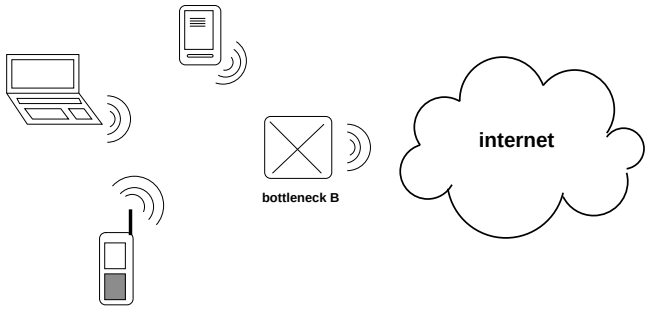
Simulation of bottlenecks in two-hop ad hoc networks

The availability of cheap yet powerful wireless access technology, most notably the IEEE 802.11 (wireless LAN), has given an impulse to the development of wireless ad hoc networks. In such a network, the stations (nodes) that are in reach of each other, facilitate connectivity by forwarding traffic, e.g., to obtain access to the fixed internet. In an 802.11 ad hoc network, the stations that are in mutual reach, and that help each other in obtaining and maintaining connectivity, are at the same time also competitors, as they all contend for the same resource, i.e., the shared ether as transmission medium. Research has shown that, effectively, the capacity of the transmission medium is equally shared between the contending stations. Although this appears to be a nice fairness property, this fairness may lead to undesirable situations in case one of the nodes happens to function as a bridge toward either another group of nodes, or to the fixed internet, because in that case a clear bottleneck situation arises.



It is interesting to analyze alternative capacity sharing strategies, that is different ways to allocate radio capacity to contending stations; as such strategies are made possible through the recent QoS-extension of the IEEE 802.11 standard. In doing so, we can study the impact of adaptive capacity sharing strategies that recognize potential bottlenecks and adapt accordingly. Recently, we presented three different strategies for dividing the available radio capacity among the competing stations and analyzed a set of performance measures on these strategies.

The goal of this assignment is to simulate the two-hop scenario and to compare the results obtained by simulation with our new analytical results. The following steps should be taken:

- literature research on mobile communications in general and on existing work on two-hop ad hoc networks in particular
- play around with the existing simulators and figure out how well this scenario can be simulated with either NS2 or OPNET
- implement a simulation model for different adaptive capacity sharing strategies
- compare simulation results with analytical results

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