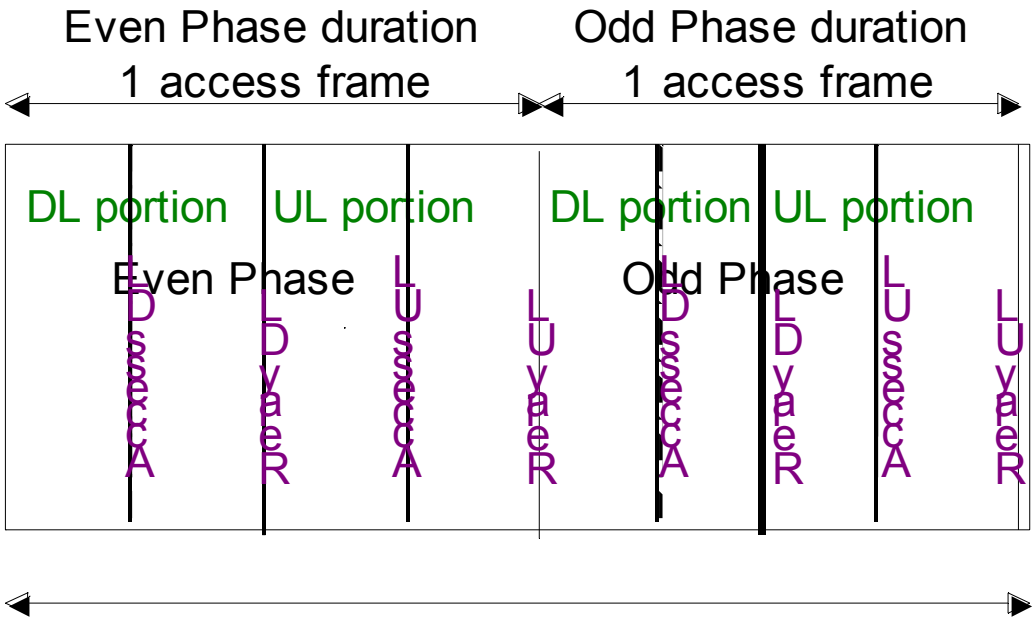
In- Band
Two hop network





In- Band
Multi-hop network



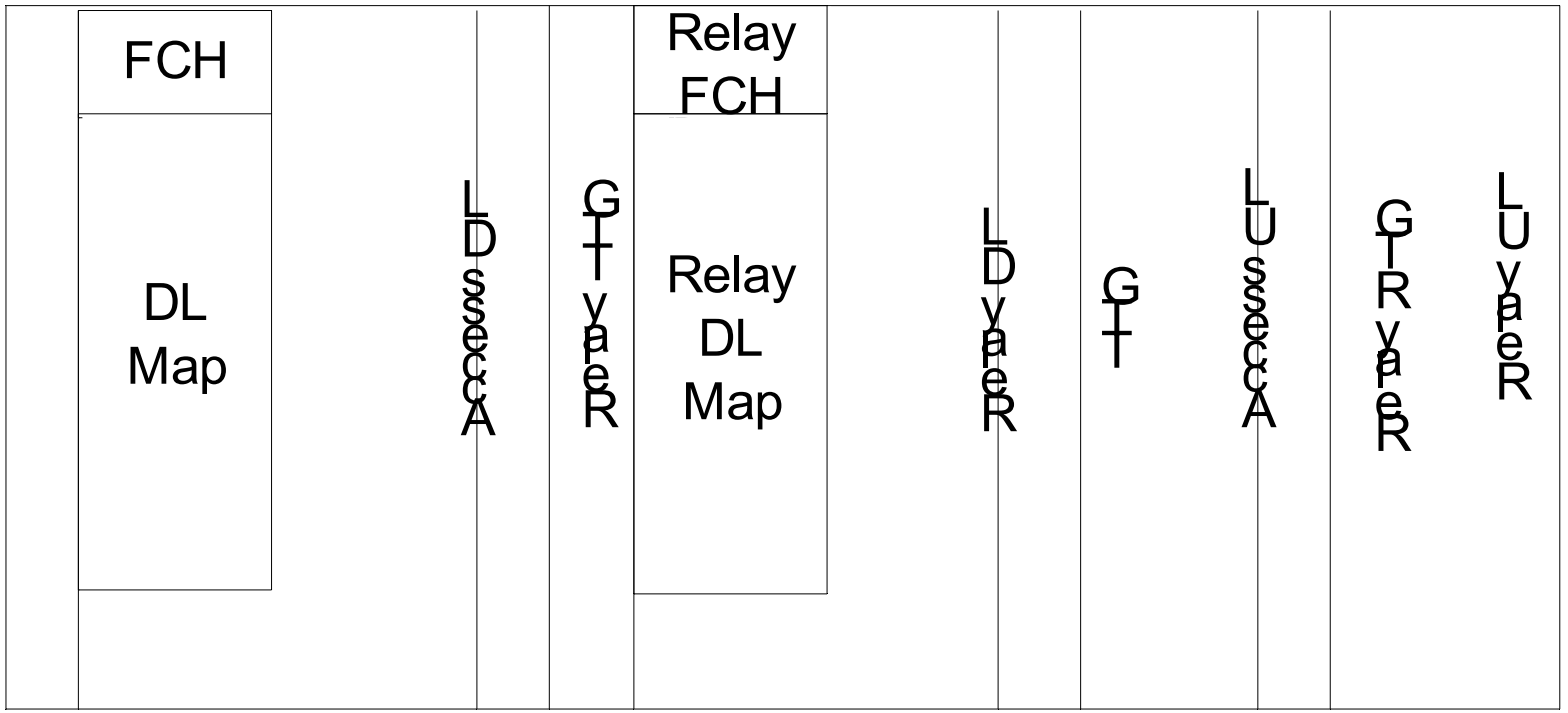


Backup

Specific Requirements and Constraints

- Where flexibility is required
  - Configurable number of Tx/Rx regions for relays sharing a channel
    - Deployment-specific tradeoff between overhead and latency and ability to limit interference
    - Don't assume directional antennas or coordinated scheduling will solve all problems
  - Support for tree topology as well as tree-like topology with multiple paths between MR-BS and RS.
  - Support for various frequency allocation schemes
    - In band (Access and Relay links share a channel)
