Enhanced IEEE 802.11 MAC Protocol for SDMA Uplink Transmissions

Ruizhi Liao
NeTS Research Group
Universitat Pompeu Fabra
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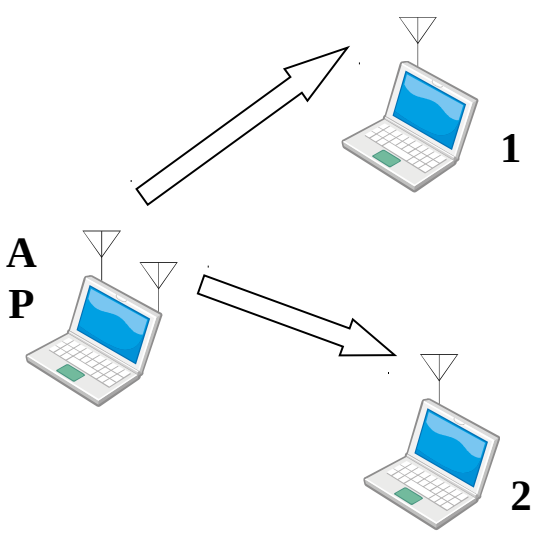
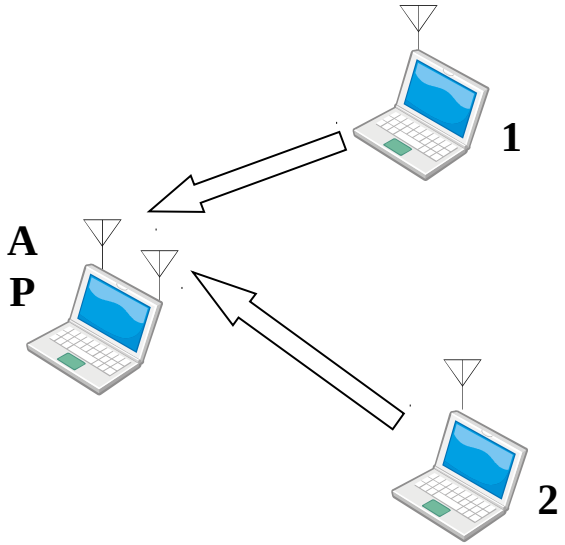
Outline

- Uplink SDMA (USDMA) multi-packet transmissions
- Enhanced USDMA MAC operations
- Scenario and parameters of the simulation
- Simulation results and observations

The Idea

SDMA multi-packet downlink & uplink transmissions





Why SDMA Uplink TX cares?

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- **SDMA-a good option to improve WLANs**

