

# E90 Topic Selection Memo: Implementation of the Shuttle Tracker

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## 1 The Shuttle Tracker System

Swarthmore College runs two shuttle vans every evening to safely transport students to and from the off-campus dormitories. The shuttles stop at Parrish Hall, Palmer Hall, and Mary Lyon 4. It is common for the shuttles to not run exactly on schedule, and this results in students who are waiting for a shuttle to get frustrated, and often call the Public Safety department to inquire about the shuttles' current locations. Also, students do not know the exact time when shuttles will arrive.

Over the summer, with Professor Erik Cheever as my adviser, I designed and built prototype hardware for a system that would provide a method of tracking the locations of the two shuttle vans, making that information available to students who are waiting at any of the three regular stop locations, and also publishing that information to a web page. A simple, low-power RF transmitter would be installed in each of the vans that would act as a beacon, and send out a constant signal. The transmitter and antenna would be selected such that the signal would only be detectable within a range of perhaps 100 feet, and the signals produced by the transmitters in the two vans would be distinct.

Inside each of the buildings where the shuttles stop a "display device" would be installed which would contain a microcontroller, an embedded webserver, and an RF receiver to pick up the signals from the beacon transmitters in each of the vans. When one of the display devices detects that one of the vans is nearby, it would send that information to a central server over the existing campus ethernet network. The server would keep track of which building each of the vans was last seen at, and each of the display devices would regularly download this information from the server. Each display device would have an LED display showing the current time, which building each of the vans was last detected at, and at what time each of the vans was last detected. This would provide, for each van, the information of either what building it is sitting outside of, or what building it last left and at what time.

## 2 Steps to Implementation

I propose making the final construction and actual implementation of this system the focus of my senior design project, with Professor Cheever continuing to advise me. This will consist of:

- Writing and debugging software for the receiver/display clients and server
- Thoroughly testing prototype transmitter and receiver/display and constructing final transmitters and receivers/displays
- Setting up the system in a preliminary, temporary configuration and obtaining feedback from users (students, shuttle drivers and public safety officers)
- Planning and arranging for the final implementation of the system, which may include:
  - Obtaining support of all relevant persons and departments (including Public Safety, Facilities, and Information Technology Services)
  - Mounting transmitters in the shuttle vans
  - Installing display devices in the buildings where the shuttle stops, which may include having new ethernet jacks installed
  - Identifying a computer suitable for running the server software
  - Explaining the system to the community
- Writing documentation that will allow others (future engineering students, Facilities, Information Technology Services) to maintain, repair, or reinstall the transmitters, receiver/displays, and server