Persistent Pseudo-Clearance Problem in IEEE802.11 Mesh Networks and its Multicast Based Solutions

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Interference avoidance of 802.11

- **Basic scheme**
  - Hear (Carrier Sensing) before transmit
  - Hidden node problem

- **RTS/CTS scheme**
  - Assumption: all nodes within transmission range of sender/receiver can hear RTS/CTS
  - Masked node problem [Ray ‘05]

- **Persistent pseudo clearance (PPC)**
Conditions & likelihood

- **Conditions to occur**
  - B and X (A and Y) beyond each other’s CS range;
  - B and Y beyond each other’s transmission range;
  - B and Y within each other’s interference ranges

- **Likelihood depends on**
  - CS range
  - Distance between sender and receiver
Cycle of collisions

Inter-arrival time
Consequences of PPC

- **Graphs:**
  - **Left Graph:**
    - Title: Average number of retries
    - X-axis: DATA frame size (Bytes)
    - Y-axis: Average number of retries
    - Data points showing a linear relationship.
  - **Right Graph:**
    - Title: Proportion
    - X-axis: Number of retries
    - Y-axis: Proportion
    - Bars indicating proportion by number of retries.
Potential solutions for PPC

- Increase CS range for worst case
- Dynamic CS and power tuning
- Our proposal: Multicast RTS (MRTS)
  - A different approach
  - shifted-MRTS (SMRTS) dedicated to PPC
MRTS protocol timeline
How they work?

- **MRTS**
  - When RTS collides with CTS or ACK
How they work?

- **Shifting MRTS**
  - When DATA collides with CTS
  - Give other flows higher priority by shifting addresses
Performance

![Graph showing Performance](image)

**Packets delivered per sec**

- RTS/CTS
- MRTS
- SMRTS

**Saturated**

- Flows
- XY
- XZ
- AB

**Unsaturated**

- Flows
- XY
- XZ
- AB
Conclusion

- Modifications to 802.11 are needed to implement mesh networks
- PPC degrades the performance of 802.11 mesh networks
- MRTS and SMRTS are effective and efficient to solve this problem
Questions

- ???
Masked Node Problem