Study of IEEE 802.16 Mobile Multi-hop Relay

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Study of IEEE 802.16 Mobile Multi-hop Relay

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- Study items of Mobile Multi-hop Relay (MMR)
- Related work
- Requirement of MMR
- Summary

Review of #38 session [1/3]

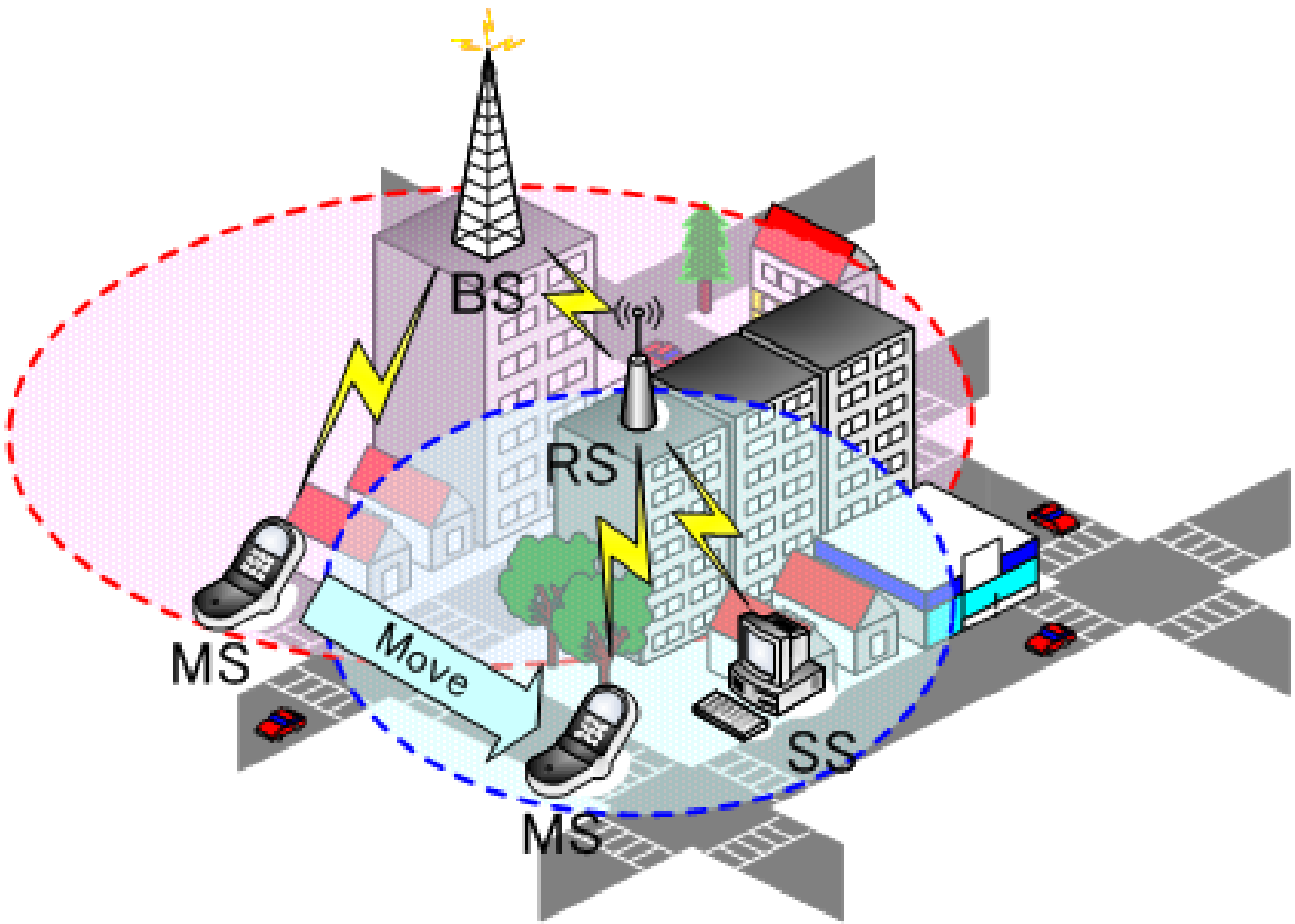
- Purpose
  - Coverage extension
  - Throughput enhancement
- Focus in MMR SG (Refer to C802.16-05/013)

		Infrastructure	Client
Mesh		No	No
Relay	Fixed	Yes	No
	Nomadic	Yes	Yes
	Mobile	Yes	No

※Inter-SS/MS communication like ad-hoc network is out of scope.

