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

Jian Zhang[1], Yuanzhu Peter Chen[2], Ivan Marsic[1]

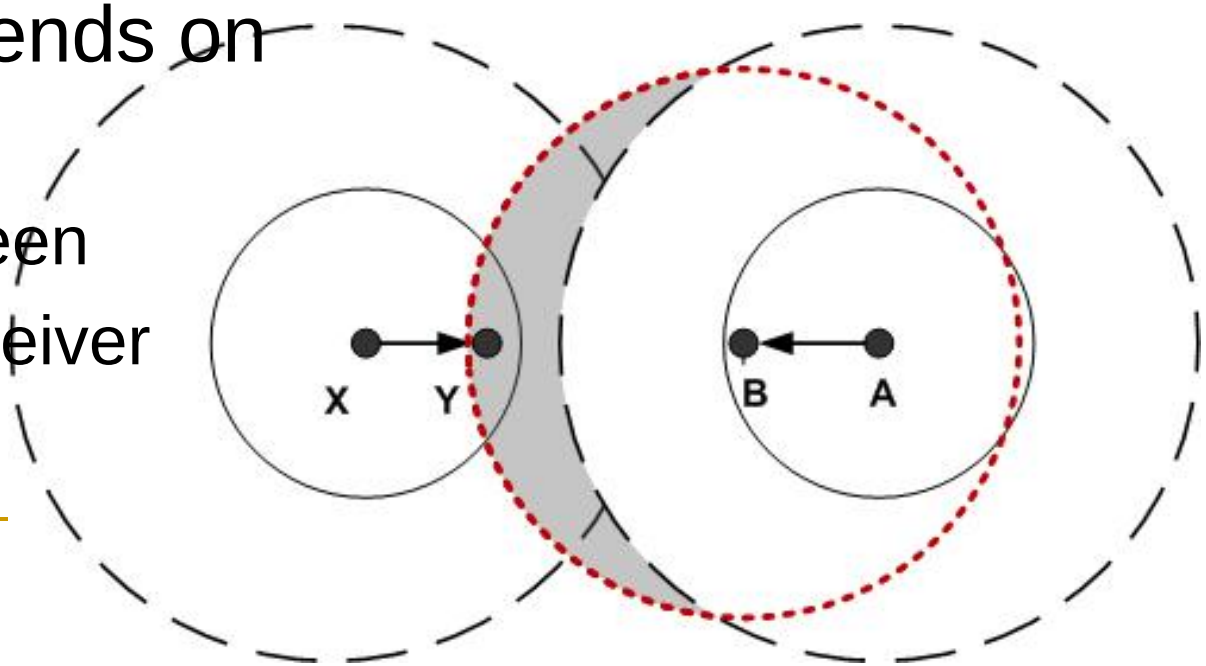
[1] Rutgers Univeristy [2] Memorial University of Newfoundland

Interference avoidance of 802.11

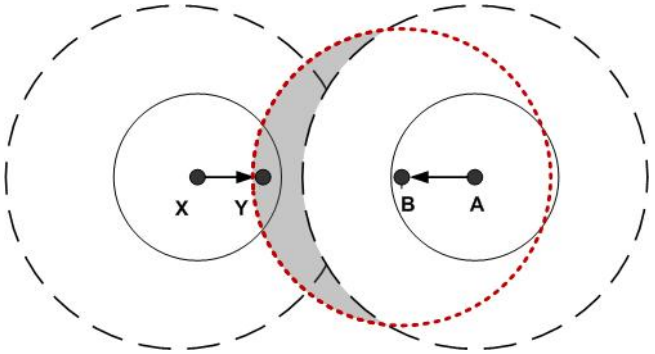
- Basic scheme
  - Hear (Carrier Sensing) before transmit
  - Hidden node problem
- RTS/CTS scheme
  - Assumption: all nodes within transmission range of sender/receiver can hear RTS/CTS
  - Masked node problem [Ray ‘05]
- Persistent pseudo clearance (PPC)