    - Out of Band (Access and Relay links operate on different channels).
    - Sharing of channel by multiple relay links
- Some practical constraints:
  - Access link is required to be 802.16e compliant
  - In band solution must be able to work with 5 ms access frame and UL subframe of no larger than 18 symbols.

Details of an In-band Phase



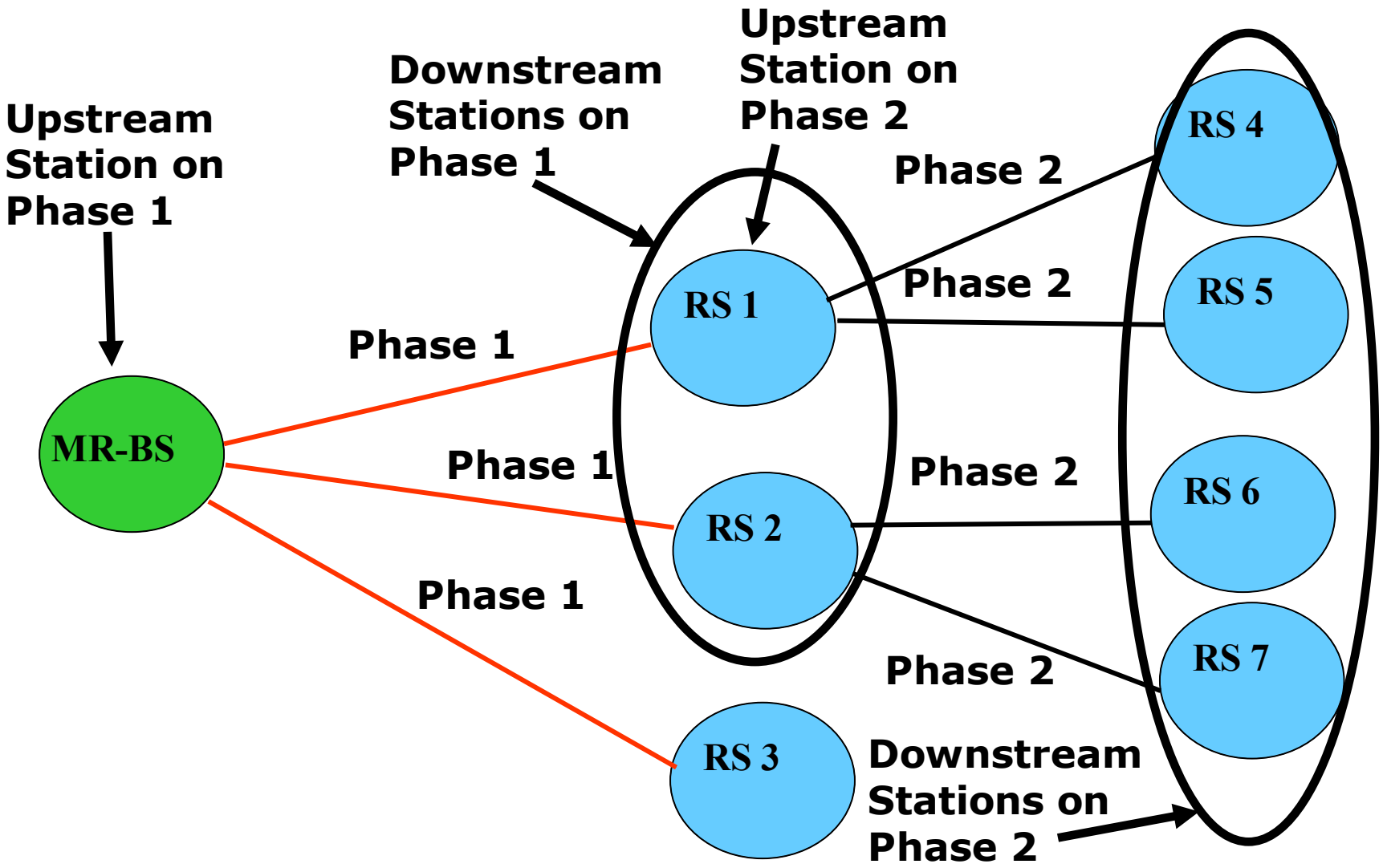
In the Access Zones

- Each IS is allowed to transmit preamble, FCH, map
- Each IS is allowed to schedule transmission of data to MSs in the DL and from the MSs in the UL.
- Each IS is allowed to use the Access zones in every phase
- Transparent relay is supported by not having RSs transmit preamble and FCH.

