A Flexible Multi-hop Frame Structure for IEEE 802.16j

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IEEE C802.16j-06/163 http://wirelessman.org/relay/contrib/C80216j-06_163r3.pdf

Purpose:

The purpose of this slide set is to support contribution C802.16j-06_163r3. This contribution describes the frame structure for multi-hop relaying system. Changes in the standard are partially described in contribution C802.16j-06_163r3.pdf.

A Flexible Multi-hop Frame Structure for IEEE 802.16j

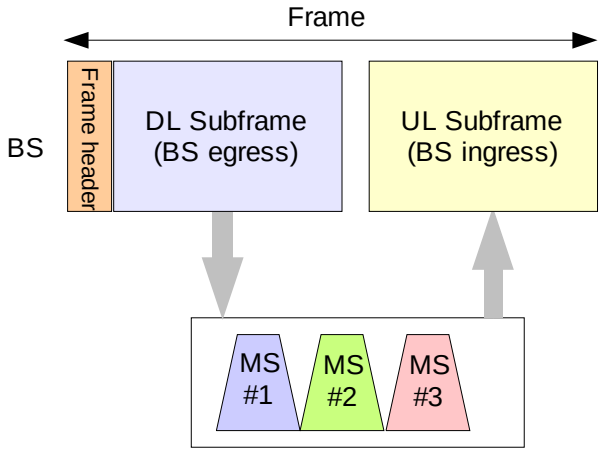
- This document provides support for the non-transparent relay frame structure proposal in the Huawei contribution C80216j-06_163
- Contents
  - Overview of motivation for Huawei's non-transparent relay frame proposal
  - Review of the 802.16e TDD frame structure
  - RS topology and frame considerations
  - Illustration and description of the proposed frame structure
  - RS transmission/reception illustration

Motivation for Huawei frame proposal

- Unlike the BS and MSs, an RS may transmit (and receive) in both the uplink and downlink directions
  - From this view, downlink and uplink distinctions are not meaningful from an RS perspective
  - The important distinction is the state of the transceiver; whether it is transmitting (egress) or receiving (ingress)
  - The RS should have the capability to transmit in either direction within one frame as well as the capability to receive in either direction within one frame
  - This allows more flexibility for data to be transmitted at the best time
- RS transmission resources
  - Unlike MSs, non-transparent RSs have the capability to schedule data
  - Unlike the BS, RSs can be point to multipoint in both directions
  - Transmission resource requirements for an RS will be more static than for an MS since they are an aggregate of many MSs resource requirements
  - RS transmission resource allocation can be changed at a slower rate than MSs

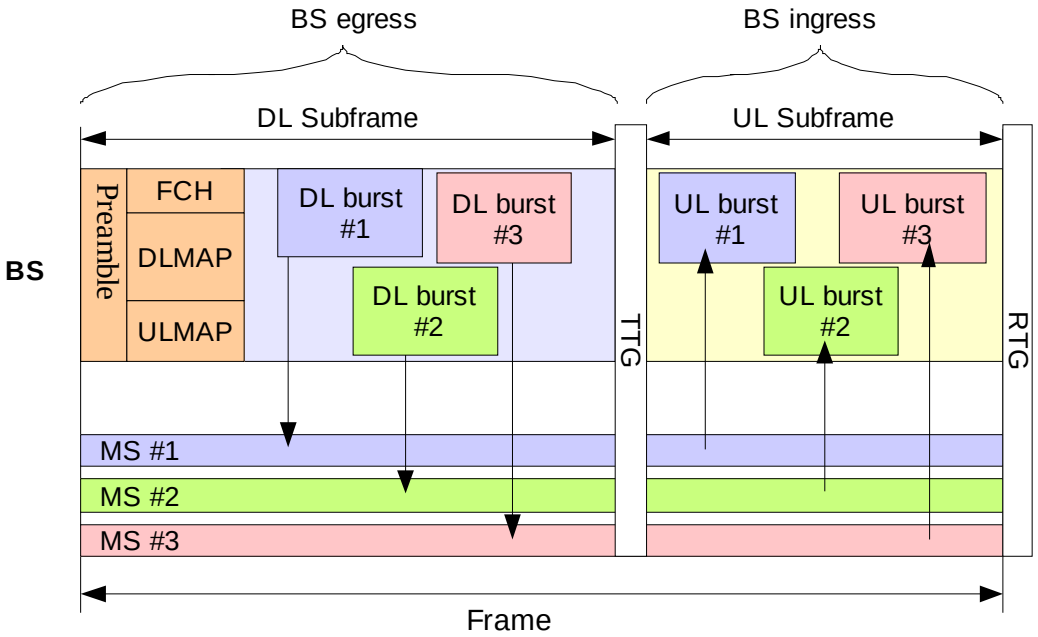
The following slides provide more details on these points

