

SA: Simulating MAC Protocols

The first MAC protocol designed for wireless networks was Aloha. As opposed to prior point-to-point computer communications, *Aloha* used a shared medium for transmission. Because of its very simple mechanism, where each node just sends data with probability p , Aloha is widely studied and serves as a basis for many of the MAC protocols being deployed nowadays in wired and wireless networks, such as Ethernet and IEEE 802.11. Keeping the random access spirit of Aloha, a variety of MAC layer protocols have been proposed for wireless ad-hoc networks. Many of these protocols use some variation of CSMA (Carrier Sense Multiple Access), which improves the utilization of the channel by allowing nodes to first “listen” to the medium and then decide whether to transmit or not. The main challenge of all these protocols is to deal with the *hidden terminal* problem, which makes it tricky to take preventive measures against collisions, since two sending nodes may not be within mutual reach of each other and therefore not be able to sense that the other is transmitting to the same receiver, for example.

In this thesis you will compare, through simulations, the performances of two or more MAC protocols for wireless ad-hoc networks in the SINR (Signal-to-Interference-plus-Noise-Ratio) model. In the SINR model, the energy of a signal fades with the distance to the power of the path-loss exponent α . If the signal strength received by a device divided by the interfering strength of competitor transmitters is above some threshold β , the receiver can decode the message, otherwise it cannot.

Your first task will be to find (or implement) a simulator that captures the notions of signal propagation, interference and collisions in the SINR model. Furthermore, you will have to generate different network scenarios, tuning parameters such as transmission power level, path-loss exponent, network connectivity, density, and other factors that influence the topology of the network. Afterwards, you will have to simulate the behavior of two or more MAC protocols and find out what are their strengths and weaknesses. The main part of the thesis will be to build interesting network topologies that represent the best and the worst-case behavior of each protocol.

Interested? Please contact us for further details!

Kind of work: Mostly practical

Contact:

1. Olga Goussevskaia: golga@tik.ee.ethz.ch, ETZ G61.4, phone 044 632 70 05
2. Roger Wattenhofer: wattenhofer@tik.ee.ethz.ch, ETZ G63, phone 044 632 63 12