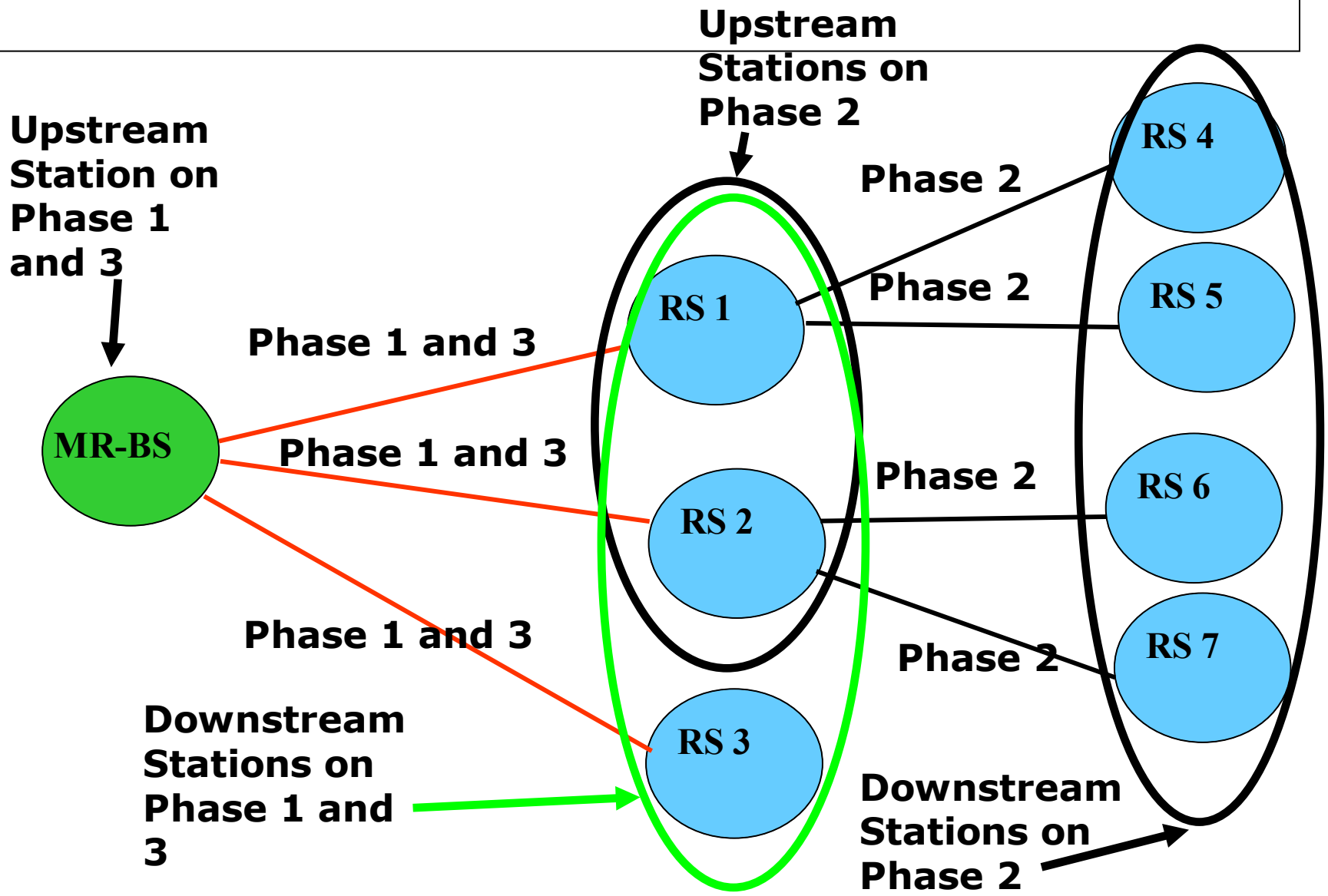
In the Relay Zones of Each Phase

- Relay links are assigned to phases
- A Relay link can be assigned to more than one phase
- Within a phase an IS can be assigned to be an upstream station, a downstream station, or neither.
- An IS can be an upstream station in more than one phase
- An IS can be a downstream station in more than one phase