802.16e TDD frame structure



- DL Subframe
  - Point to multipoint downlink transmissions
  - BS to MSs
  - “BS egress” subframe

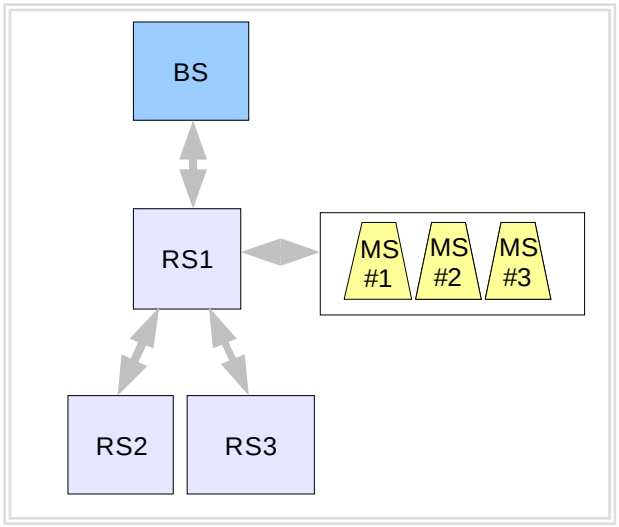
- UL Subframe
  - Multipoint to point uplink transmissions
  - From MSs to the BS
  - “BS ingress” subframe



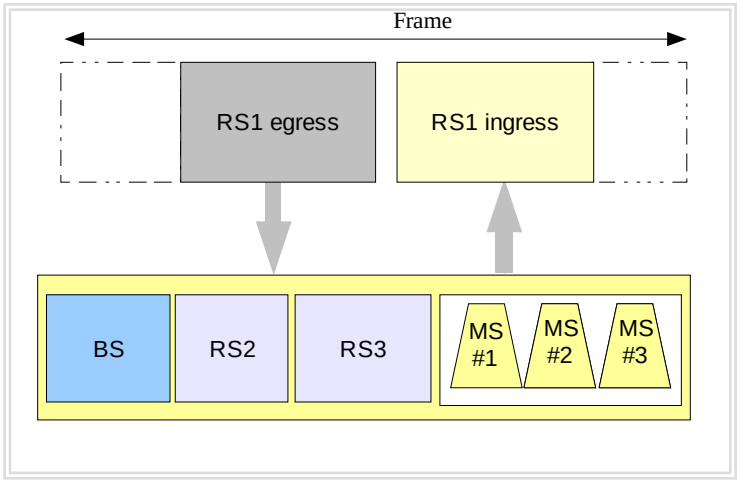
- For downlink burst, DLMAP provides
  - Target MS
  - Burst location in subframe
  - Burst decoding information