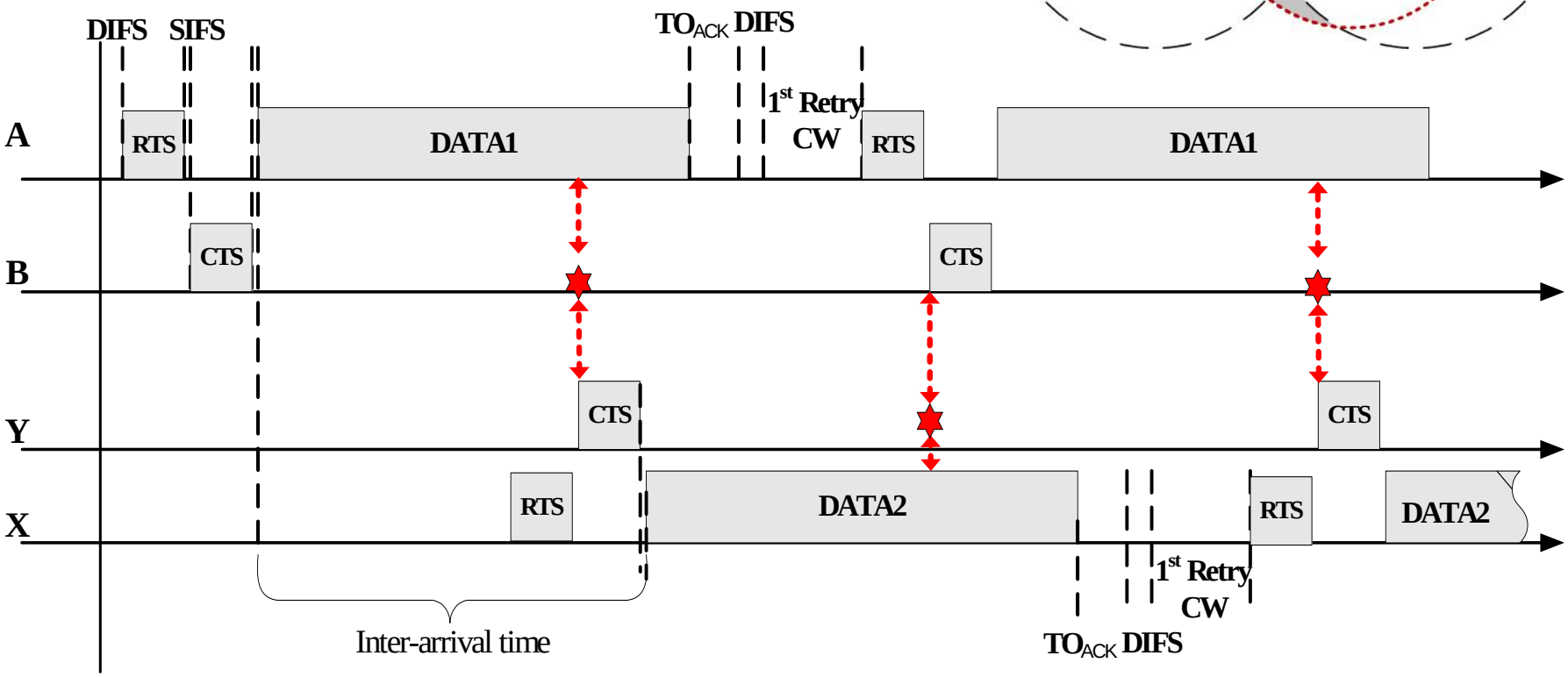
Conditions & likelihood

- 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

