Trace-based Analysis of Wi-Fi Scanning Strategies

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Motivation: Automatically detecting Wi-Fi opportunities

Wi-Fi is better than cellular technologies for data transmission

1. Wi-Fi provides higher bit rate and consumes less energy per byte
2. Home and work Wi-Fi access is almost free

What is a good strategy for turning the Wi-Fi NIC on and scanning?

1. Naively scan until an access point is found
2. Scan with a fixed interval
3. Exponentially increase the interval between consecutive scans

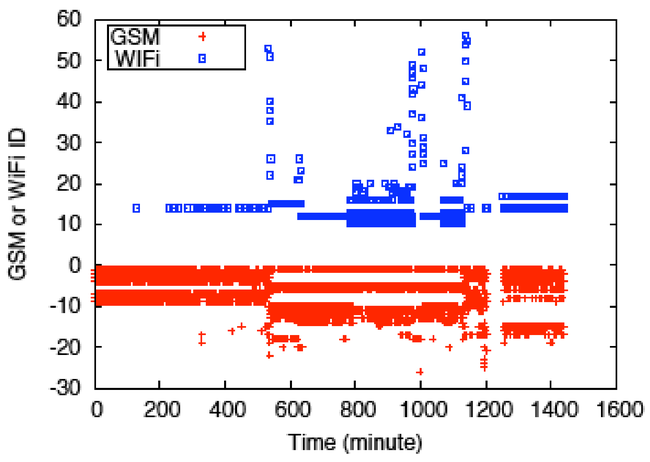
Approach: Trace-based simulation

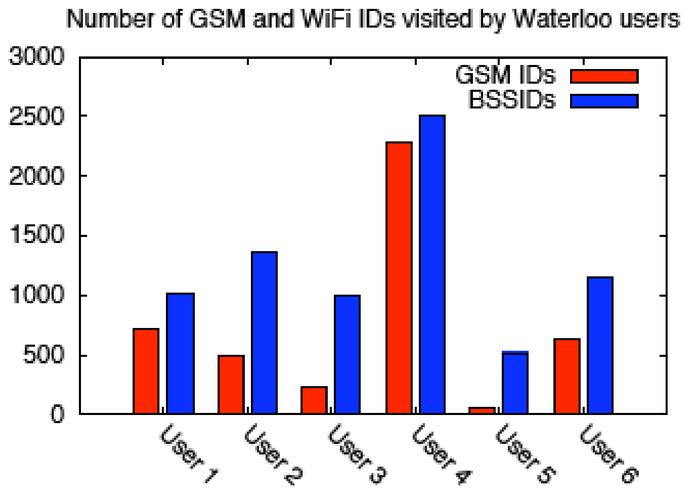
Experiment

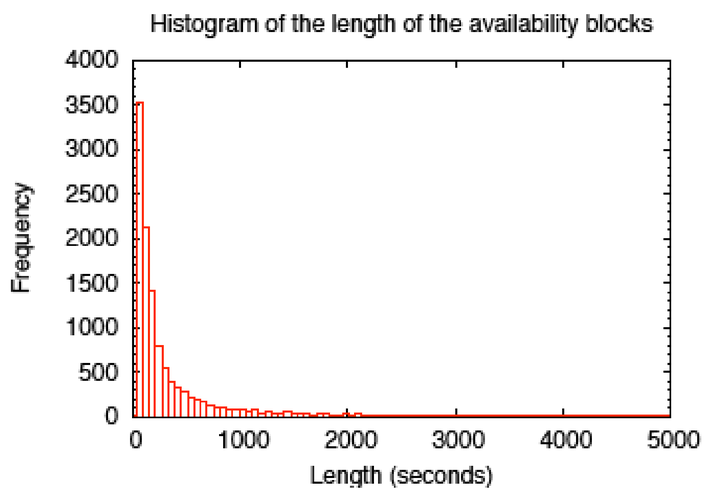
- Six iPhone users, five weeks
- Scanned Wi-Fi and GSM every minute

Performance Metrics:

- **Number of Scans:** Total number of scans throughout the day
- **Missed Opportunity:** Total connectivity opportunity missed by a strategy

