BAT - Bluetooth Assisted Tour

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Outline

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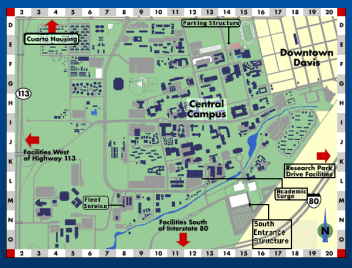
Project Goals

- Interactive campus tour guide
- No predetermined route setup
- Use Bluetooth Technology to supply user with location specific data
- Simple PDA user interface for on-demand data
- Location-aware utility

Current Tour Options

- Self-guided walking tour
- Walking tour with student
- Private tram tour

- Must follow path
- Non interactive



Motivation

PDAs are Bluetooth enabled, however they lack software to make our scheme possible. The built in Bluetooth technology does offer some connectivity options but none of which would be suitable for our project. We must integrate online resources with options provided by Windows Mobile.

Bluetooth Bytes

- Short range (10 m), low power consumption, 2.45 GHz ISM
- Voice and data transmission, approx. 1 Mbit/s gross data rate
- Two Bluetooth devices within 10m of each other can share up to 720 kbps of capacity
- Interconnecting computer and peripherals, handheld devices

Advantages of Bluetooth

- Bluetooth can support a high density of devices all within range of each other without undue contention
- Transmission efficiency degrades gracefully as device density increases
- Fast hopping and short packets minimize the impact of noise on performance
- The baseline 10 meter range limitation further extends device capacity

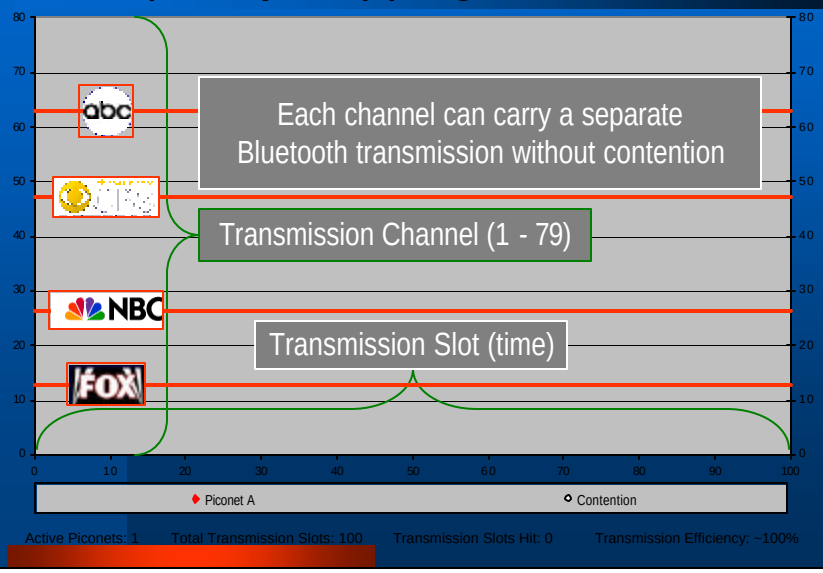
Approach

- Researched available 3rd party software
- Tested OEM Bluetooth software
- Setup piconet to transfer data
- Decipher Host from Client
- Create a user interface for client with HTML

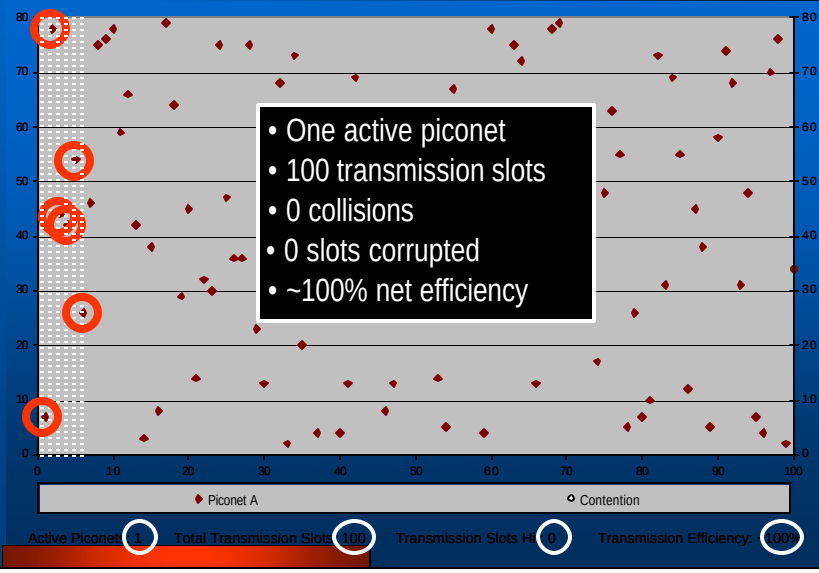
Bluetooth Transmission Protocol

- Frequency Hopping with Time Division Duplexing
  - Transmission rapidly hops among the available channels
  - Transactions are divided into dedicated time slots each for the Master and the Slave
  - Typically odd cycles for the Master and evens for the Slaves