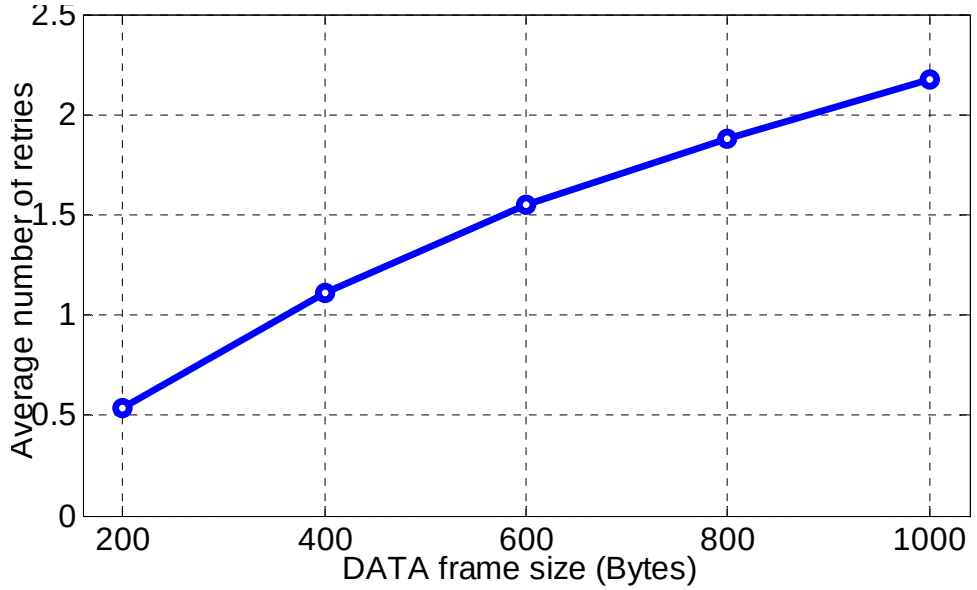


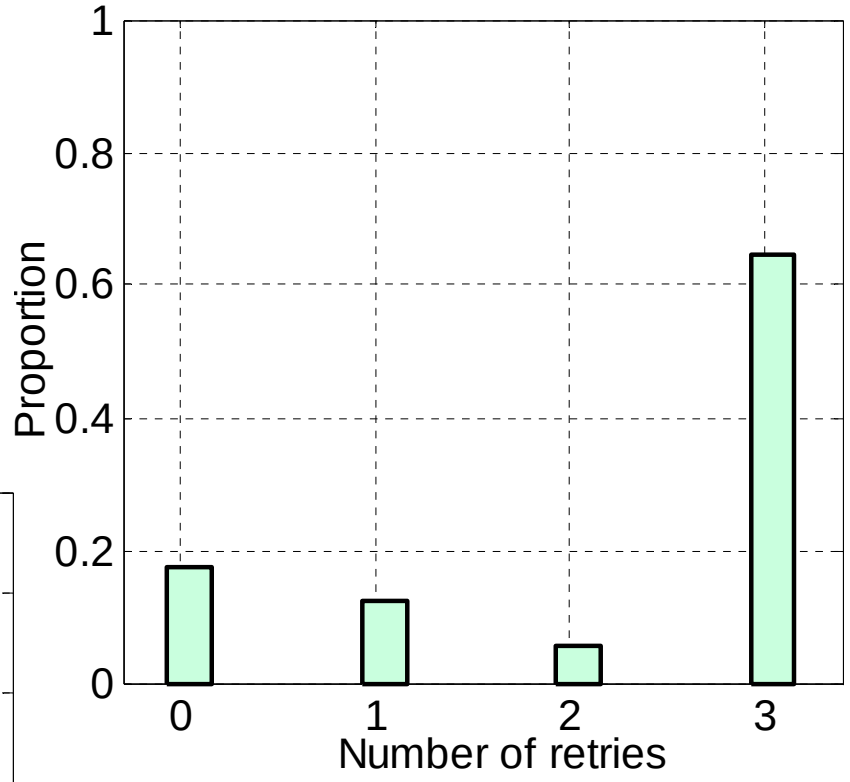
Cycle of collisions