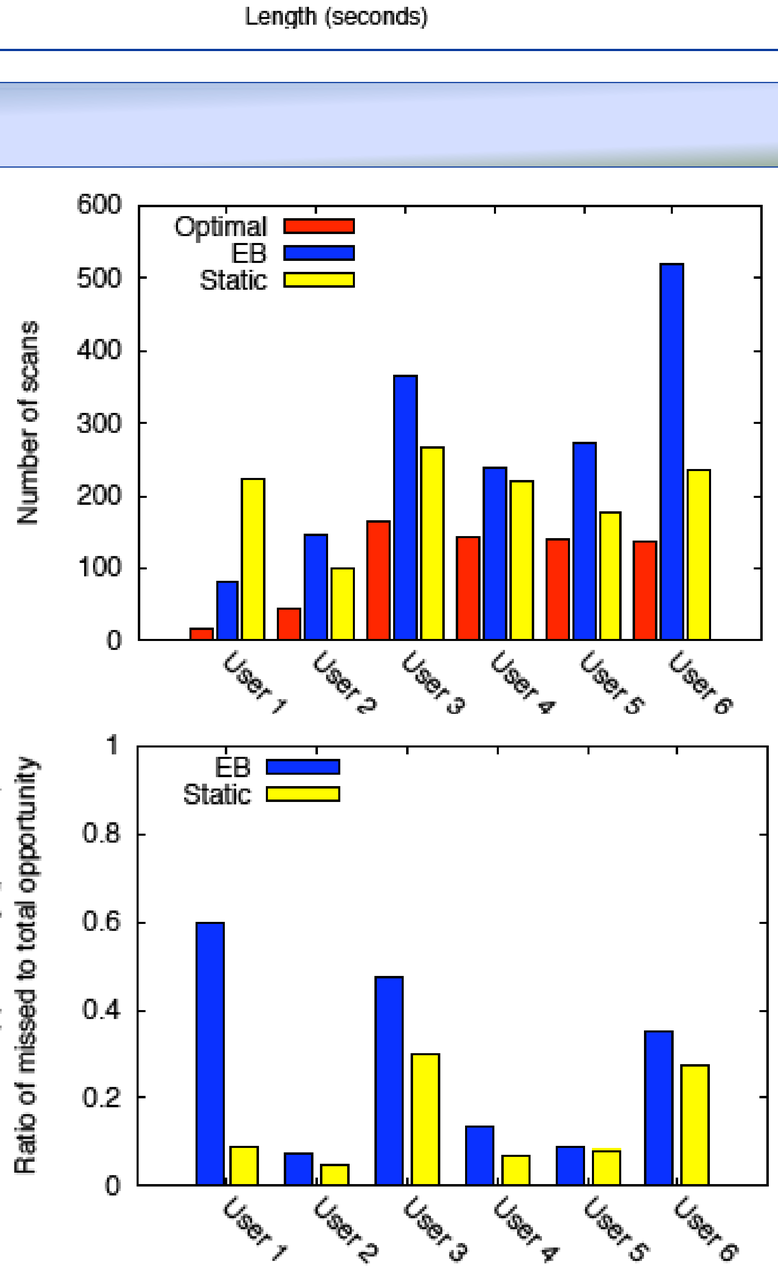


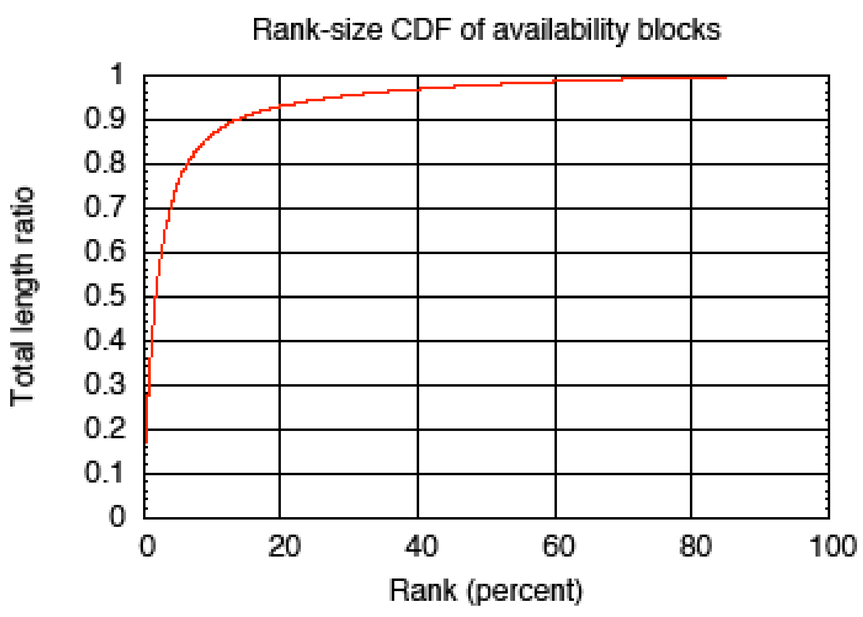


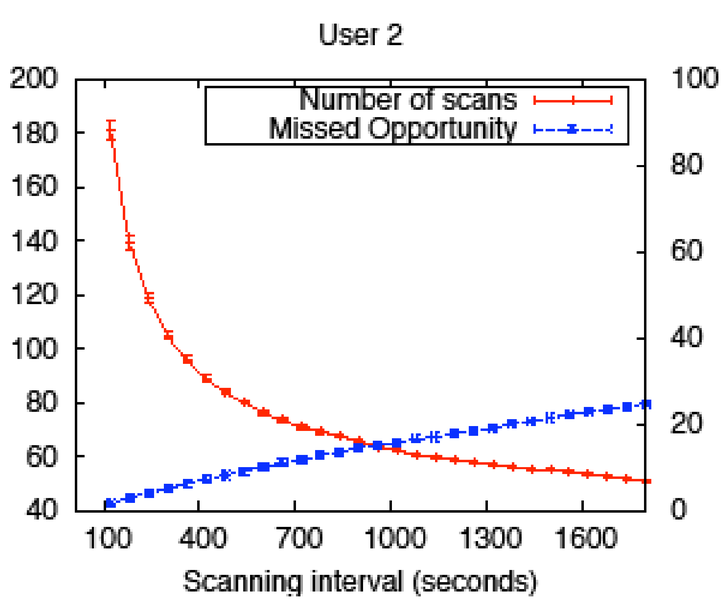


Results: Static scanning performs better

- **Exponential Back-off**
  - Ends up with very few scans and very high missed opportunity for some uses
- **Static Scanning**
  - The missed opportunity is relatively low
  - Performs fewer scans for most users
