Considerations for the MMR PAR

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None

Purpose:

This is a response to http://ieee802.org/16/sg/mmr/docs/80216mmr-05_026.pdf (call for comments and Contributions: IEEE 802.16's Study Group on Mobile Multi-hop Relay) to present some discussion material.

Considerations for the MMR PAR

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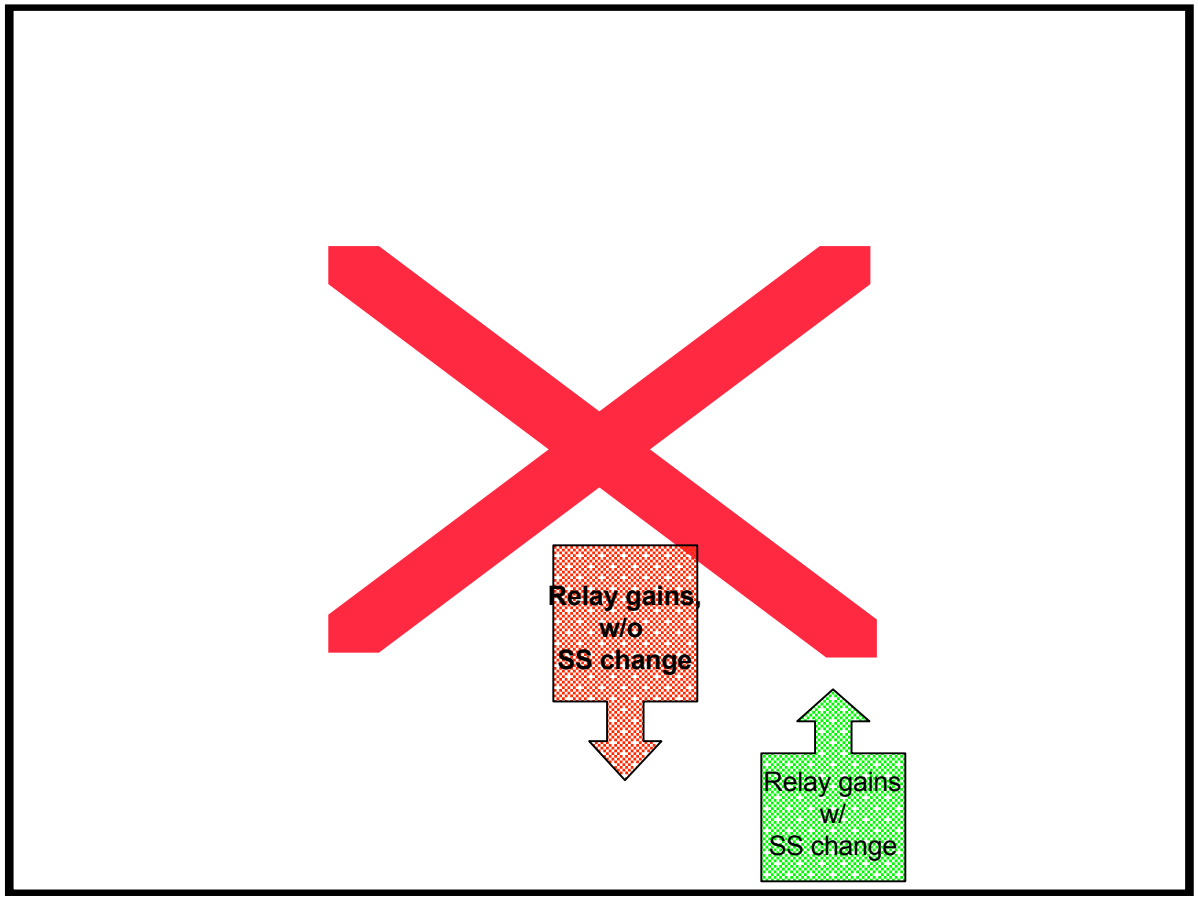
Agenda

- Making MMR Impactful
- Feasibility
- Revised Phases
- Rationale for Phases
- Recommendation