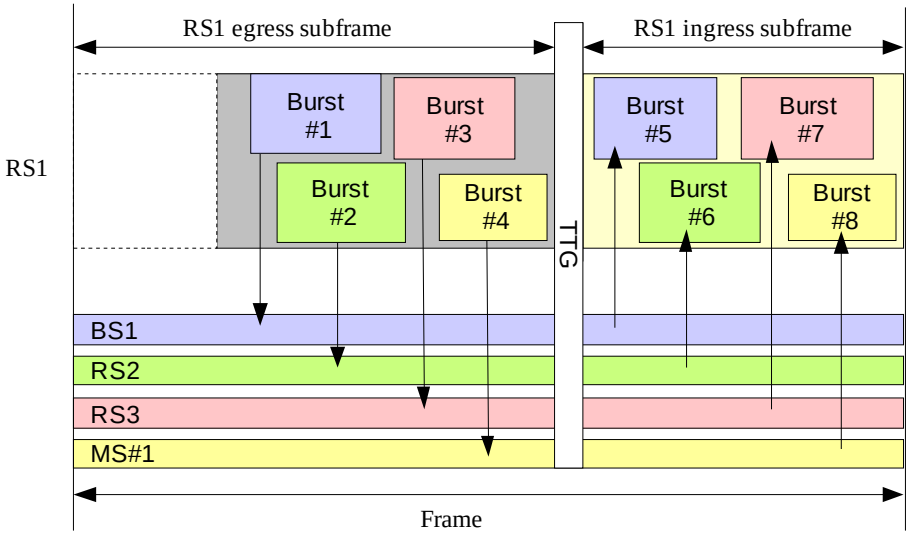
- For uplink bursts, ULMAP provides
  - Target MS of burst
  - location in subframe where MS can transmit
  - Burst encoding information

RS topology and frame considerations



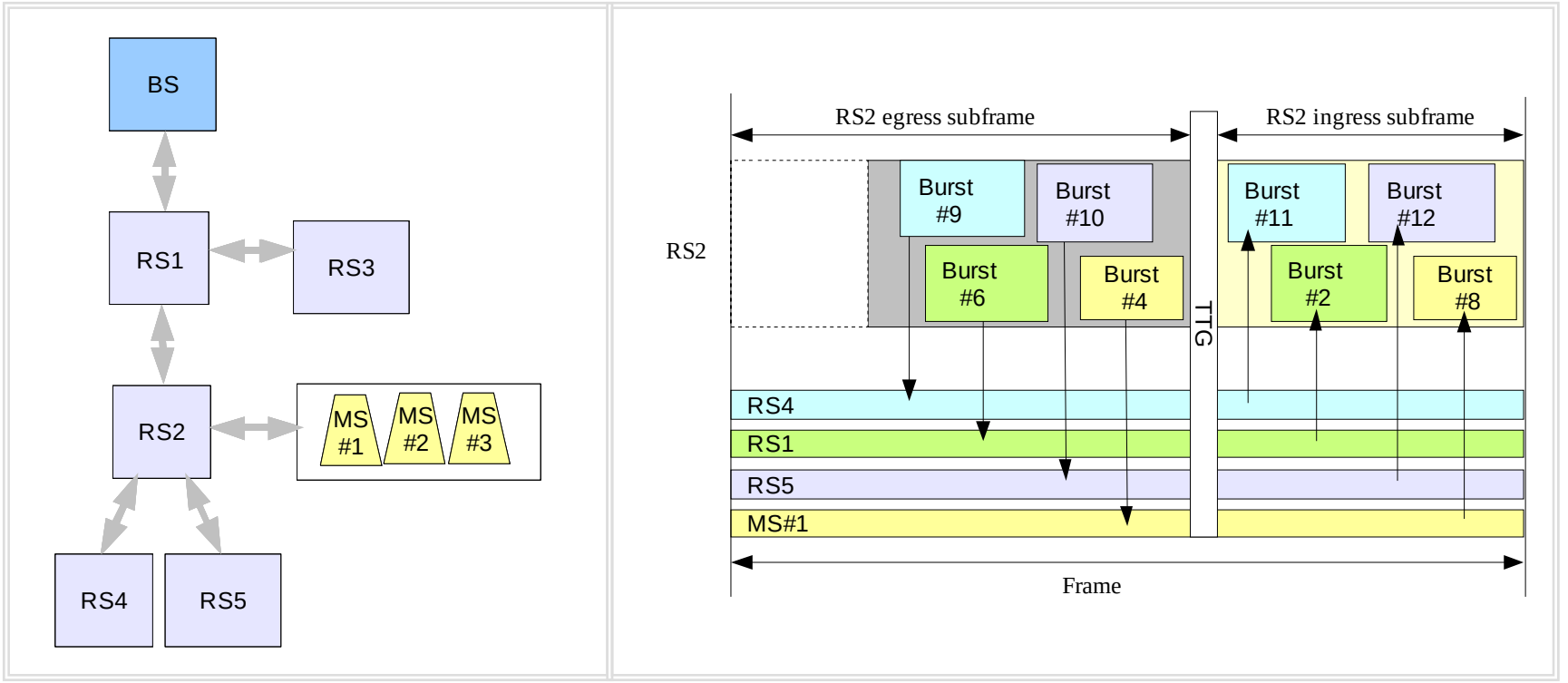
- RSs are interim nodes between BS and MS
- Since RS schedules data and transmits and receives in both the uplink and downlink directions, uplink and downlink distinctions are not meaningful
- With regard to the frame structure, the important distinction is the state of the transceiver; whether it is transmitting (egress) or receiving (ingress)





