# Issues and Scope of MMR

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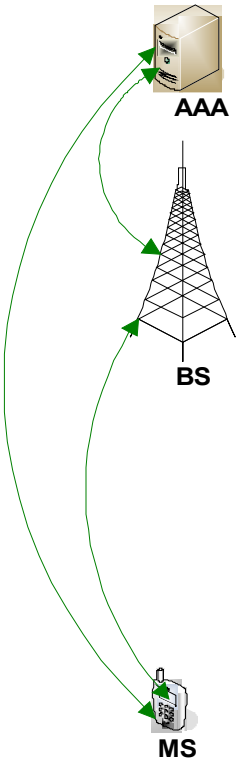
This is a response to http://ieee802.org/16/sg/mmr/docs/80216mmr-05_021.pdf (call for contributions: IEEE 802.16's Mobile Multi-hop Relay Study Group) to present some discussion material.

# Introduction

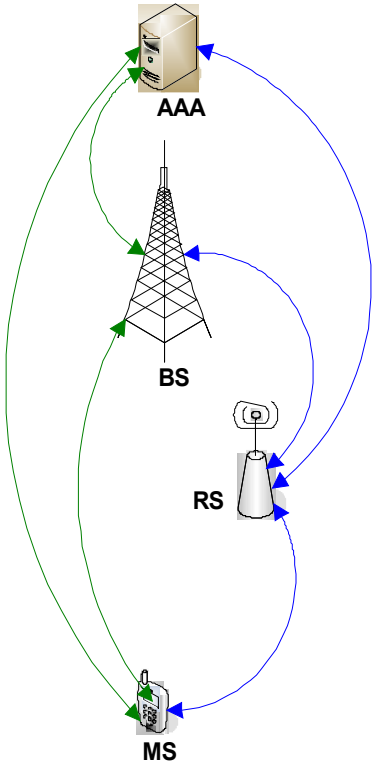
- Provides input on scope of the work in MMR SG
- Attempts to describe possible approach for solving RS problem
- Suggests to simplify RS problem space for cheaper RS

- Topics for discussion
  - Security
  - Same Frame or Different Frame Relay
  - Mobile RS

# Security Issues




Current 3-party security model




With RS, it will become 4-party security model

# Impact of RS on PKM

- From key management perspective, adding one RS, will convert the security problem into a 4 party model.
- In the 4 party model, the following security associations need to exist for ensuring trust and distributing session keys:
  - **AAA←→RS**: *New*
  - **AAA←→BS**: *Existing*
  - **AAA ←→MS**: *Existing*
  - **BS←→RS**: *Existing*
  - **RS←→MS**: *New*
  - **MS←→BS**: *Existing*
- Channel binding will be needed in the 4 party model
- Given the complexity of 4 party model, and the requirement that AAA server maintains a secure tunnel between each middle-party (be it BS or RS), it's better to minimize the RS involvement in the security mechanisms.
- RS could be involved in traffic encryption and message authentication

# Impact of RS on the Traffic Encryption

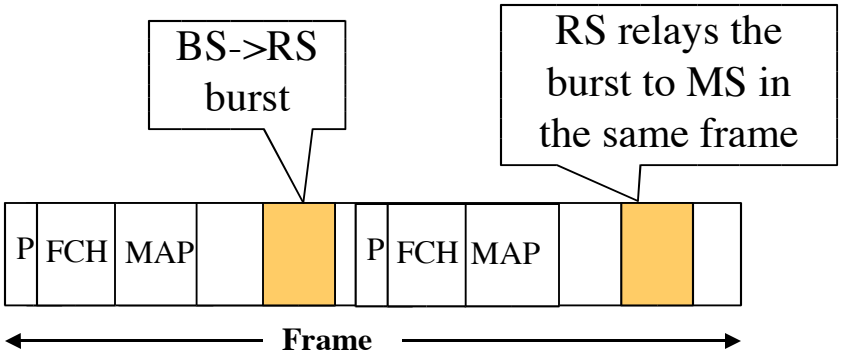
- We can keep traffic encryption/decryption in the BS and MS, the RS doesn't need to take part in the traffic encryption
- The advantage of this approach is that RS doesn't require key-exchange and any new security association between the AAA-server and RS, and doesn't suffer from the channel binding concerns of the "four-party" model.