1. Increase throughput
2. Decrease delay
3. Downlink done!

- **Now**

1. P2P & Cloud services get popular
2. A faster Uplink transmission becomes an inevitable trend

- **Future**

  Ongoing IEEE amendment-802.11ac has taken that into account

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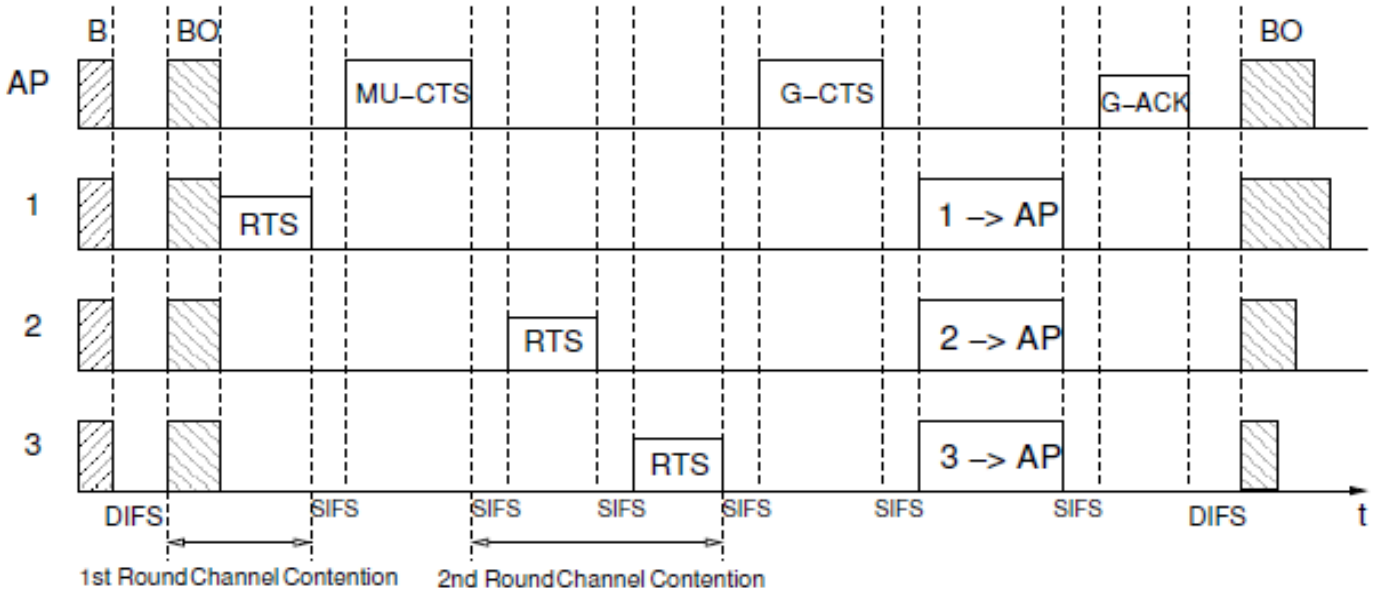
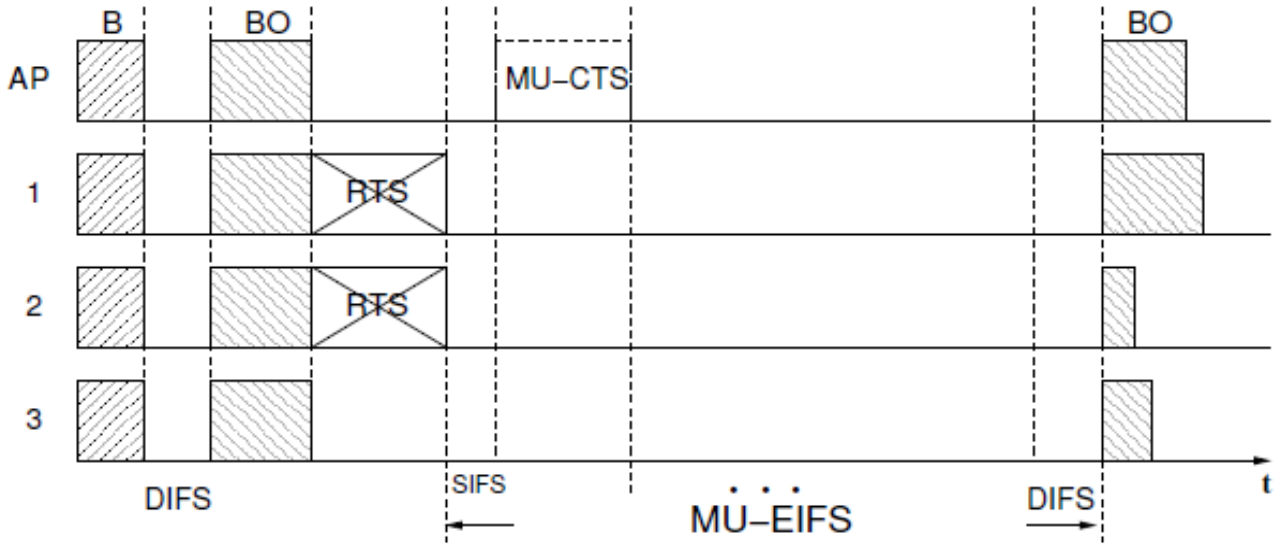
USDMA Operations

