Scope Considerations for Mobile Multihop Relay

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None

Purpose:

Contribution is intended to promote discussion of scope & objectives and aid the PAR definition for a 802.16 mesh task group

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  - Three examples of backward compatibility
- Relay Strategies
  - Four strategies
  - Summary of results on uplink relay system based on Motorola's previous contributions

Figures of Merit

- Performance merit should be clarified
  - Performance merit compared to what baseline?
    - Performance of IEEE802.16e could be a reference
  - What performance metrics should be considered?
    - Capacity / Coverage / Throughput / Spectrum Efficiency / Latency / etc.
  - Clarify definition of each performance metric
    - Need to define at Task Group
- Cost impact of relaying should be identified
  - Operating cost
    - Introduction of repeaters reduces OPEX by way of reducing wired terminations
  - Equipment Cost
    - Base Station cost increases
    - Subscriber Station cost increases
    - Overall system cost goes down

Backward Compatibility

- What is “Backward Compatibility”?
  - Definition
    - Use of modified IEEE802.16 protocol
  - Possible compatibility
    - No change to subscriber station of .16 (old SS)
      - Relay messages to/from old SS
    - Minimum change to enable relay operation
      - Relay messages to/from new SS only
      - Old SS communicates with BS only (no relay functionality)
      - Co-existence of new and old SSs
    - Radical change to maximize relay performance
      - New system does not accept old SSs
      - All stations need to be modified to have relay operation
      - Dual system operation (16e and multihop systems)

Relay Station Based

- Introduce relay stations to enable multihop
  - (SS – RS – BS)
  - pretends to be a BS for SS and to be a SS for BS
  - deployed by the operator or subscriber
- Motivation
  - Improved access (range, capacity, speed)
  - Lower OPEX and CAPEX costs
- Minimal or no changes to SS

BS-to-BS Multihop

- BS is modified to communicate with other BSs
- Motivation
  - Flexibility and redundancy in backhaul design
  - OPEX reduction
    - Fewer fiber/T1s per network
- No changes to SS

SS-to-SS Multihop

- SS is modified to communicate with other SS
- Client based multihop relay
  - (SS-SS-BS)
  - (SS-SS-SS)
- Motivation
  - Peer-to-peer communication
    - Useful for emergency / disaster relief / public safety / military communications
  - Improved access (range, capacity, speed)

Hybrid Relay

- Combination of above three relay strategies or any special cases thereof
- Utilize the best of the combination of all strategies

Previous Motorola Contributions

- Transparent Uplink Relay - IEEE C802.16e 04/417
- IEEE C802.16e 04/237
  - Example Link Budget Calculations illustrating that, under certain conditions, there is a significant uplink throughput problem for 802.16.
  - The identified problem is mitigated via uplink relay

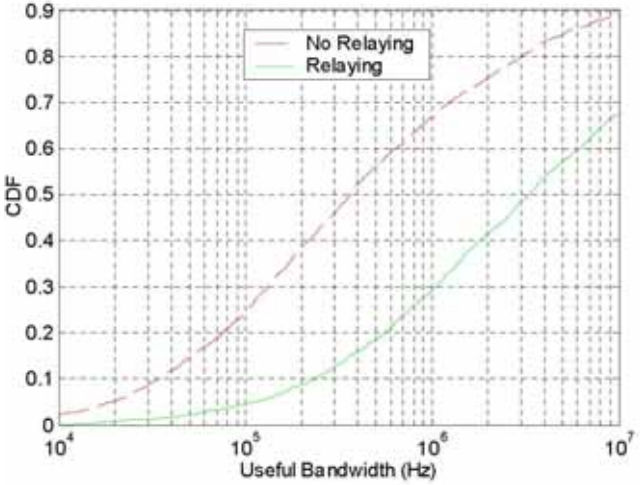

Figure 5. Useful bandwidth improvement with relaying.

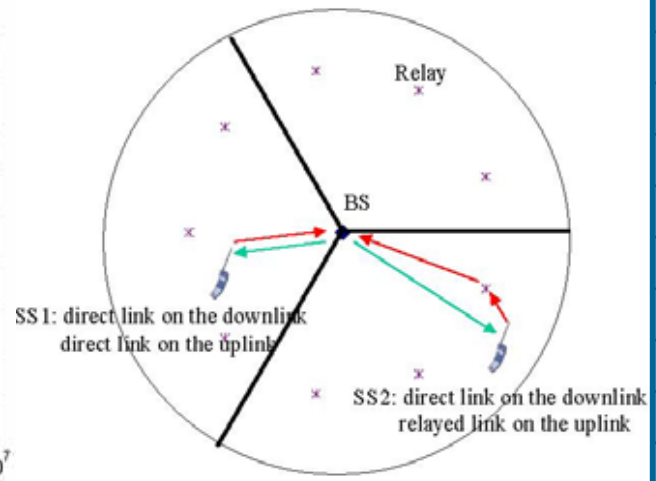

Figure 3. Deployment scenario for the relays.

In-band TDD relay	
Frequency (GHz)	3.5
Base Ant Ht (m)	28
SS av EIRP (dBm)	20
BS Ant Gain (dBi)	16
BS Noise Figure (dB)	5
Shadow Margin (dB)	10
Cell Radius (km)	2
Relay Ant Gain (dBi)	9
Relay Radius (km)	1.4
Target SNR (dB)	5
Relay Radial Spacing (deg)	40

Study of other multihop relay strategies is needed to assess merits.