

CarNet: A Scalable Wireless Network Infrastructure

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Project Overview

Smart devices will require self-configuring wireless data networks that support mobility. Current network technologies are awkward for smart devices: for example, the Internet does not support mobility, the cellular telephone network requires expensive pre-deployed infrastructure, and existing "ad-hoc" networking proposals do not scale well. The CarNet project will design and build a network system that avoids these limitations by use of geographic reasoning.

The scope of the CarNet project includes:

- Geographic multi-hop forwarding for scalable routing;
- Scalable distributed location servers, to support mobile hosts and services;
- Location-aware and peer-to-peer applications that take good advantage of Grid's geographic orientation;
- Support for anonymous use, so that location tracking does not compromise users' privacy
- Integration of the routing system with radio power and spectrum control, to support widely varying node densities; and
- Traffic control to spread load over the many independent paths likely to be available in an ad-hoc network.

Progress Through December 2000

In the first six months of the project we accomplished the following goals:

- Finished the design, simulation, and analysis of the Grid distributed location service (GLS);
- Presented a paper about GLS at the MOBICOM 2000 conference;

- Implemented a basic multi-hop forwarding system for Linux using the Click modular router toolkit, and deployed the implementation on a small test network of 16 nodes;
- Designed a technique that minimizes the power consumption due to network activity, by allowing most nodes to leave their radios completely turned off most of the time, but still maintaining network connectivity by ensuring that enough nodes are powered on at all times.
- Designed techniques for using geographic forwarding even in cases in which many nodes do not know their positions;
- Investigated the theoretical capacity likely to be available in the kind of networks we are building, as a function of traffic and mobility patterns.

Research Plan for the Next Six Months

Our main task for the coming months will be to continue deploying a test network. We hope to have a network of many dozens of nodes in production use. Most of the nodes will be Compaq iPaq hand-held PDAs running Linux. We hope to port enough useful software, such as a Web browser, group calendar, mapping software, that people in our lab will find them useful and use them a lot. This use will allow us to accumulate measurements of typical usage patterns, particularly motion and communication patterns. The measurements will in turn help us design and predict the behavior of future networks.