Cellular-aided Mobile Ad Hoc Networks (CAMA)

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Project Summary

Integrating ad hoc and cellular networks can enhance wireless communication and support for services. Mobile ad hoc networks have limited wireless bandwidth, low throughput, large delays, and poor authentication and security.

This research proposes a cellular-aided mobile ad hoc network (CAMA) architecture. A mobile ad hoc agent (a CAMA agent) in the cellular network manages the control signaling for the ad hoc network, and the data traffic is via the ad hoc network. Mobile ad hoc users exchange routing and security information with the agent through cellular radio channels.

We plan to investigate the CAMA architecture and its implications, such as, how to overcome the shortcomings of the pure ad hoc networks. Research includes identifying strategies for routing with global positioning knowledge, security, and radio resource allocation for data transmission. Research problems in moving from an integrated networks with a "flat" ad hoc network component to integrated networks with a "hierarchical" ad hoc network component are included.

The basic idea of building cellular-assisted ad hoc networks to improve upon pure ad hoc networks, uses "out-of-band signaling" for an ad hoc network to increase the quality of network control and management. It utilizes global information related to an ad hoc network, and incorporates anti-jamming solutions based on filter design with smart antenna technology.

Intellectual Merit The proposed research is expected to contribute to the areas of mobile wireless networks, communications theory, and signal processing by providing insights into both theoretical and practical aspects of integrating ad hoc and cellular networks. We will develop a new architecture, with its associated schemes, protocols, and algorithms. The proposed architecture has a significant potential for extending the applicability of ad hoc networks. It can provide a complimentary service for cellular networks by providing high-speed and low-cost mobile wireless data services.

Impacts of Interdisciplinary Collaboration Entities from schools of science, engineering, education, and technology in Purdue University will work jointly with Motorola, Inc. Research conducted by different schools will contribute to protocol and architecture design, filter design and applicaiton of smart antenna, and generating new business models. Research results in each of schools will both depend on and guide the research in other schools. The prototype can be used as on-campus mobile distance education system. Research results from university will impact Motorola's strategies in product development and marketing evaluation. The research requirements from Motorola for commercial application will guide the research in university.