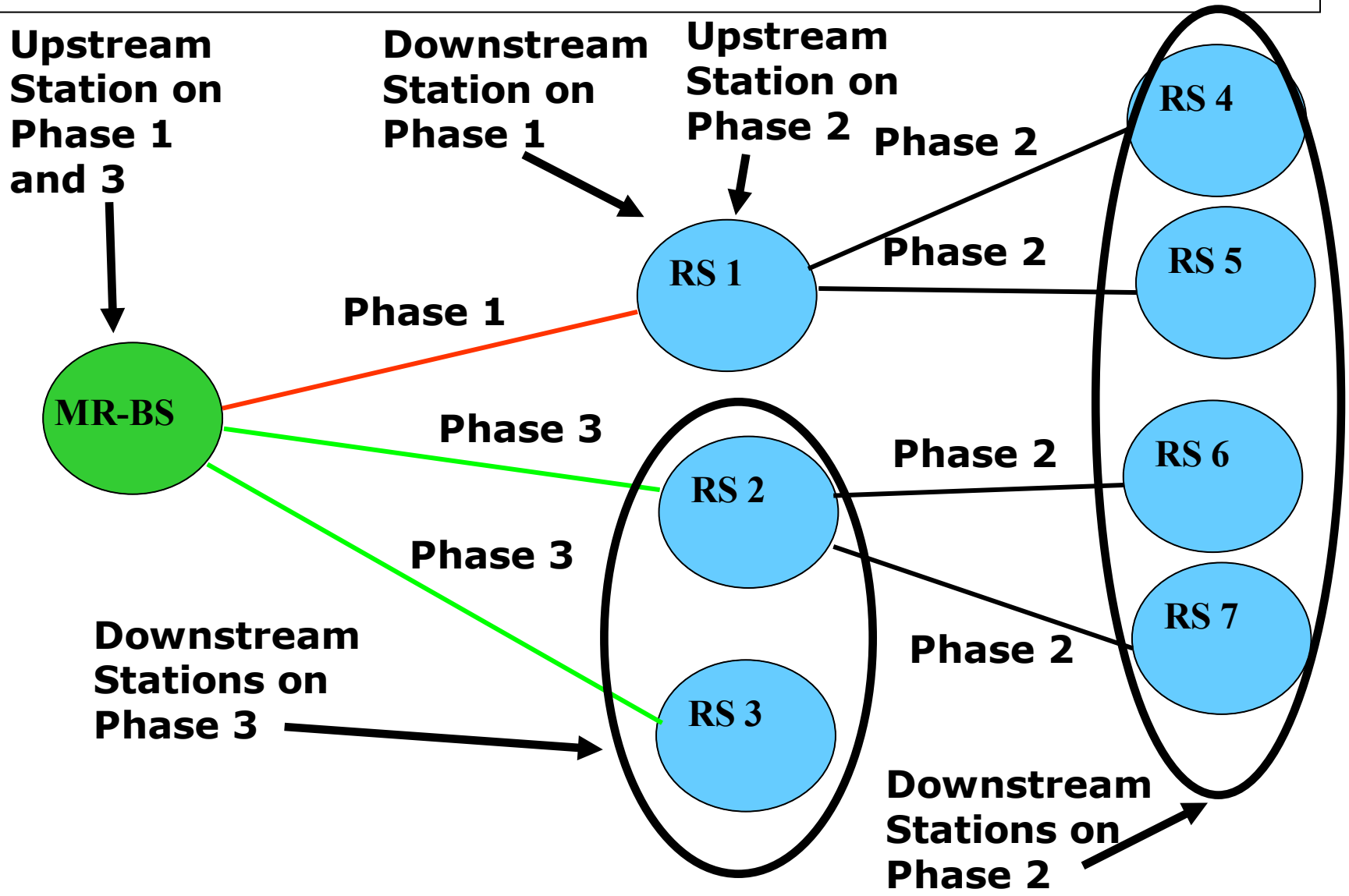
Relay Links are Assigned to Phases – An Example