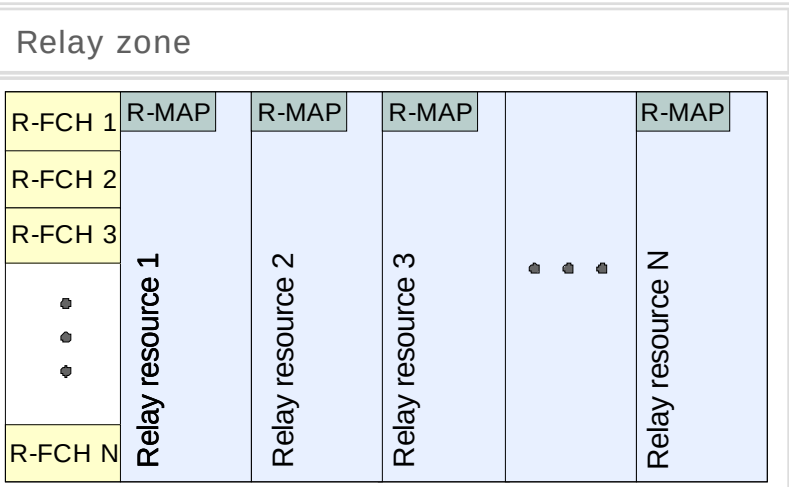
RS topology and frame considerations

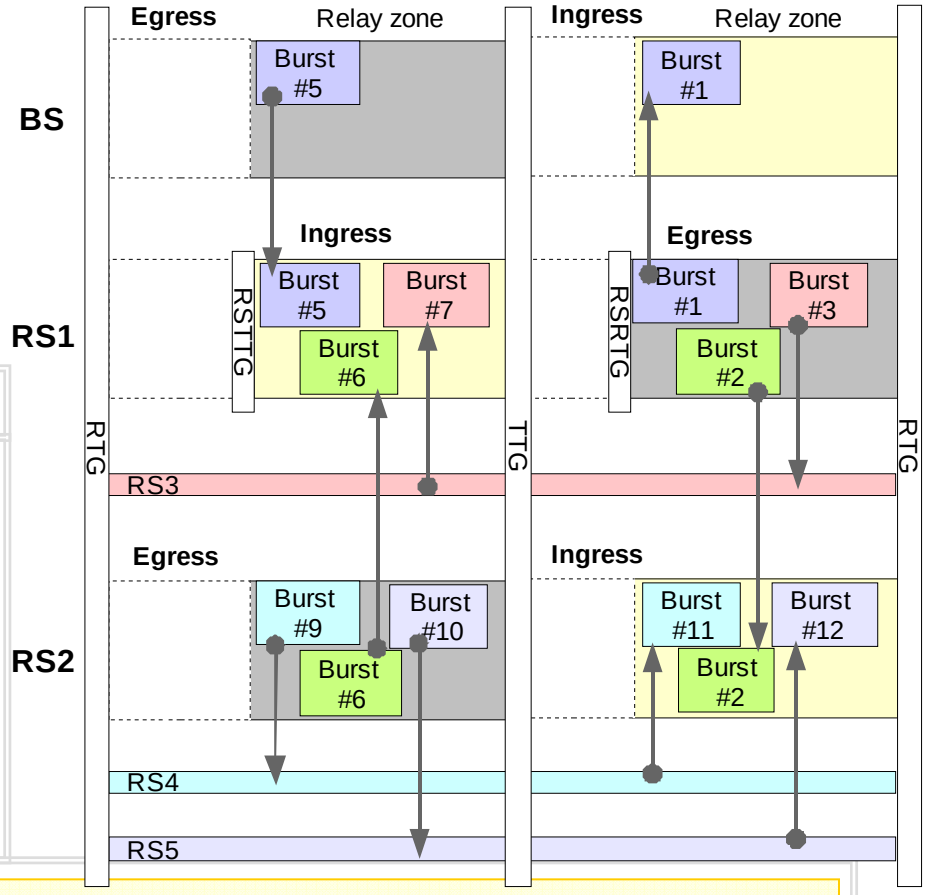
Example from RS2 view



Example with RS1 and RS2 views together-Relay zone only