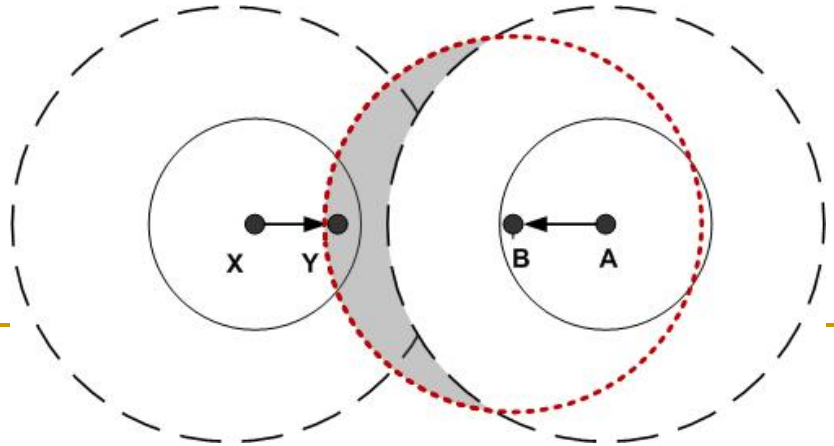
Consequences of PPC



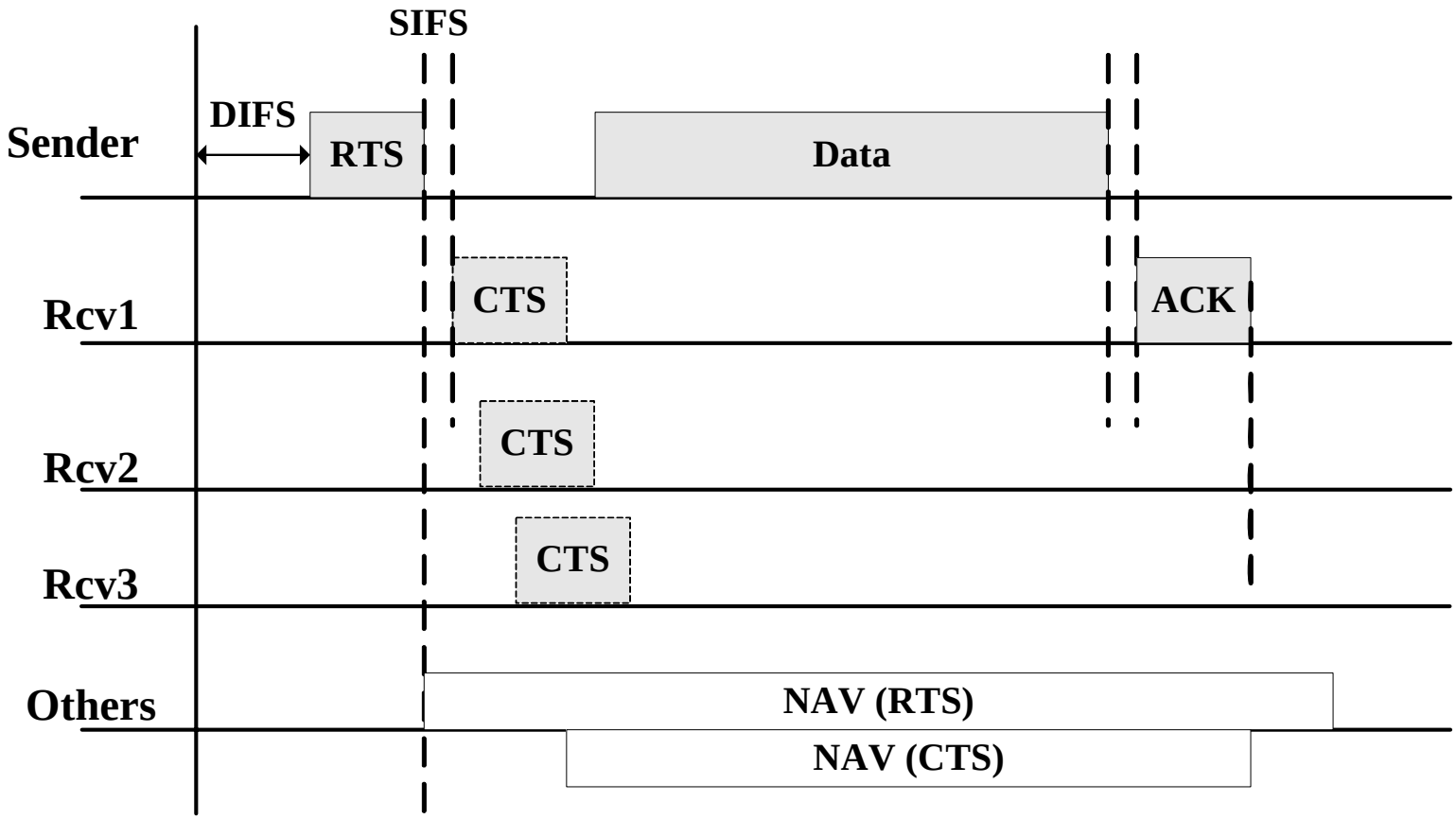