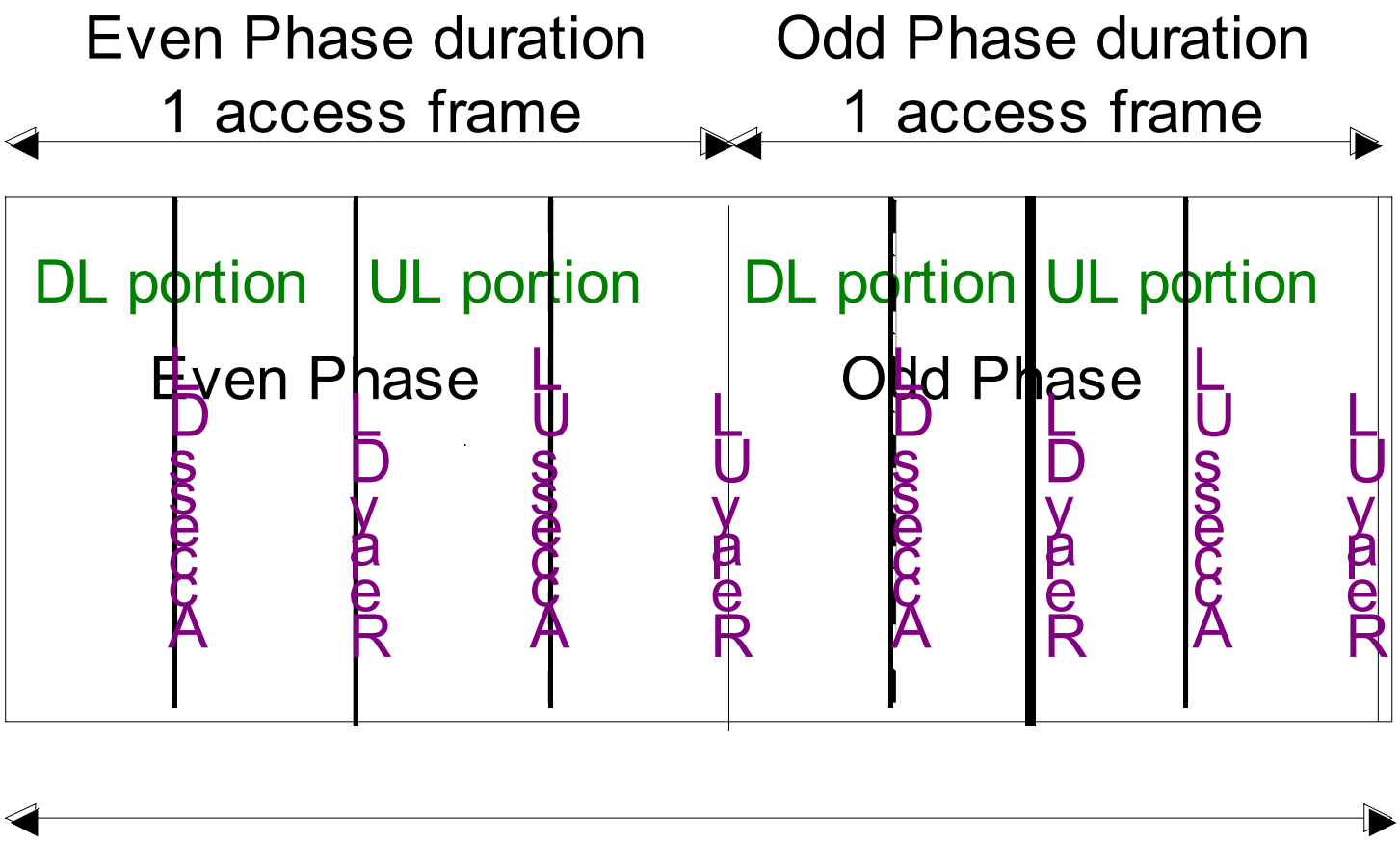
A second Relay Link Assignment Example



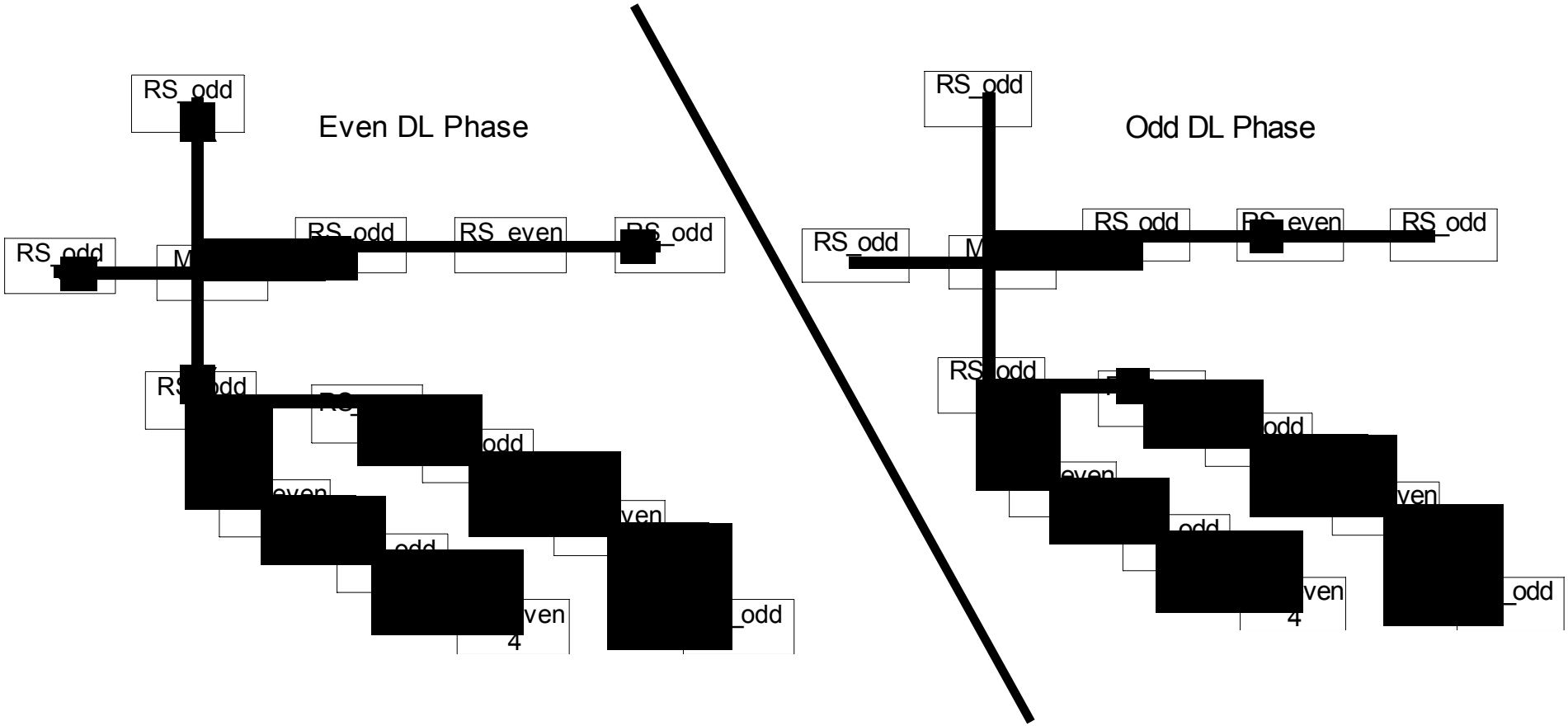
A Third Relay Link Assignment Example



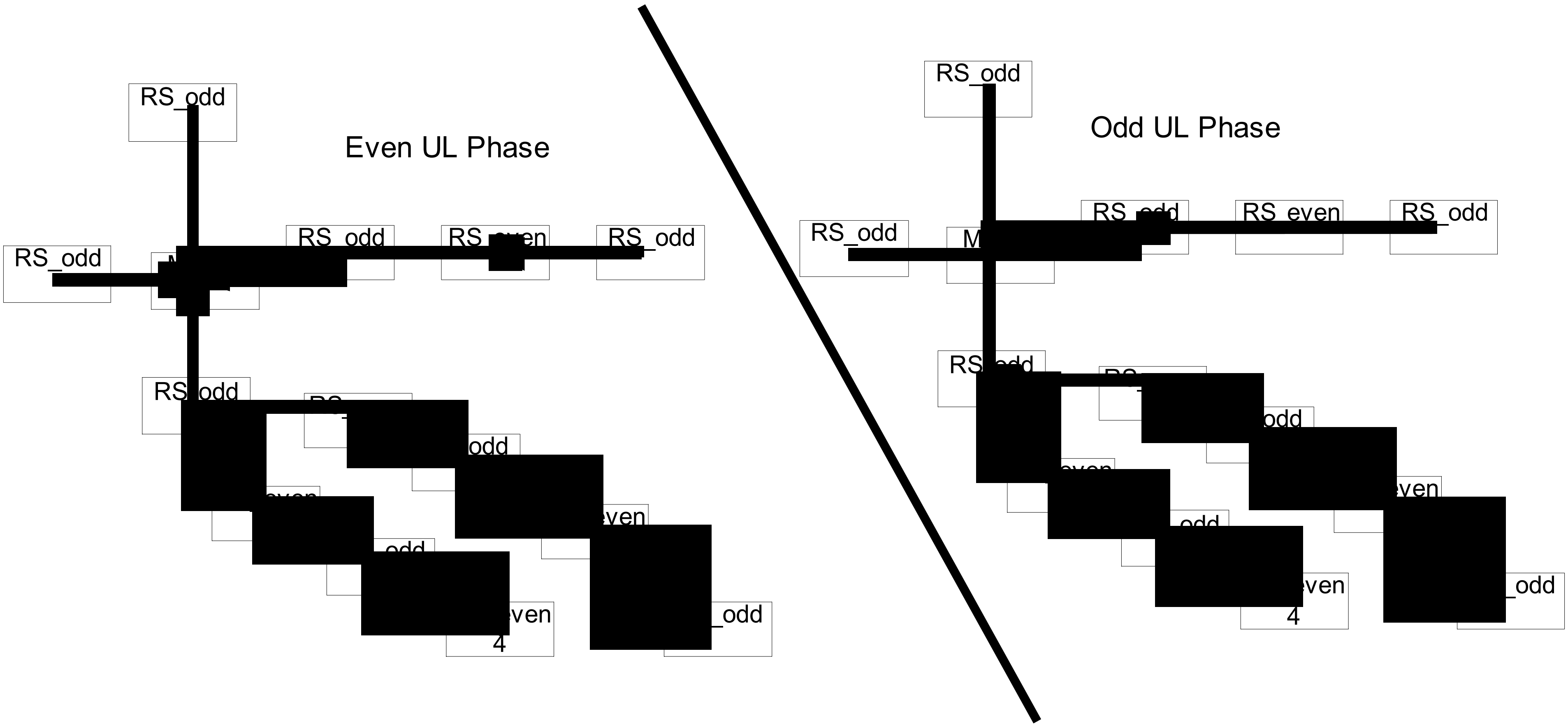