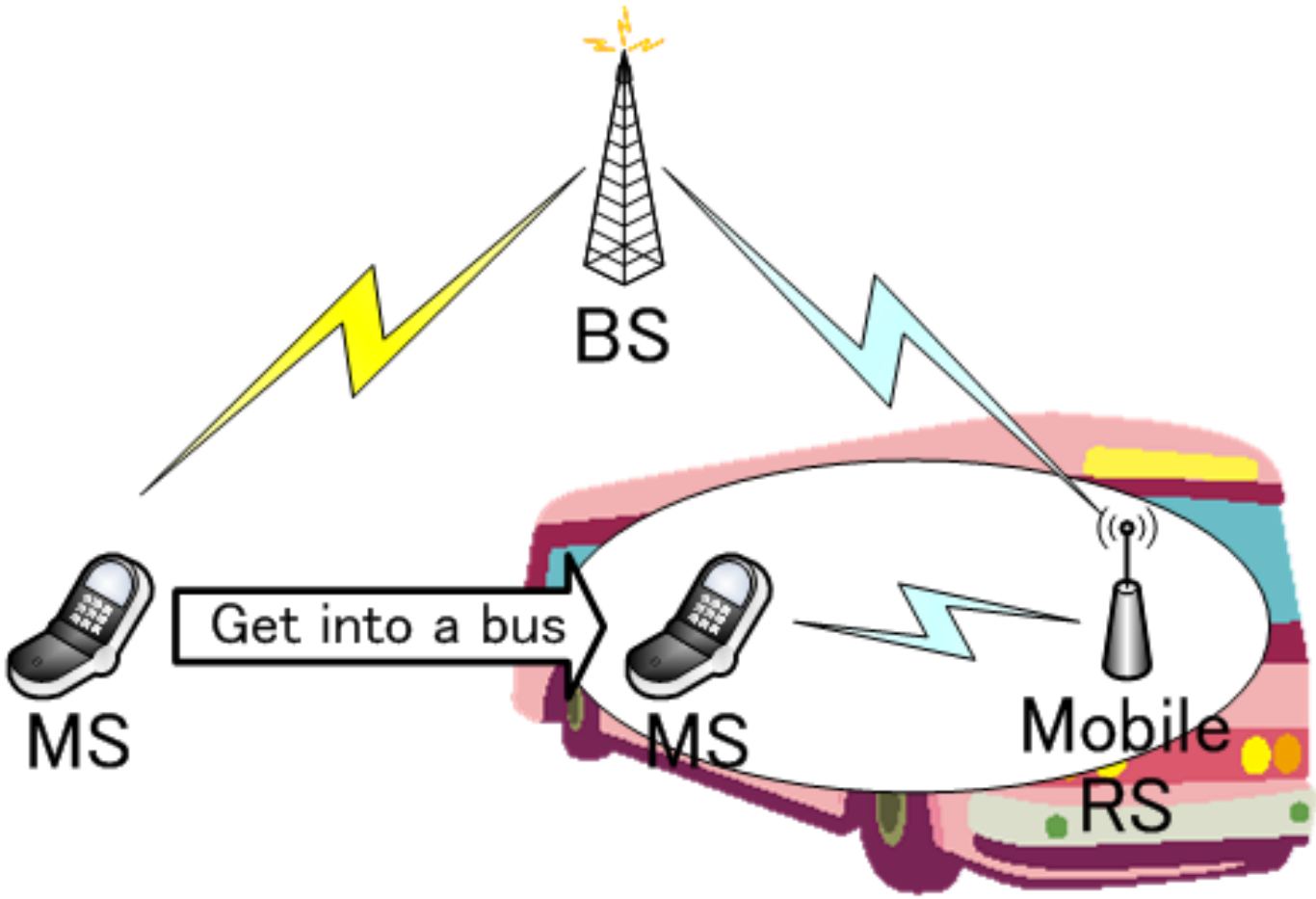
Review of #38 session [2/3]

- Fixed / Nomadic Relay



Review of #38 session [3/3]

- Mobile Relay



Study items for MMR

		Relay	
		Fixed / Nomadic	Mobile
Frame structure based on PMP		Common subject	
Network entry procedure		Common subject	
Mobility	L2 routing	For MS	For both RS and MS
	HO sequence		
	Optimal route selection		
Radio Resource Management	Frequency reuse strategy	Coordination between BS and RS	More complex than Fixed / Nomadic
	Spectrum efficiency		
	Interference		
Synchronization		Common but more complicated for mobile	
Security		Common subject※	

※There may be more security issues for the client RS compared with Infra-ones.