  - The missed opportunity is not highly sensitive to the scanning interval
  - The number of scans drops dramatically as the scanning interval increases



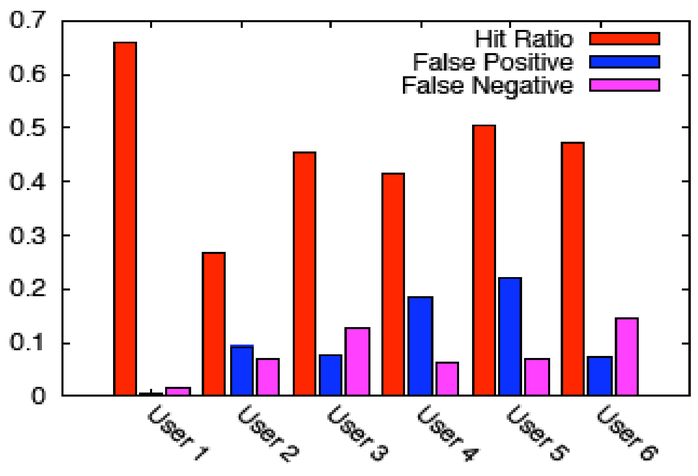




Future Work: Hints from the environment and the user

Caching scan results

Use currently visible cell IDs as index into the cache



Effect of user interactions

Initiate a scan every time the user starts interacting with the phone