Example 2: Two Phase In-Band Configuration for Multi-hop Network (1)



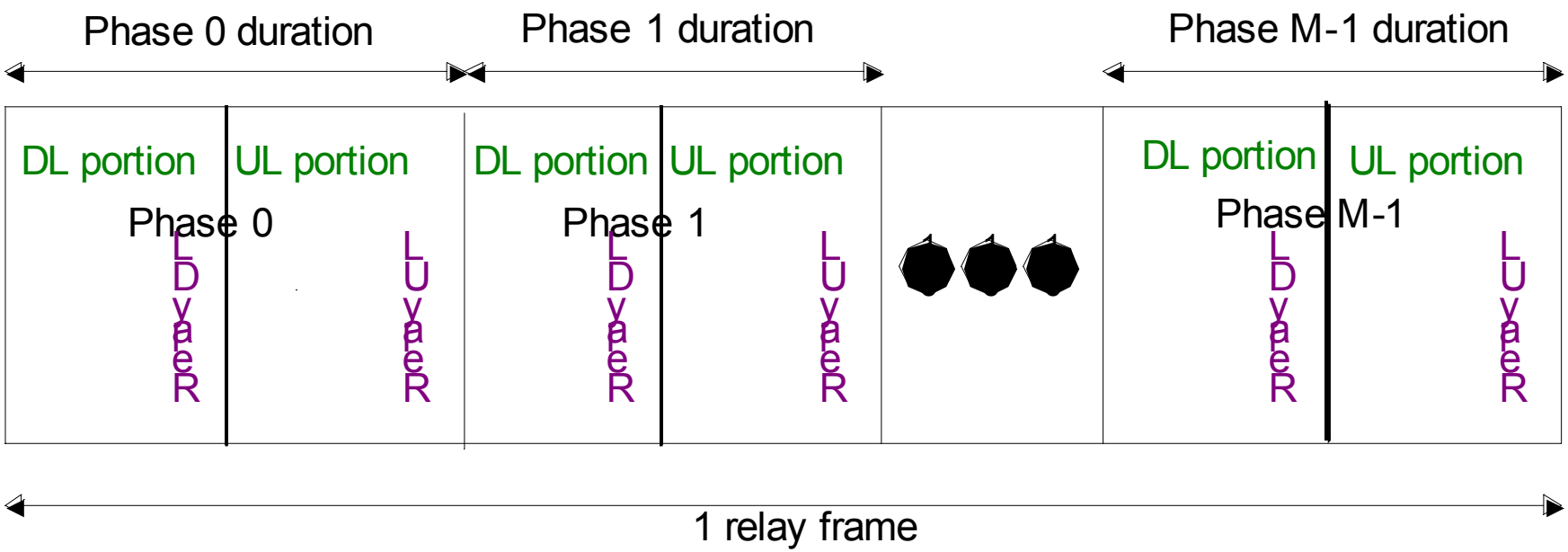
Example 2: Two Phase In-Band Configuration for Multi-hop Network (2)