- **Successful Transmissions**



USDMA Operations

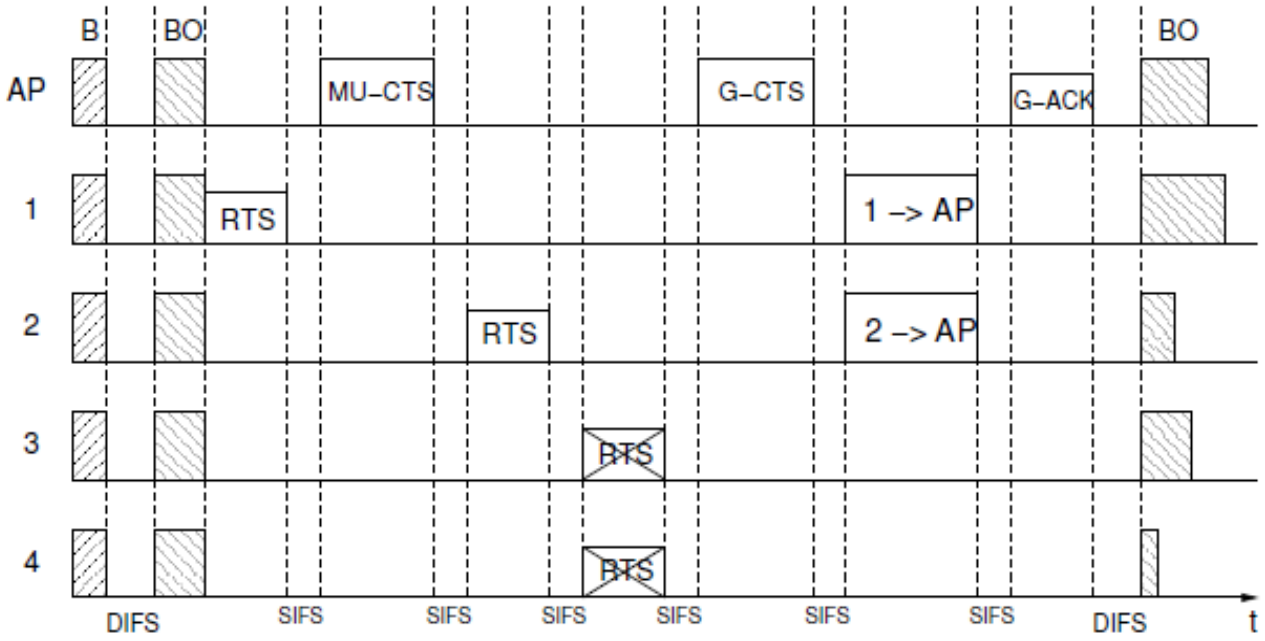
- **Collisions in the 1st Round**



MU-EIFS = *N* * (sifs + CTS) + DIFS

USDMA Operations

- **Collisions in the 2nd Round**



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The scenario

- IEEE 802.11 WLAN

1. One Access Point (AP) and *M* Mobile Nodes (MNs)
2. AP has an array of *N* antennas, while each MN is equipped with a single antenna
3. Frames that arrive to MNs follow the Poisson Process
4. DCF MAC is used with an error-free channel

Parameters

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TABLE I
SYSTEM PARAMETERS

Parameters	Values
Data Rate	54 Mbps
PHY/Basic Rate	6 Mbps
Queue Length	50 Frames
Frame Length (L)	8000 bits
PLCP Header	40 bits
Preamble Length	96 bits
MAC Header/RTS/CTS	160 bits
Slot Time (T_s)	9 μs
SIFS	16 μs
DIFS	34 μs
CWmin	32
CWmax	1024
AP Antennas (N)	1, 2, or 4

