Geocasting in an Ad Hoc Network

Ad hoc networking involves computers, typically wireless mobile nodes (MNs), that cooperatively form a network without specific user administration or configuration. In other words, ad hoc networking allows an arbitrary collection of MNs to create a network on demand. There are numerous scenarios, scenarios that do not have an available network infrastructure, that would benefit from the creation of an ad hoc network: rescue/emergency operations, law enforcement activities, tactical missions, commercial projects, and educational classrooms. Consider, for example, the benefits of an ad hoc network in a rescue/emergency situation, i.e., the rapid installation of a communication infrastructure during a natural/environmental disaster (or a disaster due to terrorism) which demolished the previous communication infrastructure. Due to the number of applications desiring the formation of an ad hoc network infrastructure, development of this technology is currently a research priority at NSF.

Since wireless computing devices are becoming more portable, network-oriented, and popular, the interest in ad hoc networking is growing. This interest is observable by the recent appearance of numerous proposals for unicast routing in an ad hoc network [1, 2, 3] and by the formation of a new working group in the Internet Engineering Task Force (IETF) (http://www.ietf.org/html.charters/manet-charter.html). In addition, there has been recent interest in the development of multicast protocols for MNs in an ad hoc network, some of which are tree-based schemes [4, 5, 6, 7]. The work in this proposal concerns a variation on multicasting, i.e., the development of geocasting protocols for MNs in an ad hoc network.

The goal of a geocasting protocol is to deliver a message to a set of nodes within a specified geographical area, i.e., the geocast region. Recent past work in geocasting has considered how to integrate geographic coordinates into our Internet Protocol, i.e., our static network [8]. In an ad hoc environment, i.e., a mobile network, geocasting is also desired; for example, consider the benefits of delivering a message that states "immediate help needed at 950 Illinois Street" to all rescue personnel in the 900 block of Illinois Street. Unlike our static network, membership in a geocast region in an ad hoc network changes whenever an MN moves in/out of the geocast region. Thus, new protocols for geocasting in an ad hoc network are needed.

In [10], the authors extend their location-aided routing technique [9] for an ad hoc network to offer geocasting communication via a variation of their forwarding zone (i.e., selective flooding). Many existing multicast techniques, however, use a tree-based approach, thus avoiding the overhead of flooding. In this project, we will adapt a tree-based approach for multicasting in an ad hoc network, such that all MNs in the geocast region will from a geocast group in the tree. Since the MNs in the geocast group will be in physical proximity of each other, we will exploit this proximity to improve the performance of a tree-based multicast algorithm. In summary, this project will adapt a tree-based

multicast algorithm for an ad hoc network to offer geocasting communication. The performance of the algorithm will be evaluated via simulation and, if time permits, the performance will be compared to the performance of flooding-based approaches.

References

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