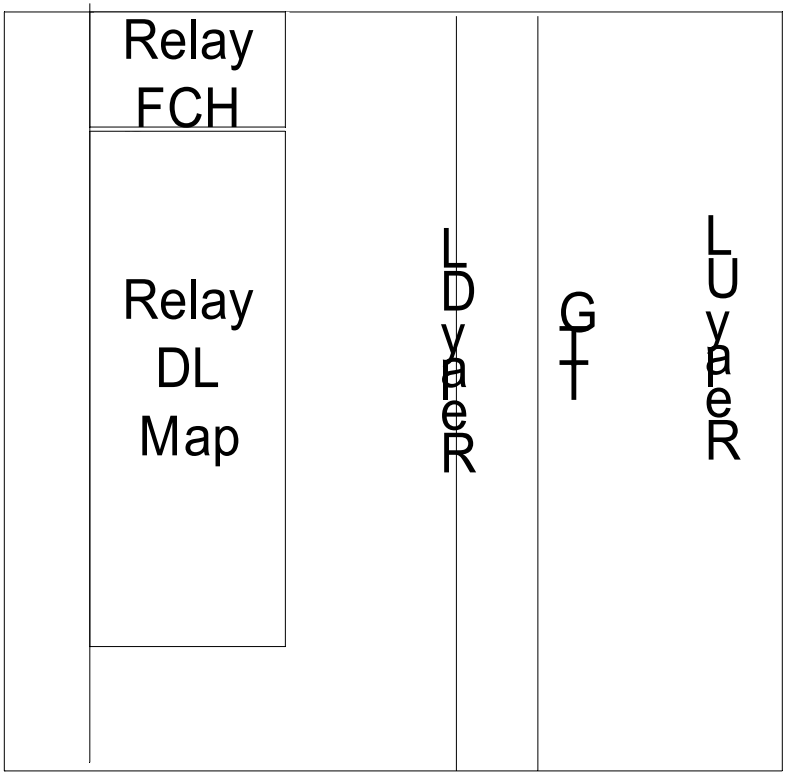
Example 2: Two Phase In-Band Configuration for Multi-hop Network (3)