Potential solutions for PPC

- 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

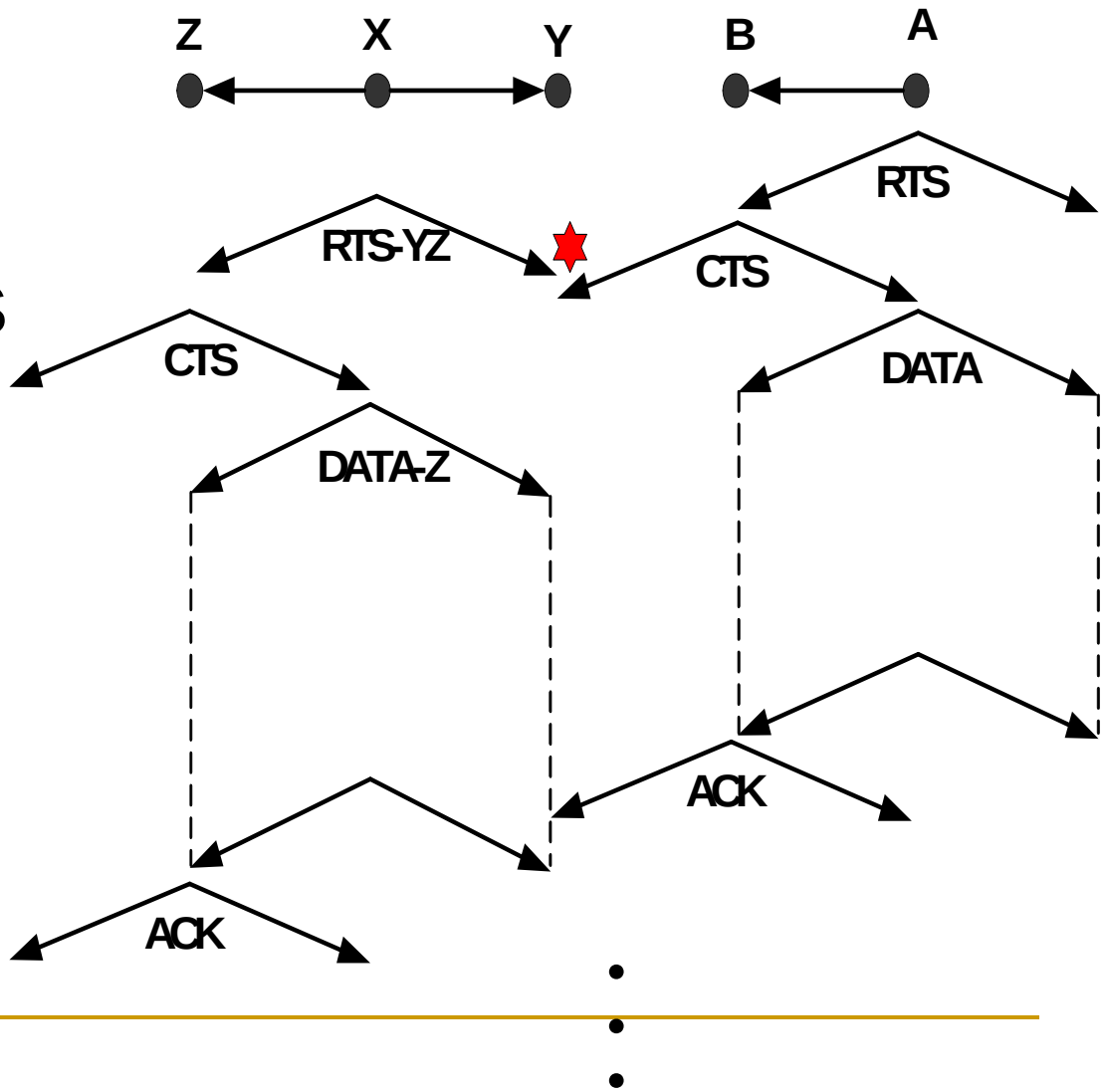


MRTS protocol timeline



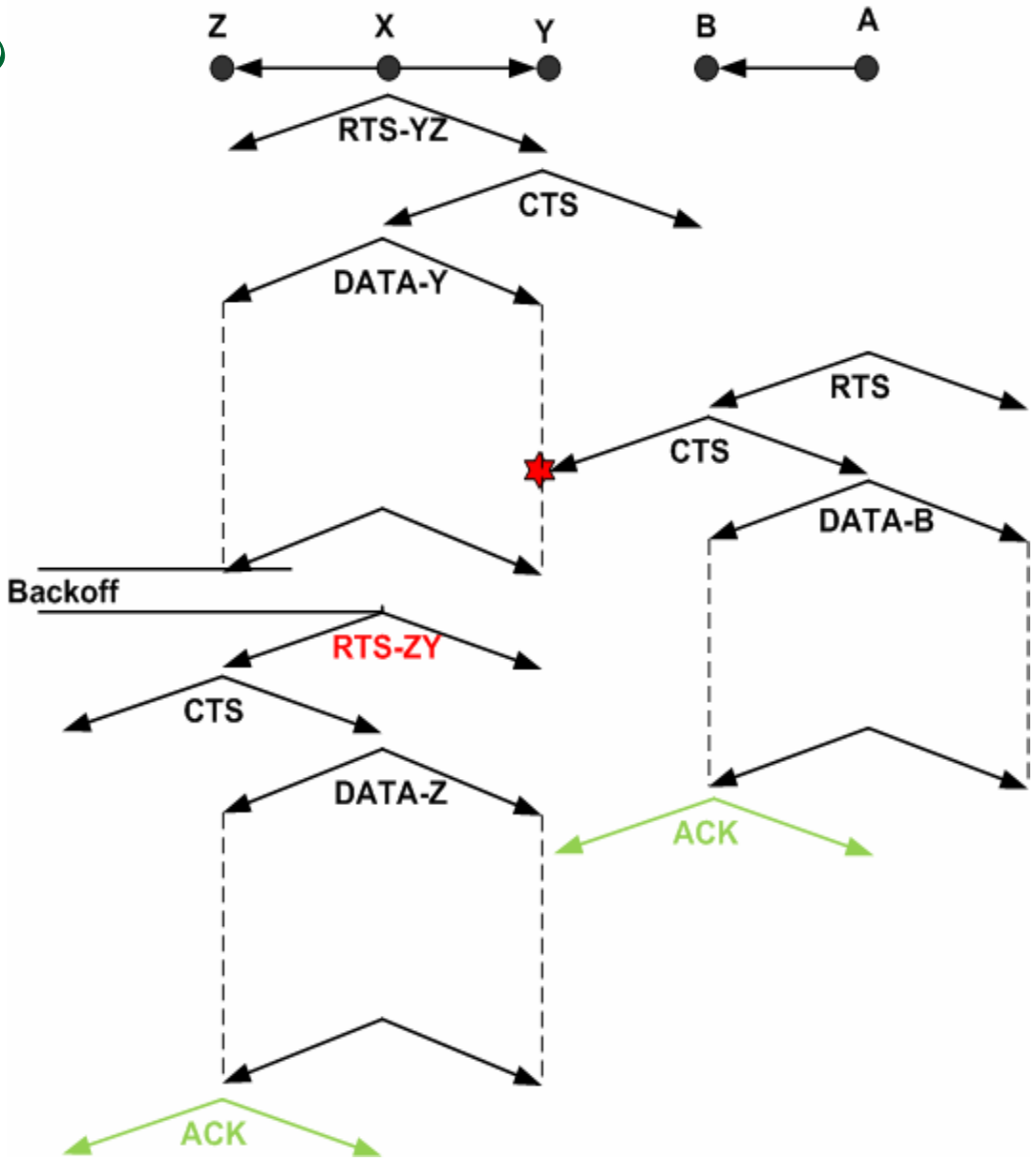
How they work?

