Wireless LAN Simulation
- IEEE 802.11 MAC Protocol

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Outline

• Project Description

• IEEE 802.11 MAC Protocol

• Simulation

• Performance Analysis
Project Goals

• MATLAB simulation
  - DCF (Distributed Coordination Function)
  - No Propagation Delay

• Performance Analysis
  - Number of Nodes
  - Range
  - Packet Size
  - RTS/CTS
DCF

- DCF
  - CSMA/CA is a DCF

- Salient features
  - Medium sharing through CSMA/CA
  - Allows one STA to use the medium
  - Random Back off interval before retransmission
  - Refinement – RTS/CTS packets
IEEE 802.11 MAC Protocol

- Also known as CSMA/CA
- 802.11 CSMA (no collision detection)

**Sender**
- If the channel is idle for DIFS seconds
  - Transmit DATA packet
- If the channel is busy
  - Backoff

**Receiver**
- If DATA packet received
  - Return ACK after SIFS seconds
IEEE 802.11 MAC Protocol

CSMA/CA (Collision Avoidance) - RTS/CTS Implementation

- Sender transmits an RTS packet
- Receiver responds with a CTS packet
- Purpose of CTS packet
  - Reserves channel for sender
  - Notify other stations

Goal – Avoid “Hidden Node” collisions
MATLAB Simulation

• Old Simulation
  - Implemented CSMA (No RTS/CTS)

• New Simulation
  - Includes RTS/CTS exchange
  - Simulates CSMA/CA
Analysis

Performance Analysis

- Successful Transmissions (CSMA/CA)
- Collisions (CSMA/CA)
- Successful Transmissions (CSMA)
- Collisions (CSMA)

Average number of packets (3 trials) vs. Number of Nodes

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Simulation of a Wireless LAN
Strengths/Weaknesses

- **Strengths**
  - Fairly accurate simulation of CSMA/CA
  - Fewer packet collisions and more successful transmissions evident

- **Drawbacks of our simulation**
  - Cluttered simulation window
  - Deadlocks increase with more nodes
Any Questions?