Related work [1/2]

IEEE Std 802.16-2004 Mesh mode

Mesh scheduling		Content
Distributed	Coordinated	Schedule coordination to all neighbor SSs
	Un-coordinated	Schedule negotiation by directed requests and grants between two SSs
Centralized		• Mesh BS Determination of flow assignments by resource requests from SSs • SS Determination of actual schedule from Mesh BS's flow assignments

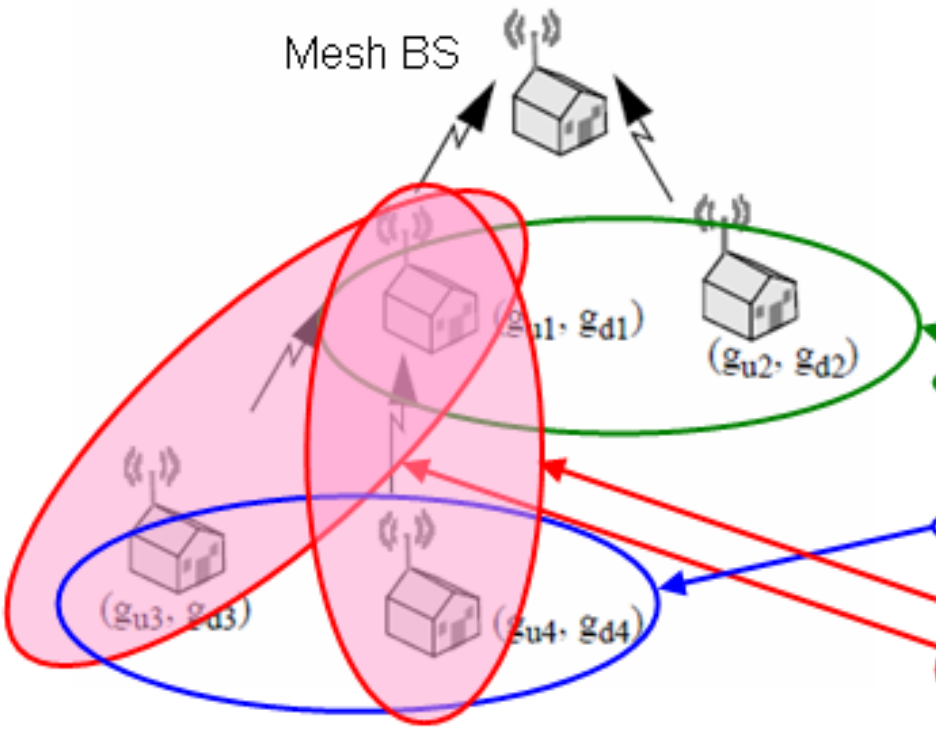
⇨ MMR resembles the concept of Centralized than Distributed mode in IEEE 802.16-2004 Mesh.

Related work [2/2]

IEEE 802.16-2004 Mesh mode (Centralized scheduling)

- MSH-CSCF message

  Hop count is limited up to 2 hops



Syntax	Size	Notes
MSH-CSCF_Message_Format() {		
Management Message Type = 43	8 bits	
Configuration sequence number	4 bits	
NumberOfChannels	4 bits	
for (i=0; i< NumberOfChannels; ++i) {		
Channel index	4 bits	
}		
Padding Nibble	0 or 4 bits	Pad till byte boundary.
NumberOfNodes	8 bits	
for (i=0; i< NumberOfNodes; ++i) {		
NodeID	16 bits	Node index for this node is *i*.
NumOfChildren	8 bits	
for (j=0; j< NumberOfChildren; ++j) {		
Child Index	8 bits	Index of j^{th} child node.
Uplink Burst Profile	4 bits	Burst profile from j^{th} child node.
Downlink Burst Profile	4 bits	Burst profile to j^{th} child node.
}		
}		
}		

