Master’s Thesis

Performance analysis and simulation of a Freifunk Mesh network in Paderborn using B.A.T.M.A.N Advanced

Description:
Freifunk is a non-commercial and open initiative to support free radio networks. A Freifunk community is a local group of interested participants, developing tools for mesh networks including, among many others, an adjusted firmware for the community and OpenWrt projects and routing protocols such as OLSR and B.A.T.M.A.N. advanced. Freifunk uses mesh technology to send data to (and receive data from) any node to any other node. On an abstract level, B.A.T.M.A.N. Advanced works as follows: Each node transmits broadcast messages (called originator messages or OGMs) to inform neighbor nodes about their existence. These neighbors are re-broadcasting the OGMs according to specific rules to inform their neighbors about the existence of the original initiator of this message (and so on). To ensure roaming functionality, an OGM is typically resent every 5 seconds. The network of Freifunk Paderborn consists of 530 nodes, so there is a huge communication overhead, currently estimated at up to 30 GB of data per month and node.

Tasks:
In a first step, the current network of Freifunk Paderborn, including all nodes and gateways, needs to be surveyed. The network will then be modeled in the OMNeT++ simulation tool. Next, a model of B.A.T.M.A.N. advanced will be implemented, validated, and verified using trace data from the real network. In a second step, improved routing algorithms will be designed and implemented and their performance compared with the current state of the art. A critical evaluation will identify the various benefits and trade-offs of proposed alternatives.

Keywords:
Wireless LANs, Mesh Network, Network Simulation, Freifunk, OMNeT++

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