Out-of-Band Configuration



Details of an out-of-band Phase

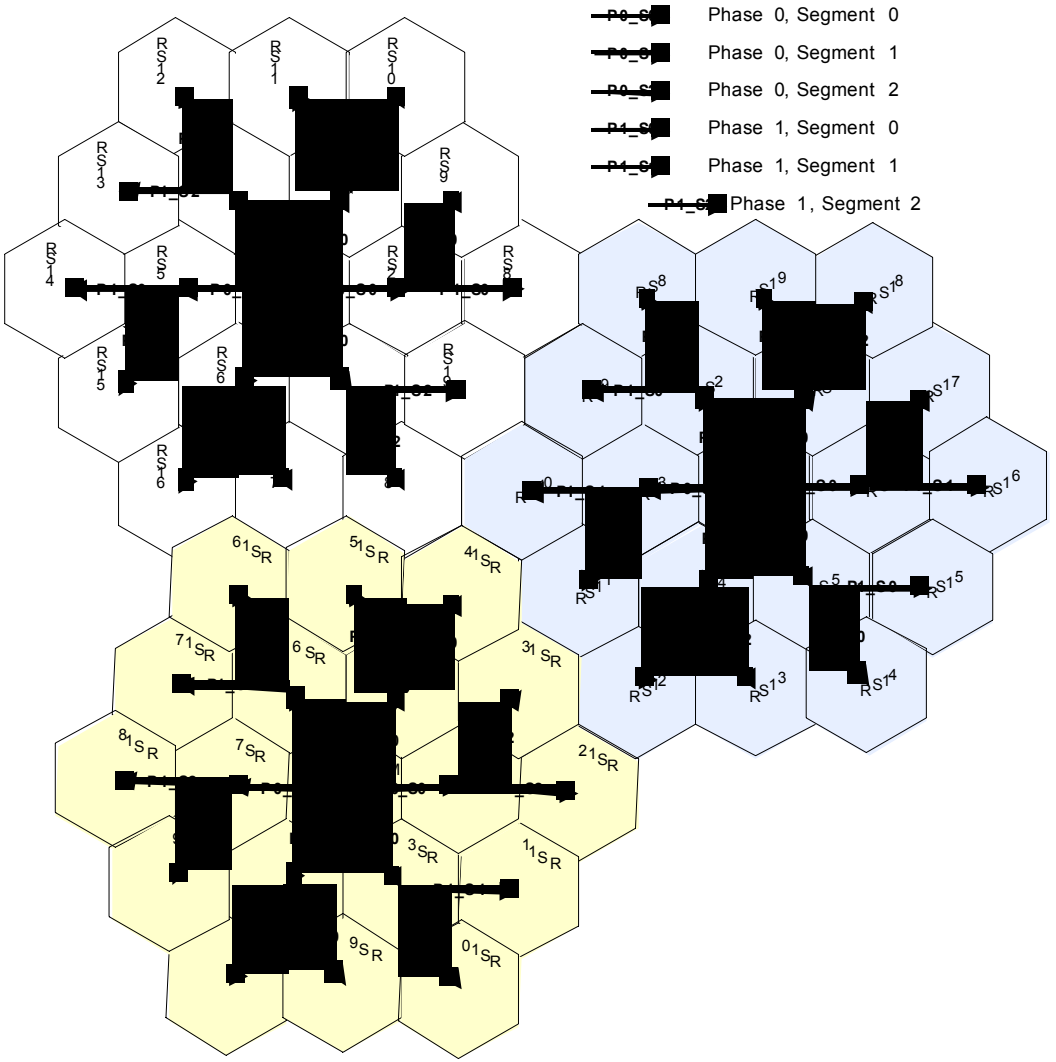


Reasons for having more than 2 phases

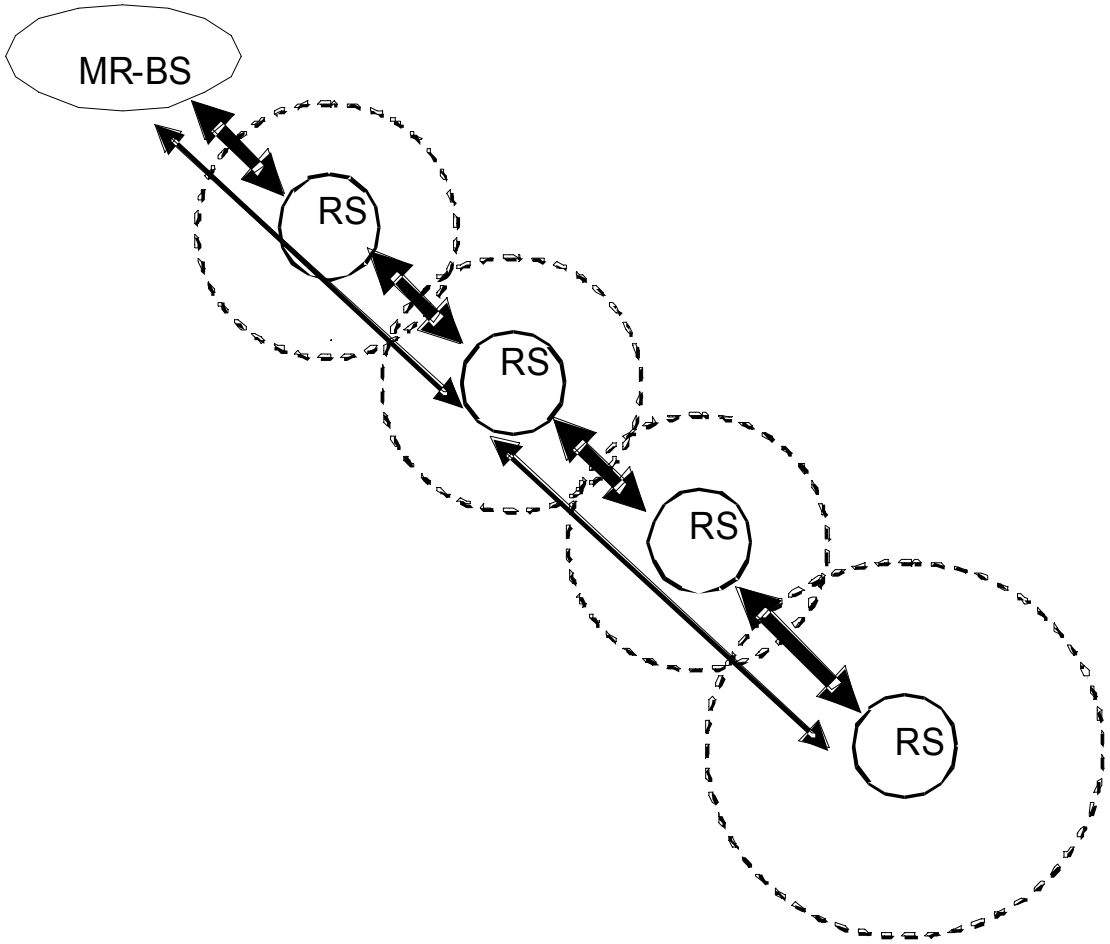
- To avoid interference between RSs assigned to the same phase
  - Preamble, FCH, DL map in particular
- To support non-tree topologies (multiple paths)
  - Provide QoS differentiation along different paths
  - Increase datarate by using multiple paths
  - Other uses we haven't yet considered?

Inter-cell interference using 2-phase only

- Consider standard 19-cell deployment with 3 MMR-cells next to each other.
- white RS 8/9 will get interfered from blue RS2.
- SINR at white RS8 with signal from white RS2 = 1dB;
- RS12 will get interference from yellow RS4, white RS16/17 will get interference from yellow RS6…
- Hence, DL-MAP transmission is not robust.



QoS Differentiation



Increased data rate from reuse on multiple paths