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## PR Mobile and Wireless Systems Problems part 8

The following problems concern about WLAN MAC protocols and some other WLAN aspects. Solutions of theoretical problems should be written in a computer presentable form (e.g. PowerPoint slides, etc.).

## 1. A comparison of WLAN MAC protocols in a simulation.

You should create a small network containing a WLAN Server and some WLAN access points and specify an application profile with some load on the network. The load should be high enough to get some collisions. Then you have to simulate the network using different MAC protocols:

- CSMA (without RTS/CTS packets)
- DCF (using RTS/CTS packets for all transmissions)
- HCF

You should simulate all MAC protocols with different load scenarios:

- low load
- medium load
- very high load (near the absolute maximum of the WLAN network)

The final result of that simulations should be a comparison of the MAC protocol in dependence of the load (e.g. some nice diagram in a powerpoint presentation measuring throughput, number of collisions, etc.), where the differences of the protocols should can be seen clearly without much explanation. Mention, what protocol works best for which network load.

Hint: You can use the 'RTS threshold' attribute of WLAN nodes.

## 2. Some modifications to the WLAN MAC implementation.

You should change several things in the wlan\_mac process model. All modifications are very small, therefore you will not have to write more than 20 lines of code for any of these modifications. The following tasks have to be done:

- (a) The backoff window size of a retransmission should be three time the window size of the last transmission.
- (b) There is one statistic measuring the amount of control traffic, including RTS, CTS, ACK etc. We want to count the number of RTS and CTS packets per second, thus you have to add two new statistics, one for RTS and one for CTS packets.

(c) Add a new data rate to the 802.11g standard (e.g. 58 Mbps). You have to add the new data rate in the list to be able to select it in the node attributes and you have to allow it to be used by the PHY layer (use the WLANC\_11g\_MANDATORY\_DRATE\_ARRAY).

**Important:** Do not overwrite the original wlan\_mac files! Instead, before changing anything, select 'save as...' from the menu and save the process model into your personal folder. Don't forget to use your own process model in your simulations...

## 3. Security aspects in WLAN.

What security mechanisms can be used in WLAN? How does they work and how secure are they? Describe especially the following mechanisms:

- Encryption mechanisms: What algorithms are used? What key lengths are used? Are they secure enough for practical applications?
- Extensible authentication protocol (EAP) in detail: How does the protocol work? What are 'eap methods' (+ examples)?
- The purpose of an AAA protocol (e.g. RADIUS, DIAMETER)