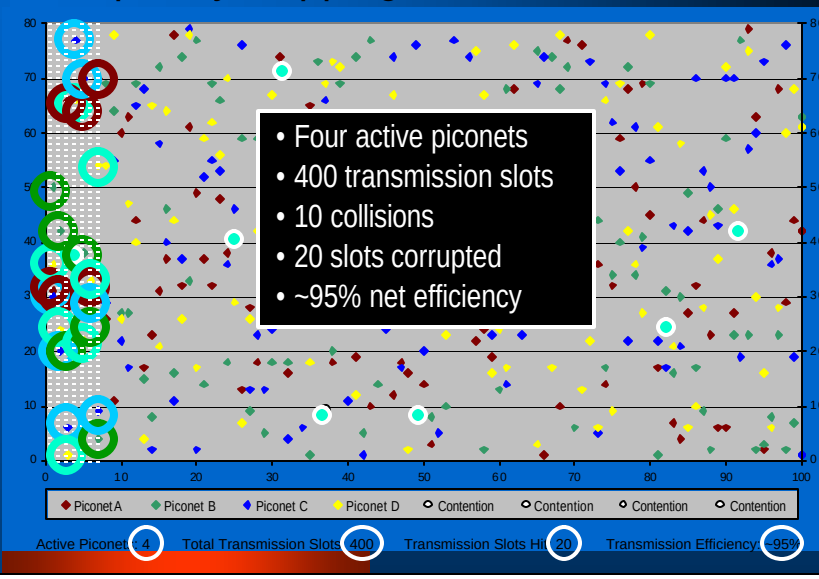
Frequency Hopping



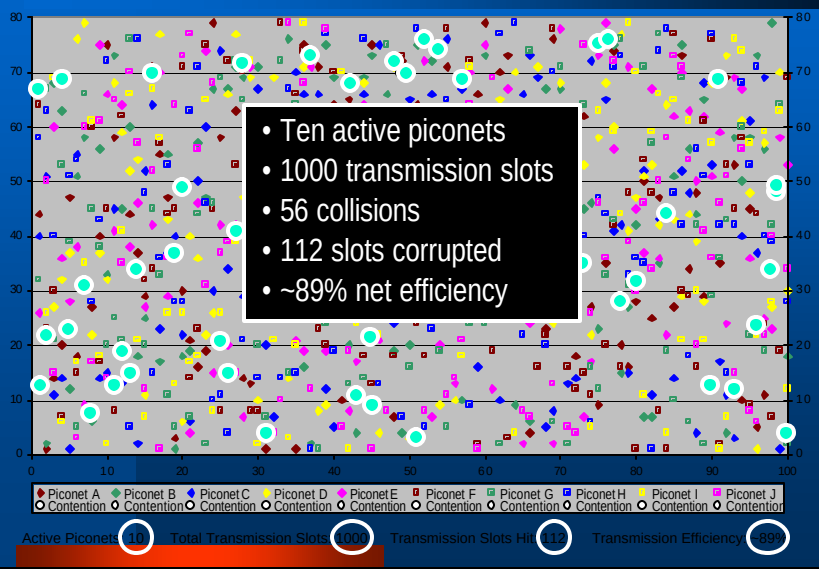
Frequency Hopping With A Single Piconet



Frequency Hopping With 4 Piconets



Frequency Hopping With 10 Piconets

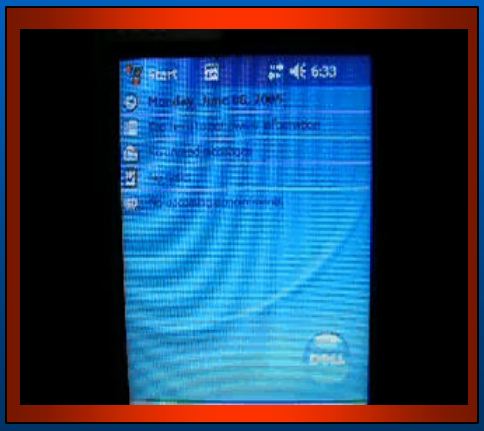


Technology

The host detects the predefined client belonging to the piconet. The client must be within at least 10m from the host to receive the data. Via Bluetooth, the data is pushed from host to client The data is viewable with a web browser. The user may refresh the browser as they see fit.

Results

- Self guided on-demand tour
- Minimal interference with other campus Bluetooth APs
- Demo



What We Learned

- Bluetooth technology vast, yet under-used
- There are currently not that many applications for Bluetooth
- Bugs occur at every point in a project, and planning for them is key

Pictures

Where We Go From Here

- Create data pages for each building/department on campus
- Create automated software to push data from host end to client end
- Research Bluetooth APs
- Optimal AP placement

Cost

- 25 PDAs @ $250 = $6,250
- 10 Bluetooth adapters @ $50 = $500
- HTML GUI development = $500
- Host software optimization = $750
- Being the only school in the nation with a BAT system = PRICELESS!

Resources

- www.bluetooth.com
- www.ece.ucdavis.edu/courses/S05/EEC173B/
- www.xilinx.com
- www.ucdavis.edu
- www.archiv.geopoint.de/premium/GIS200109014.pdf
- www.archimuse.com/mw2005/papers/colazzo/colazzo.html
- www.mjc2.com/Frameset_products_atease.htm