

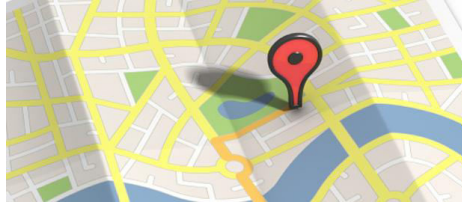
Muffle Coordinates

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Location Based Services

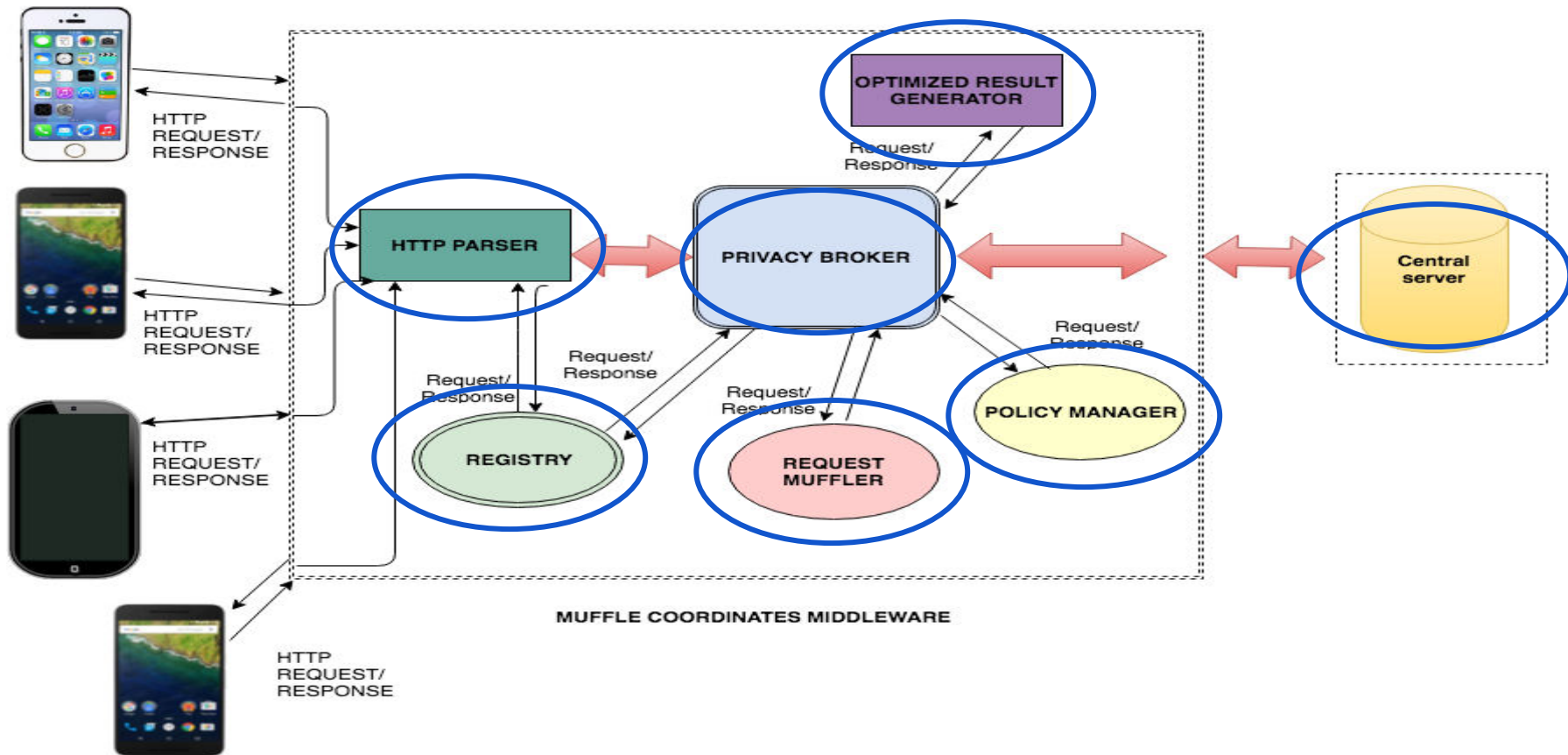


FOURSQUARE



Goal: Building a **Middleware System** which Manages the **Users Privacy** for any location based recommendation services which is **usable, efficient, secure** and **extensible**.

Managing Privacy in Location Based Services



Privacy Policies Available

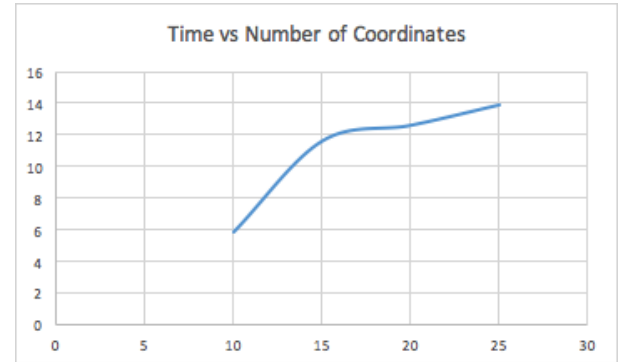
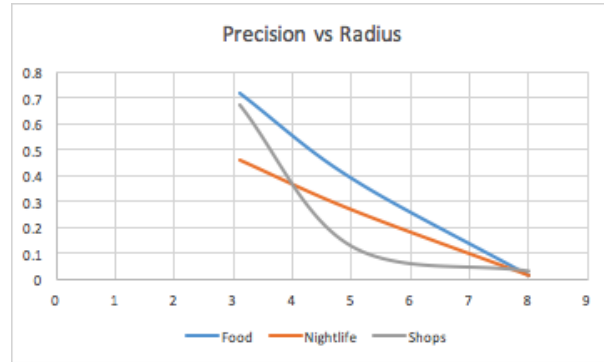
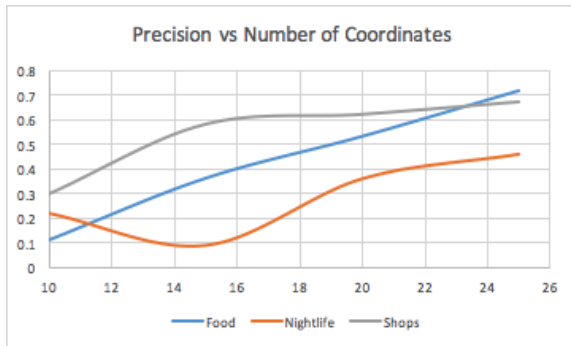
- Location Privacy

- Obfuscation Techniques
 - Random Coordinates
 - Send N random coordinates within a region of radius R.
 - Dummy Coordinates
 - Send N coordinates with the Exact coordinate and N-1 dummy coordinates
- Elimination
- Anonymization

- Identity Privacy

- K - Anonymity

Results



- We found it takes about 15 secs for a user request to complete when using 30 points. This results in a timeout.
- Precision goes down drastically as the Radius increases from 3 miles to 8 miles and improves with number of coordinates(Density) .
- Results degradation depends on the category of recommendations desired by the user (NightLife vs Food).

Conclusions

- Location Privacy can be attained in a model where only the client can be trusted with some overhead 😊
- Identity Privacy seems difficult 😞

Future Work

- Implementing a mobile proxy based system.
- Identifying approaches towards reducing the risk of identity privacy
- Finding solutions for Systems with 2-way exact location sharing (Uber, Lyft).