# Impact of RS on the Message Authentication

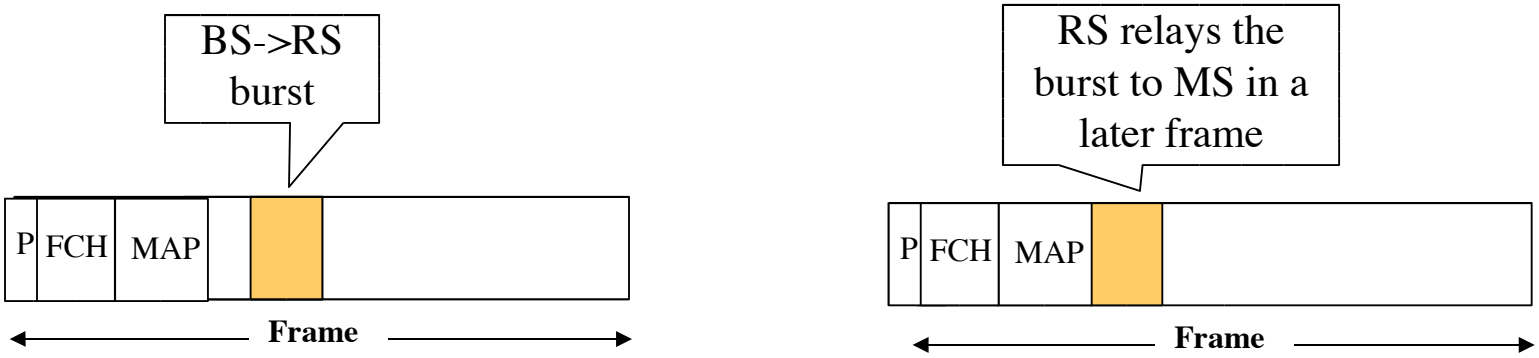
- Even with minimal functionality on RS, certain management messages (e.g. RNG-REQ/RSP) still need to be authenticated between the RS and MS
- Moreover, there would be some messaging between RS and BS
- This may require a mechanism at RS for message authentication.

# Possible Approaches for Relaying

**Same Frame Relay**




**Different Frame Relay**



# Same Frame Relay vs. Different Frame Relay

## Same Frame Relay

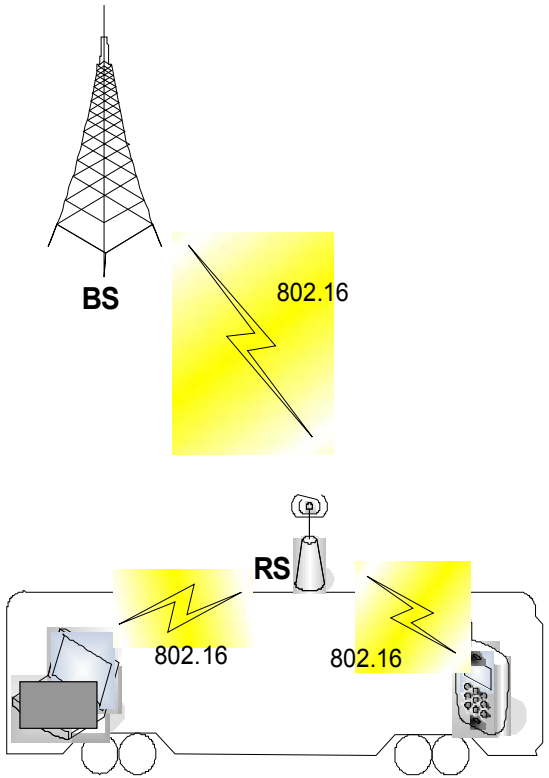
- \+ Scheduling is centralized at the BS: BS schedules for BS<->RS, and also for RS<->MS
- \+ BS provides MAP for RS also, alleviates RS from managing MAP allocation
- \+ QoS setup between BS and MS is not impacted with the addition of RS.
- \+ BS and RS transfer frame within a frame boundary. In this way relaying doesn't increase delay beyond the frame size.
- \+ Fast feedback can be delivered within one frame