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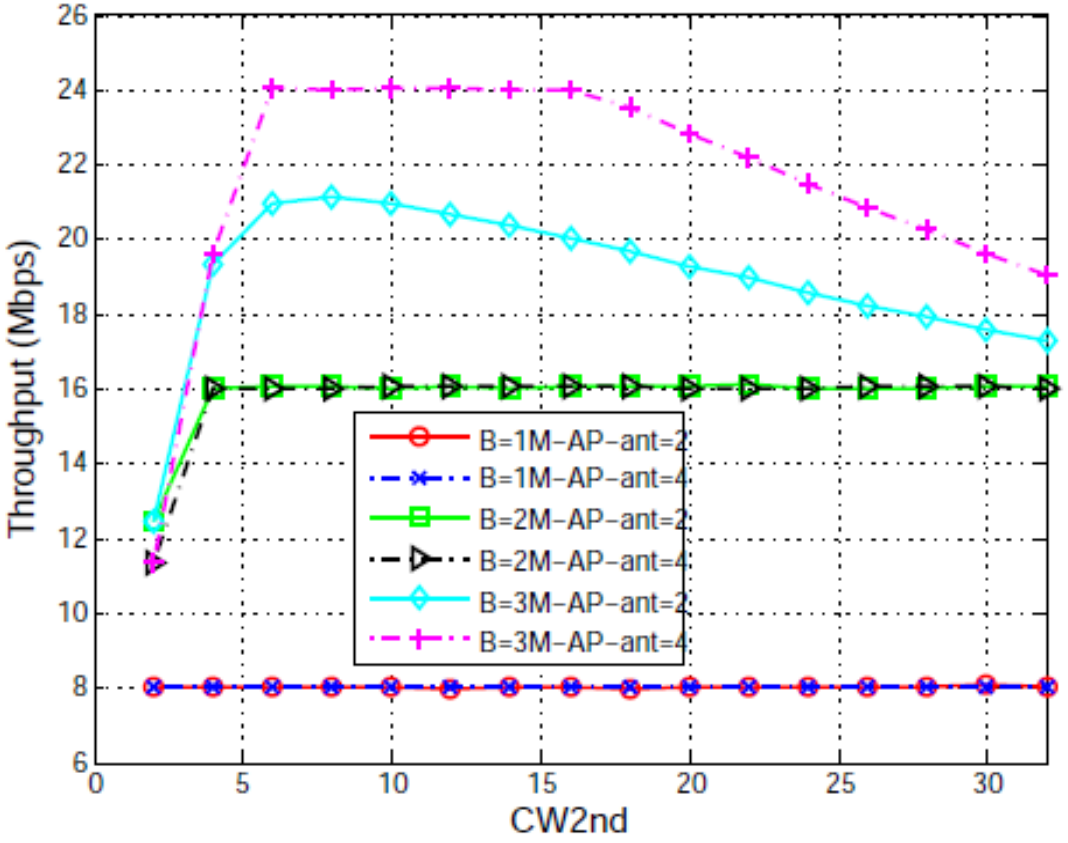
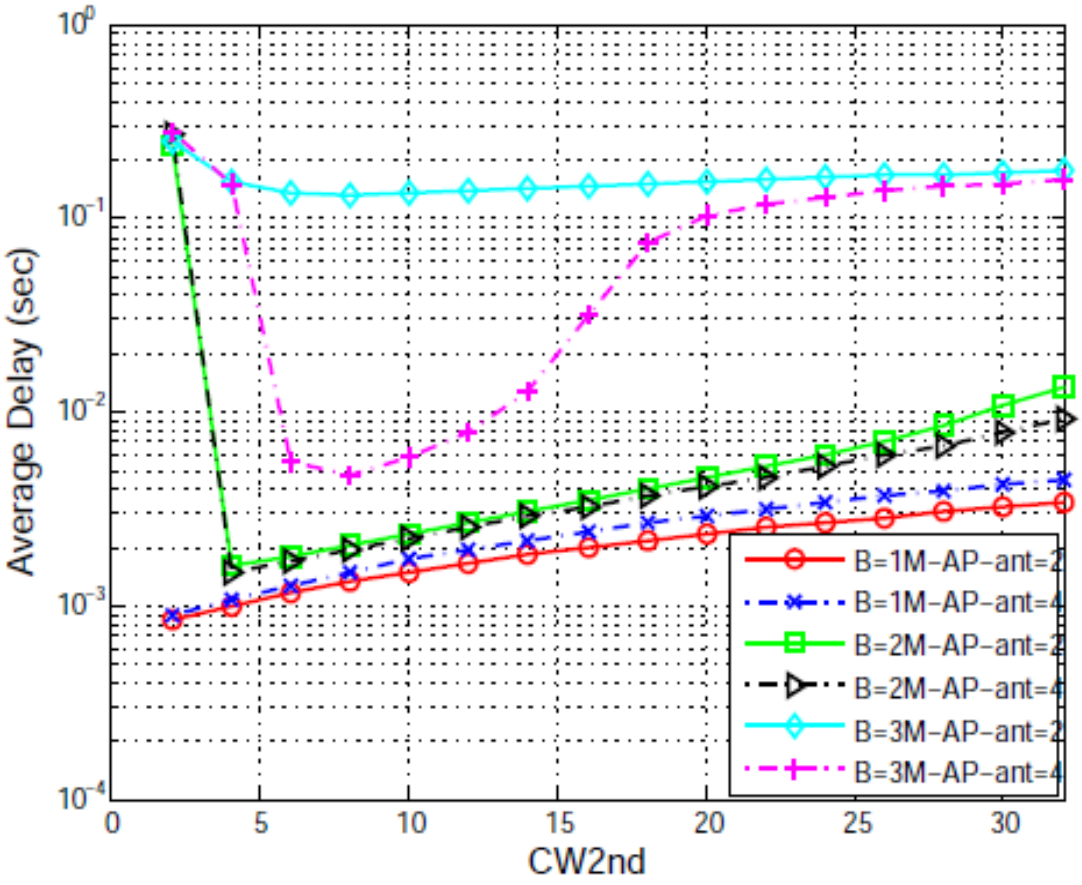
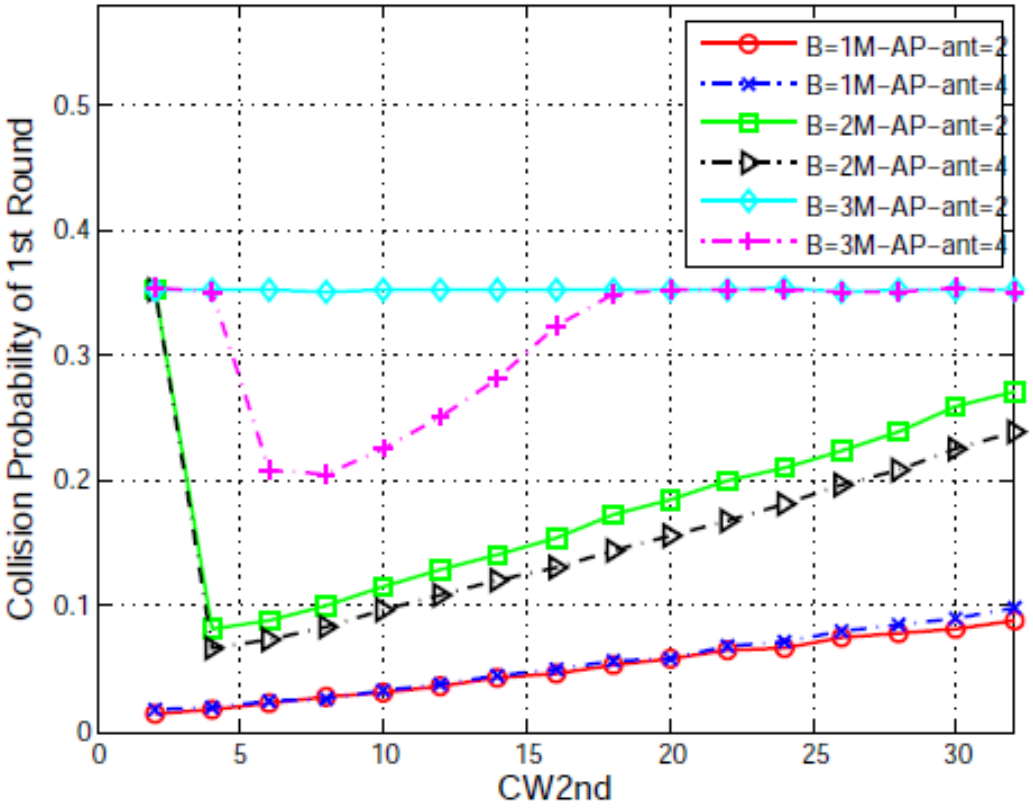
Results & observations