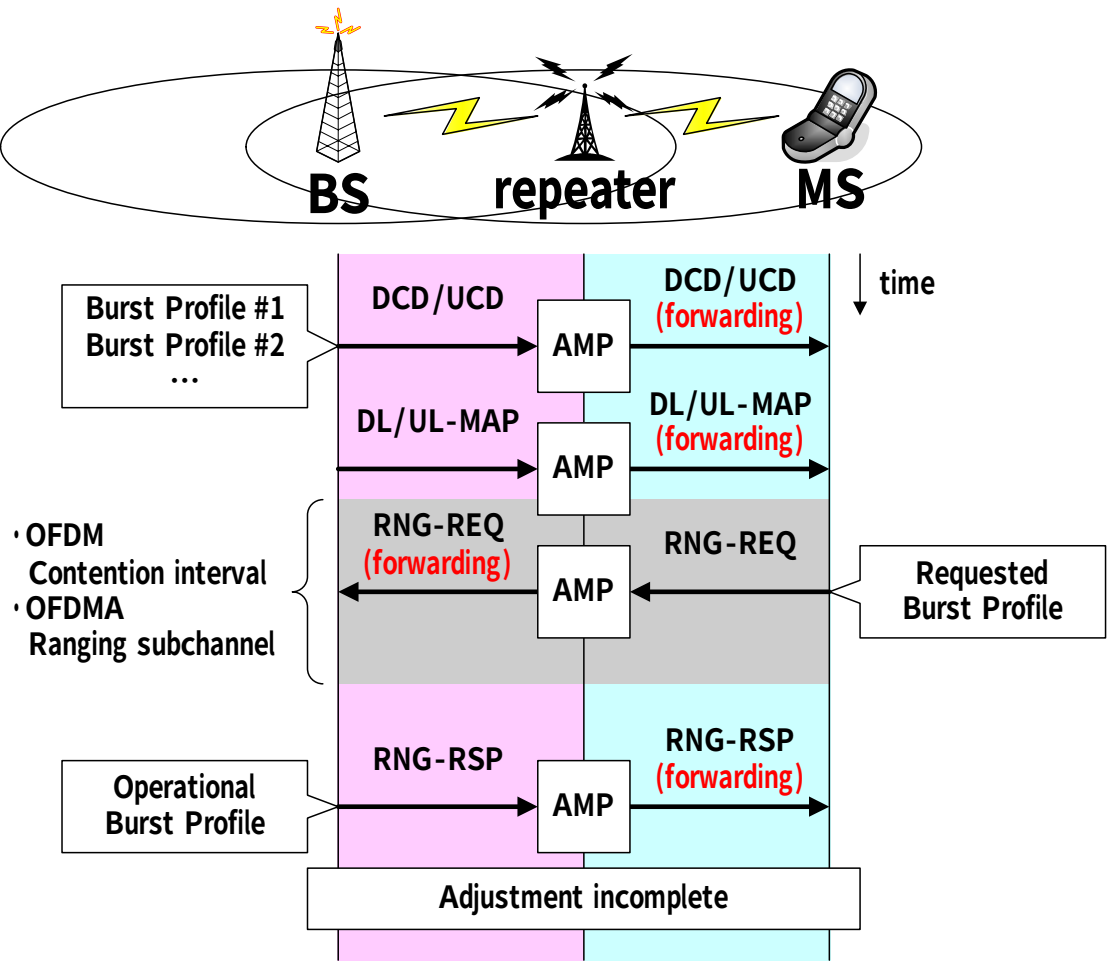
⇨ In MMR, that limitation will not be applied.

Requirement of MMR [1/2]

- Backward compatible to PMP mode
  - PHY Compatible to PMP frame structure

    Support OFDM / OFDMA
  - MAC Common network entry procedure for MS
- Support for 802.16TGe MS
- Minimum change of the existed standard / devise function
  - BS Some changes of BS function may be necessary, such as firmware update
  - MS Few change of MS function, if possible
- Efficient RS
  - RS may need to have a part of BS function
  - Active repeater

Requirement of MMR [2/2]



Network entry procedure
(case of passive repeater)

Passive repeater

- Passive repeater only re-transmits a message/data
- BS recognizes that the passive repeater is MS
- MS recognizes that the passive repeater is BS
- BS could not create exact MAP information for relayed MS

Active repeater is required for MMR

Summary

- Review of #38 session
  - Focus of MMR is Relay, not Mesh
- Study items of MMR
  - Fixed / Nomadic Relay
  - Mobile Relay
- Requirement of MMR
  - Backward compatible to PMP mode
  - Efficient RS