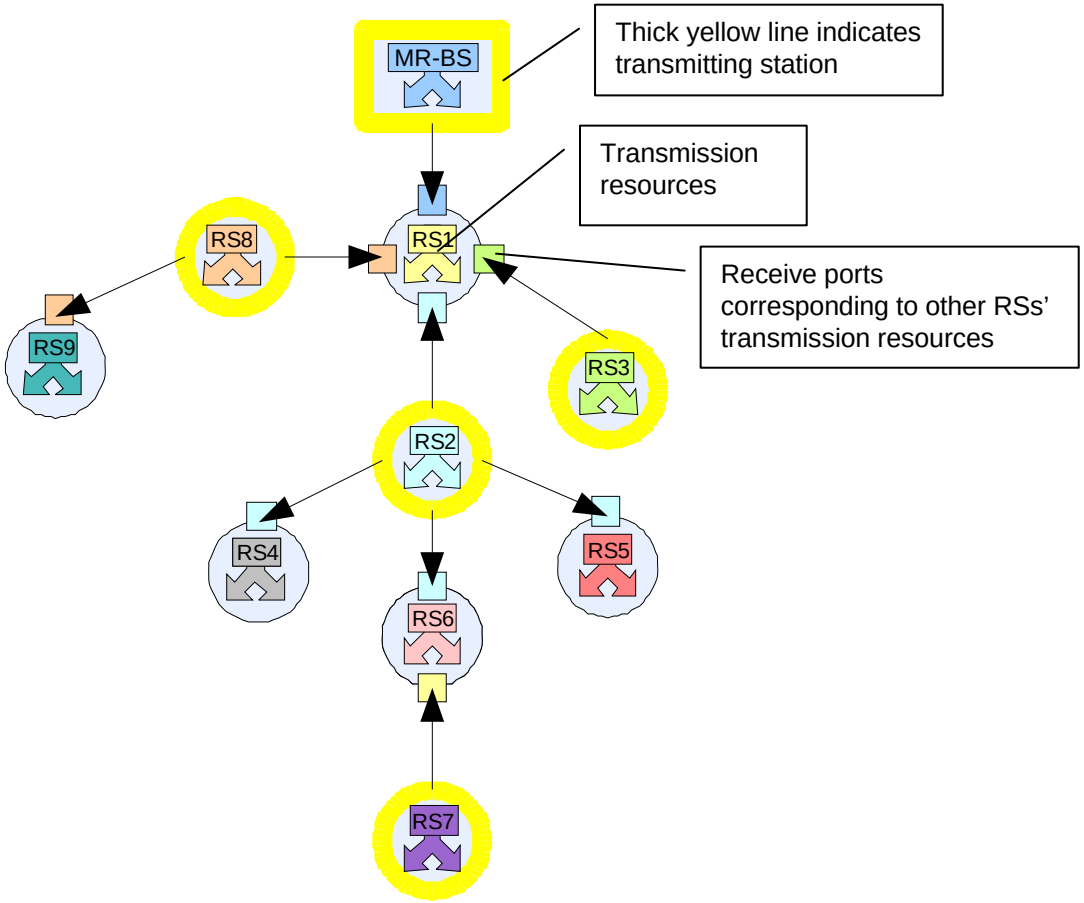
- RS transmits to multiple adjacent RSs
- RS receives from multiple adjacent RSs
- RS1 and RS2's transceiver states must be opposite
- Alternating RSs transceiver states must be opposite



