Wireless Network Discovery

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Introduction

- Wifi Access Points are run by private entities
  - Harder to gather collective information
- Free WiFi hotspots are everywhere, but under-utilized
  - Concentration of traffic can lead to slow connections
- Wireless AP information is of interest to researchers, organizations, and developers
  - Is wireless available? What is its behaviour?
- People everywhere have mobile phones that can scan access points
  - Exploit the mobility and presence of people

Problem Statement

- Develop a wifi monitoring system which:
  - Exploits the mobility and presence of the crowd to gather information
  - Is built on top of the Google Android OS
  - Is usable to model wifi networks and report access points with a bias factor

Related Work

- Crowdsourcing
  - Looking for incentives to motivate users
  - Tradeoff of workload balance between infrastructure and cloud

- WiFi
  - Most Access Point detection programs combine Access Points by same SSID
  - Lack of getting Time and Location information about Access Points

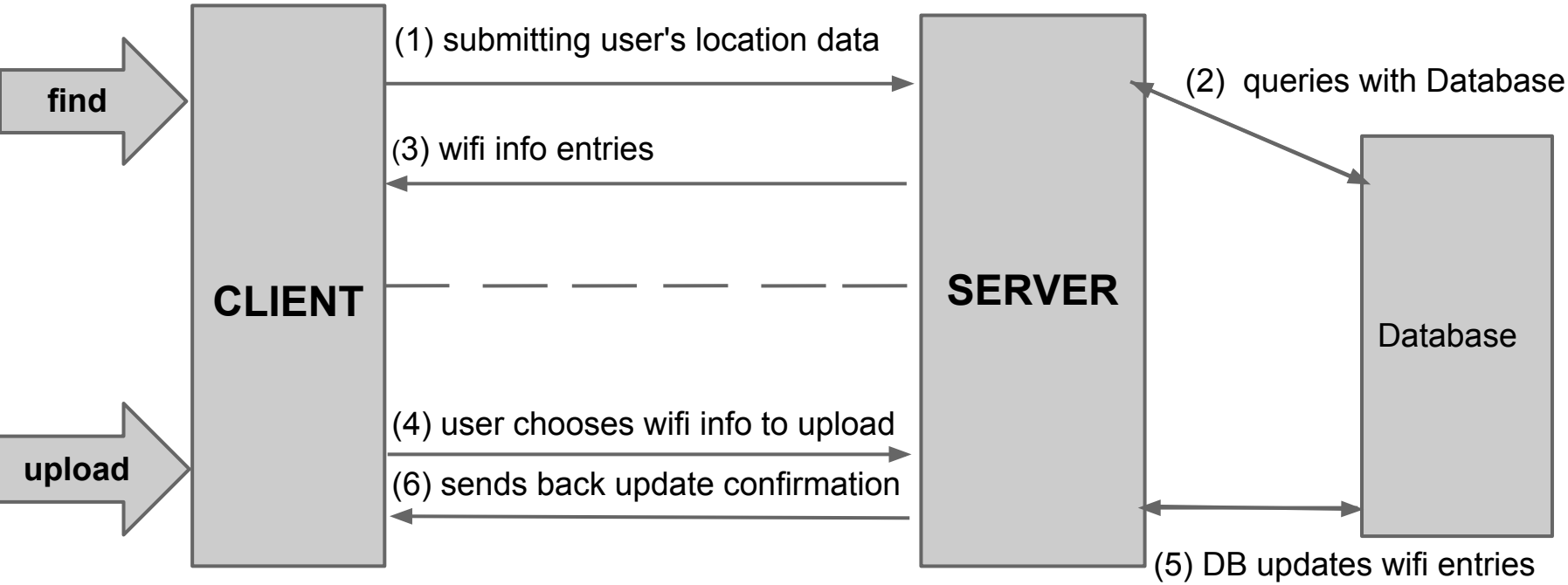
Contribution

- Collection of data in order to:
  - Provide information about free access points to consumers
  - Enable modeling of the distribution of wifi networks in both time and space
  - Build a database of information which can be utilized by research institutions or industry for use

Architecture

- The system is composed of two parts:
  - The Crowd
    - Employs the use of the mobility and near omnipresence of crowds of people
    - Responsible for gathering data and transmitting to server
    - Android mobile devices (4.0.3) with Google Maps
  - Database Server
    - Stores information gathered
    - Responsible for analyzing nearby APs and returning suitable nearby routers to users
    - Single Java server running on a PC running MySQL

System Components



Algorithms

- User motivation
  - Access to network
  - Tracking statistics per-user (fame)
  - Potential for monetary compensation if funded by an inquiring institution
- Access point return information
  - Looks at and returns wifi networks within 2km
  - Reports statistics about which spots (last recorded time and signal level)
  - Average locations to position router
  - Could be expanded to suggest based on:
    - Past congestion information
    - Time of day statistics
    - Recent information (such as # users)

Evaluation

- Find WiFi nearby
  - Locations displayed on Google Map
  - Mode:
    - Map markers at access point location
    - Include detailed information to indicate quality

- Collecting Wifi information
  - ~3-5 second typical collect WiFi information time
  - The specific types of information
    - SSID, MAC, Strength, Signal Strength, GPS location of recording

Future Work

- More advanced techniques for rating networks
  - Gathering information such as network congestion
  - Usage of more advanced algorithms to direct users
- Development of simulation / visualization tools beyond Google Maps
  - Brings forth ability to use data in research projects and to visually show wireless networks changing
- Evolution into a CrowdSourcing sensor framework
  - Framework can be adapted to gather more than just wireless network information from mobile devices
  - Use of AMT topology to motivate users

Conclusions

- Researched methods for, and designed, a Crowdsourcing application including user motivation
- Developed a working Android application
- Researched possible future paths for development of the tool
- Introduced potential uses for collected data