## Different Frame Relay

- – Scheduling is distributed: BS schedules for BS<-> RS, and RS schedules for RS<->MS
- – BS provides MAP for BS<->RS, and RS needs to provide MAP for RS<->MS.
- – Requires QoS setup on each hop.
- – RS receives frame and then relays bursts in a later frame. Adds delay in frame transfer. Delay increases with the number of hops.
- – Fast Feedback may have to go through multiple frames, could become slow

- A simpler RS can be achieved with the same frame relay
- Different frame relay adds more issues and consideration

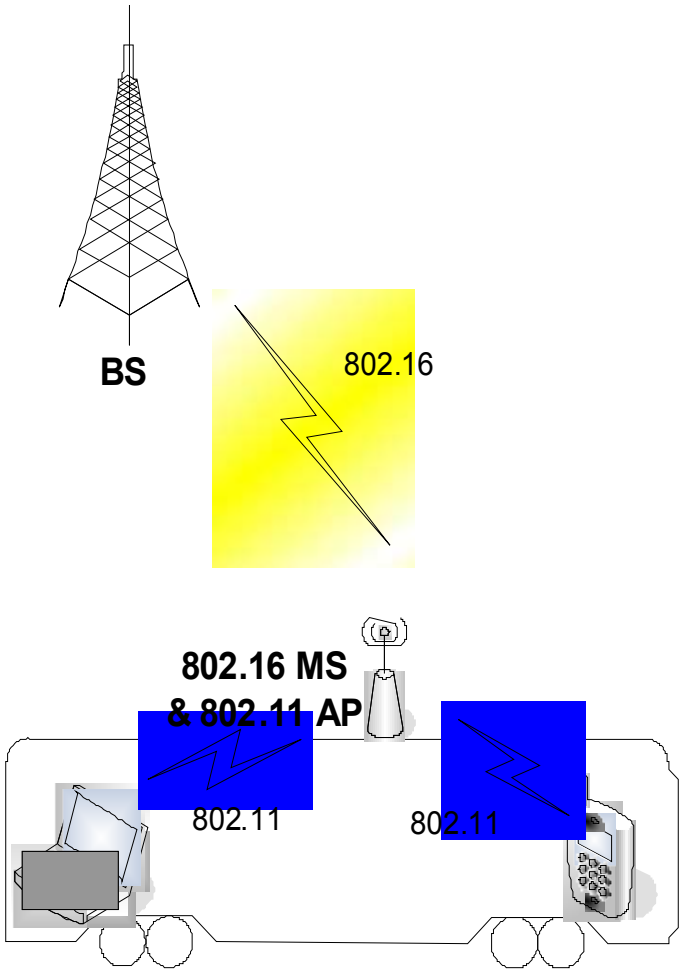
# Mobile RS




- Mobility of RS means that 802.16 air interface is also on the MS/SS side
- Mobile 802.16 RS may make sense, when an RS is moving with its associated MS/SS, e.g. on a bus or boat…. Continued

# Do we need Mobile RS?

- However, in such use cases, an 802.16 MS with 802.11 (WLAN) interface towards the clients is more feasible
- 802.11 is suitable because it is designed for local area coverage.
- This is not an extending coverage case, 802.16 client could simply connect to the BS directly
- Therefore, suggestion is to consider only fixed RS in the scope of MMR
- Earlier contributions, in the MMR SG, also demonstrated a decrease in throughput if the RS is not positioned at an optimal location.



# Summary

- We need to resolve security issues with the addition of RS
- Same Frame Relay simplifies functionalities in RS
- Fixed or Nomadic RS is appropriate for extending coverage and maximizing throughput