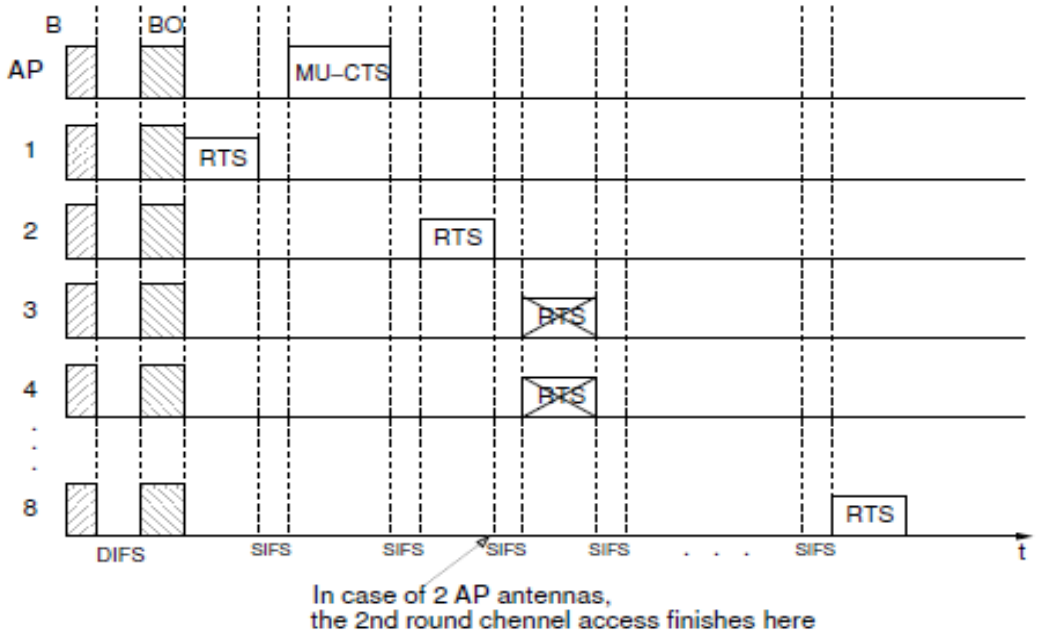
Results & observations



Results & observations



Results & observations



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Thank you!

Questions & Comments

ruizhi.liao@upf.edu

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