What will make MMR high impact? And soon…

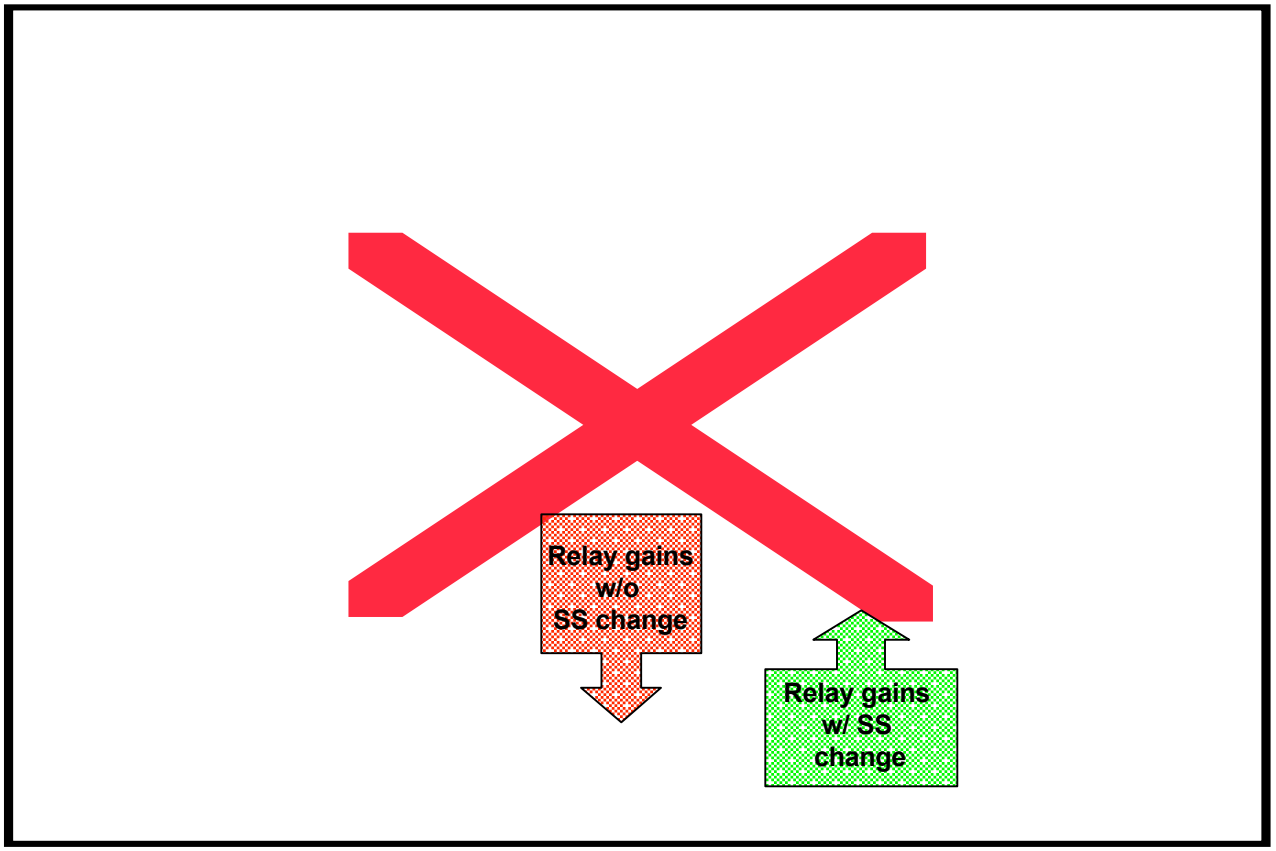
- Coverage/Capacity enhancement for the 802.16e service
- Drive down CAPEX/OPEX costs of infrastructure
  - CAPEX => Lower Equipment Costs
  - OPEX => Wired Backhaul to Wireless Relay, Lower site acquisition costs thru Up-the-pole/Roof-top solutions
- Improved ROI
  - Relay augmented network could provide higher ARPU though higher grades of service at lower overall incremental cost
  - Need subscriber terminal costs to reduce and not increase. With terminal changes the costs are bound to increase. Manufacturing costs, validation costs… all add up.
- Faster completion (~1 year) and rapid WiMAX Forum feature enablement
- Impact to larger number of 802.16e based terminals vs MMR enhanced terminals that can benefit from the relay augmented network
- Allows 802.16e technology to take root in market place before resetting baseline.
- OFDMA has become the key PHY technology of choice, so its time to avoid carrying on the burden of continuing to enhance all PHYs.