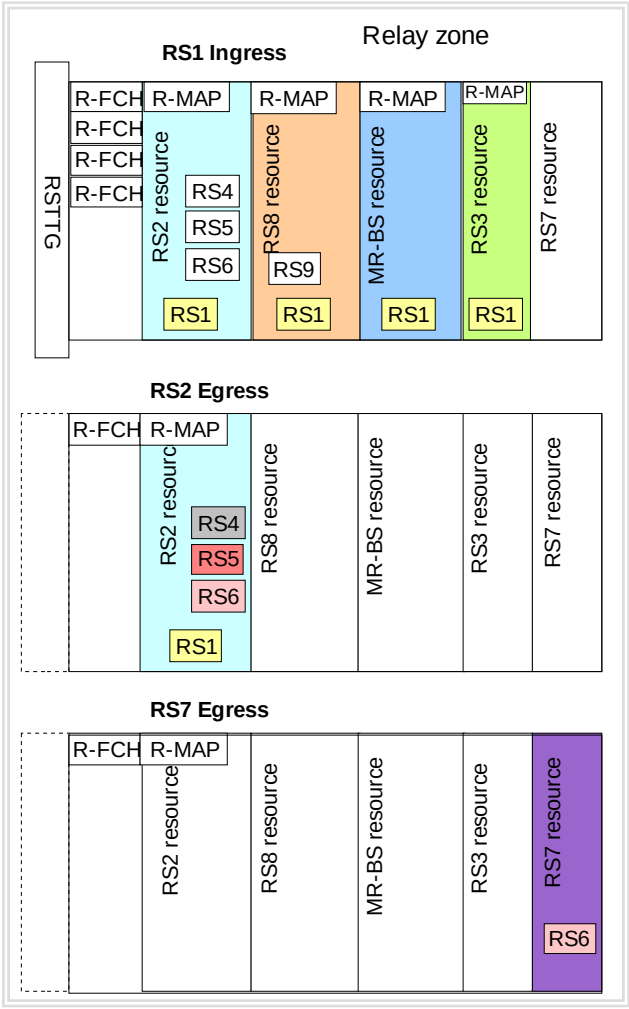


- Resource allocation
  - An RS transmits to RSs in a point to multipoint fashion
  - A transmitting RS uses R-MAP to identify bursts similar to DLMAP
  - Each RS is allocated its own resource block for transmission (self-managed resource)
    - An R-FCH points to the location of the resource block for a transmitting RS
    - A receiving RS knows the location of the R-FCH for each adjacent RS
    - If a frame contains an R-FCH for an adjacent RS, a receiving RS checks R-MAP
  - RS self-managed resource may be changed using MAC management messages

RS transmission/reception example-RS1 receiving



- RSs only transmit in their allocated resource block
- RS1 checks if R-FCH for MR-BS, RS2, RS3, RS8 are present
- RS1locates R-MAPs using R-FCHs' that are present
- RS1 checks R-MAPs for bursts referencing its address
- Resources for MR-BS, RS2, RS3, RS8 do not overlap resources for RS7 to avoid interference



RS transmission/reception example-RS1 transmitting

- RS1 transmits bursts to MR-BS, RS2, RS3, RS8
- RS1 uses its R-FCH to point to its allocated transmission resource
- RS1 uses its R-MAP to identify the RSs that have data included
- Resources for RS4, RS5, RS6, RS9 do not overlap resources for RS1 to avoid interference