- MRTS
  - When RTS collides with CTS or ACK

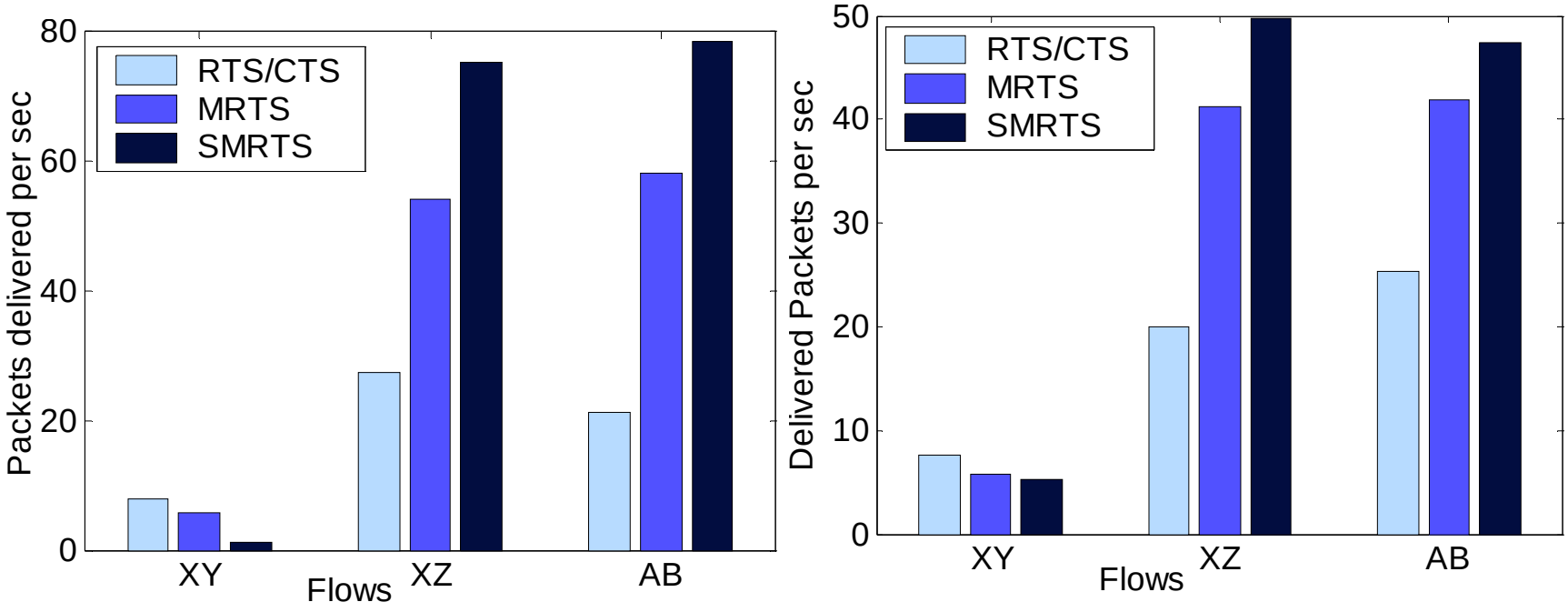


How they work?

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



Performance



Saturated

Unsaturated

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