Feasibility of Backward Compatible Relay (802.11n)



- Outage vs end-to-end Shannon capacity (802.11n indoor D, BS-RS-SS at 30m)
  - SS selects BS or RS based on best capacity
    - **Backward compatible selection** ignores backhaul quality, provides gains over direct BS
    - **Optimal selection** requires end-to-end knowledge, provides further gains

Feasibility of Backward Compatible Relay (802.16)

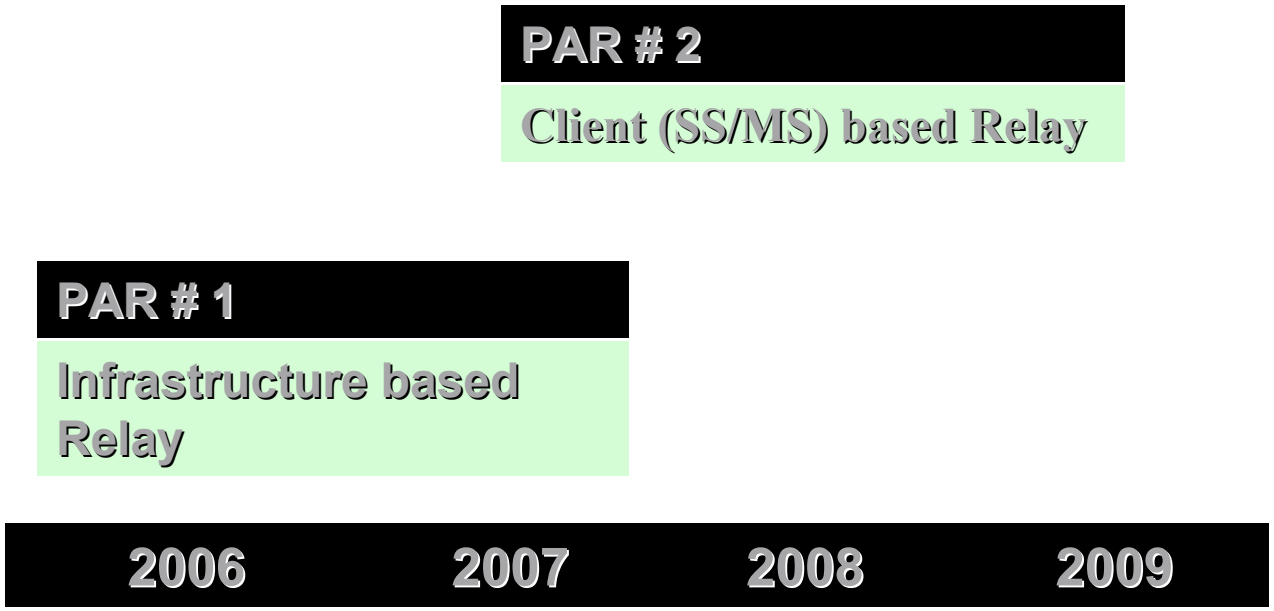


- SS selects BS or RS based on best capacity
- 802.16 link budget, BS/RS/SS heights 30/12/2m, BS-SS 750m, BS-RS 600m, RS-SS 250m
  - **Backward compatible selection** ignores backhaul quality, provides gains over direct BS
  - **Optimal selection** requires end-to-end knowledge, provides further gains (small!)

Revised Roadmap to MMR Standards Development

Note :

- Timeline below are proposal for start date which illustrates the phased approach concept . Actual start dates will be determined by MMR SG based on a clear design definition of PAR 2



Rationale for Phases (1/2)

- Faster roll-out of relay capability to 802.16e networks being rolled out
  - Operators increasing coverage have choice to demand MMR equipment, while not affecting the nascent subscriber base that it is trying to grow
  - Operators staged rollout, allows them to stagger capex/opex expenditure while still attempting to improve link performance
- As initial MMR focus is on infrastructure, critical client Si economies of scale not seriously impacted with change
  - Rapid cost reduction of existing functionality can be attempted
- Faster infrastructure cost reduction possible by scaling with lower cost and lower complexity relay stations
  - RS/Pico BS solutions very similar
- Higher grades of service can be enabled with relay augmented network in a staged manner

Rationale for Phases (2/2)

- Access side enhancements are not prematurely developed without the experience and learnings from 802.16e roll outs, but as we get smarter with some deployments over the next 2 years.

- Client relay solution complexity is significant and its viability requires a lot more feasibility analysis
  - Customer Premise Relays don't scale easily.
  - Reducing impairments for the overall network is a significant research problem.
  - What happens if every home has a customer premise relay?
  - Is it going to be in licensed band or unlicensed? How do we guarantee QoS?
  - Is the customer premise relay part of infrastructure or subscriber equipment?
  - How is security ensured? Unique solutions may be required.
  - Near term Wi-Fi based indoor connectivity enabled through Customer premise APs makes the solution less compelling.

Recommendation

- Adopt the two phased approach
- Make sure that 802.16e technology that we are enabling in the next 2-3 years in the marketplace get benefits out our work
- Select OFDMA as the basis
- Make sure Backward Compatibility is maintained with 802.16e for both BS and RS.