

WIND: Wireless Networks of Devices 9807-04

Proposal for 1999-2000 Funding

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Project Overview

The goal of the WIND project at MIT is to design and implement self-organizing networks with a high degree of decentralization, robustness and distributedness in their operation. The WIND protocols and middleware provide built-in support for user and device mobility, resource discovery, service location, and group communication in a decentralized manner. Our main innovation is the use of an intentional naming architecture where applications describe what they are looking for (i.e., their intent), not where to find it (unlike how most network naming schemes work today). In this architecture, name resolvers can also route messages to the eventual destinations. Thus, WIND is built around the premise that a flexible naming architecture and the integration of naming and routing is a key enabler of large-scale self-organizing networked systems.

Plan for 1999-2000

The following is our research plan for the July 1999 - June 2000 period.

1. Query expressions in name resolution: At this point, WIND's intentional naming only uses exact matches of attributes to values. While very useful, there are numerous applications (e.g., finding the nearest least loaded printer) that require a richer set of operators. We plan to provide this functionality in the resolution system. Planned completion date: End of 1999.
2. Handheld location-based computing: We are currently porting (and in the process modifying) WIND's protocols to handheld environments like the Palm from 3Com. Part of this research includes the design and implementation of a simple, lightweight applet scripting language to automatically download arbitrary device user interfaces to the Palm based on the characteristics of the devices the user desires to control. At this point, we are using an Infrared link for this, but are considering the use of an RF modem over the Palm's serial port for wider-area access. Planned completion date: INS on handhelds (December 1999), Lightweight applets (December 1999), June 2000 (overall) [first prototype version]

3. Scalable wide-area architecture: Thus far, WIND's protocols have been designed for and deployed on relatively small scale networks, and have not been experimented with in the wide-area. There are a number of challenges to be overcome to make our system scale to large numbers of entities (we would like to scale to several million devices and services) over the entire world. We are embarking on an ambitious wide-area architecture for this. While a complete implementation and demonstration will take longer than one year to achieve, we intend to demonstrate the ability to access and control a number of services in remote domains by June 2000. We expect to continue researching this aspect of the system beyond that time frame as well. Planned completion date: Beyond June 2000

4. Service location protocols in WIND: A key middleware component for location-based computing is scalable service location and resource discovery. Intentional naming provides a natural framework for services to express their capabilities and for client applications to use them. We intend to provide this functionality and compare its performance and robustness to other service location proposals. Planned completion date: June 2000 (More experiments beyond June 2000).

5. Applications: Continuing on the early applications we demonstrated in April 1999, we intend to add more applications (and solidify existing ones) over the next many months. Example applications include:

- (i) Controlling a network of mobile cameras.
- (ii) Location-based services and map dissemination to mobile users.
- (iii) Self-organizing communities of devices and users.
- (iv) Service location applications (e.g., device control of printers, televisions, music systems, etc. using handheld Palm devices). Planned completion date: Beyond June 2000.