Thesis Statement

I propose to investigate the performance and reliability of disruption tolerant transport protocols for MANETs, with the intent to identify and recommend possible protocol enhancements for such environments.

Background

When implementing reliable transport mechanisms, two approaches are usually taken. First, we have implementations that rely on end-to-end connectivity, such as TCP. While this is a suitable approach in most cases, it tends to work poorly in dynamic environments where degradations due to temporary link disruptions are mistakenly treated as congestion.

The second approach is based on disrupt/delay tolerant networks (DTN). In this case, the network operates in a 'store-and-forward' fashion, where the data packets are passed down from one node to another and each time a node receives a packet, the node becomes responsible for delivering the packet to its destination.

Tactical MANETs (mobile ad-hoc networks) are typically characterized for being highly dynamic and volatile. Changes at the RF level (due to mobility, for instance) are eventually propagated to the routing layer, and only later will be picked up at the level of the peer-to-peer transport protocol. A purely peer-to-peer protocol will not take advantage of the valuable information available at the routing level to better adapt to changes in the network.

By allowing the network to manage the custody of the data packets, we can also take advantage of local information that is otherwise unavailable (or too expensive to obtain) to the end points of the network, such as the density of the areas of the network. In such case, for instance, traditional peer-to-peer communication cannot adapt the transmission mechanisms according to the sections of the network the packets traverse. DTNs might be better suited at dealing with this issue.

Custodial routing, however, is not of much help when the MANET is prone to the creation of disconnected segments. In such cases, critical information might end in 'custody' of a node that has no means to reach a destination node. For such cases, multipath (redundant) routing might turn useful.

The proposed project will be composed of five phases. The first phase will consist of a detailed bibliographical review of the DTN literature and its applications to tactical MANETs. During the second phase of the project we will

implement and evaluate one of the currently available DTN implementations with the purpose of establishing a baseline for our proposed enhancements. To achieve this we will rely on MANET simulations, and/or on small scale MANET emulation environments available at IHMC. In the third phase we will describe and propose improvements to the protocol. The optimization and evaluation criteria for improvements will consider metrics such as end-to-end throughput, protocol overhead, average delay and agility of reaction to changes in network topology and link characteristics. In the fourth phase we will implement the proposed improvements for later experimentation during the fifth and final phase, where we will also discuss, compare and analyze the results obtained during experimentation.