

Energy efficient semantic context model for managing privacy on smartphones

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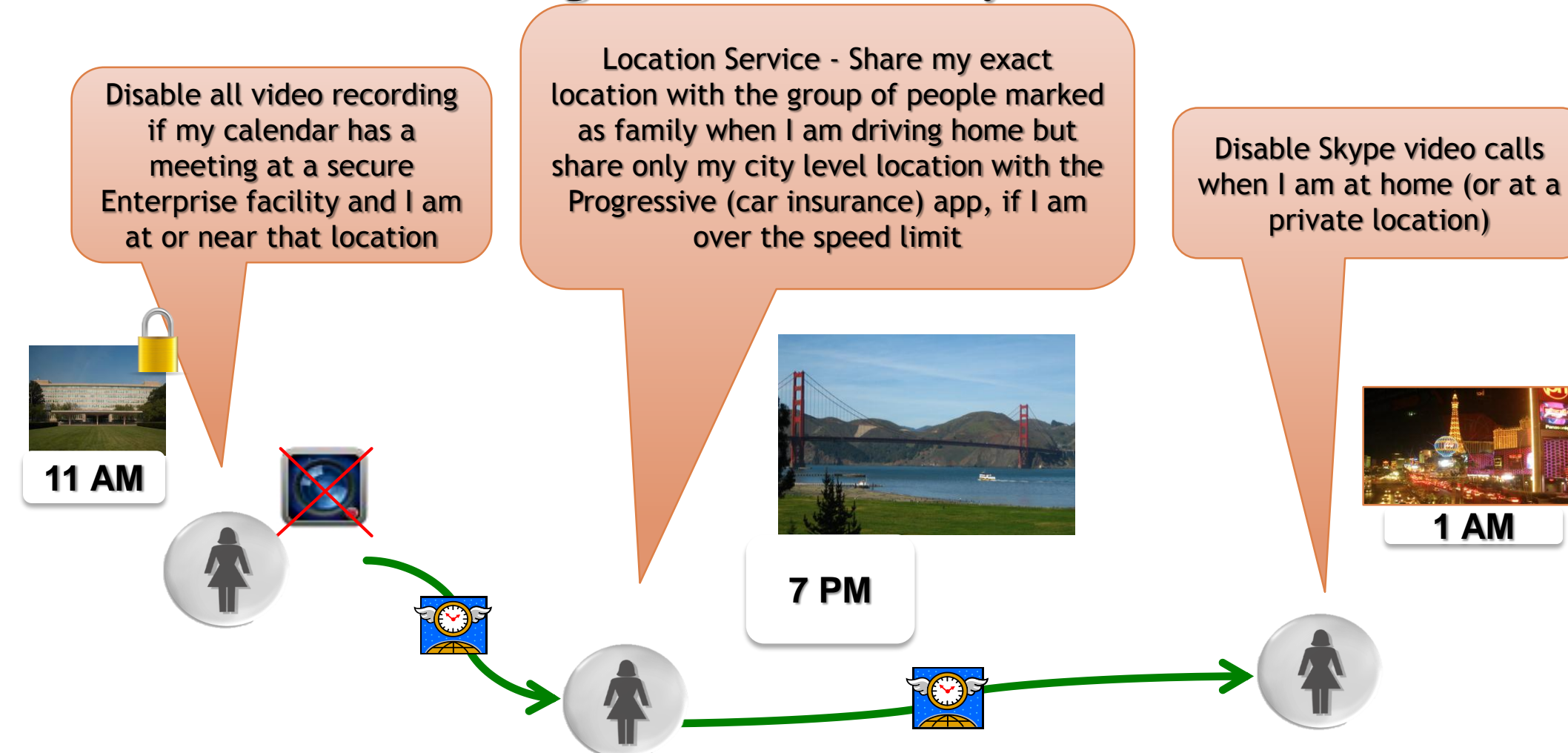
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Motivation

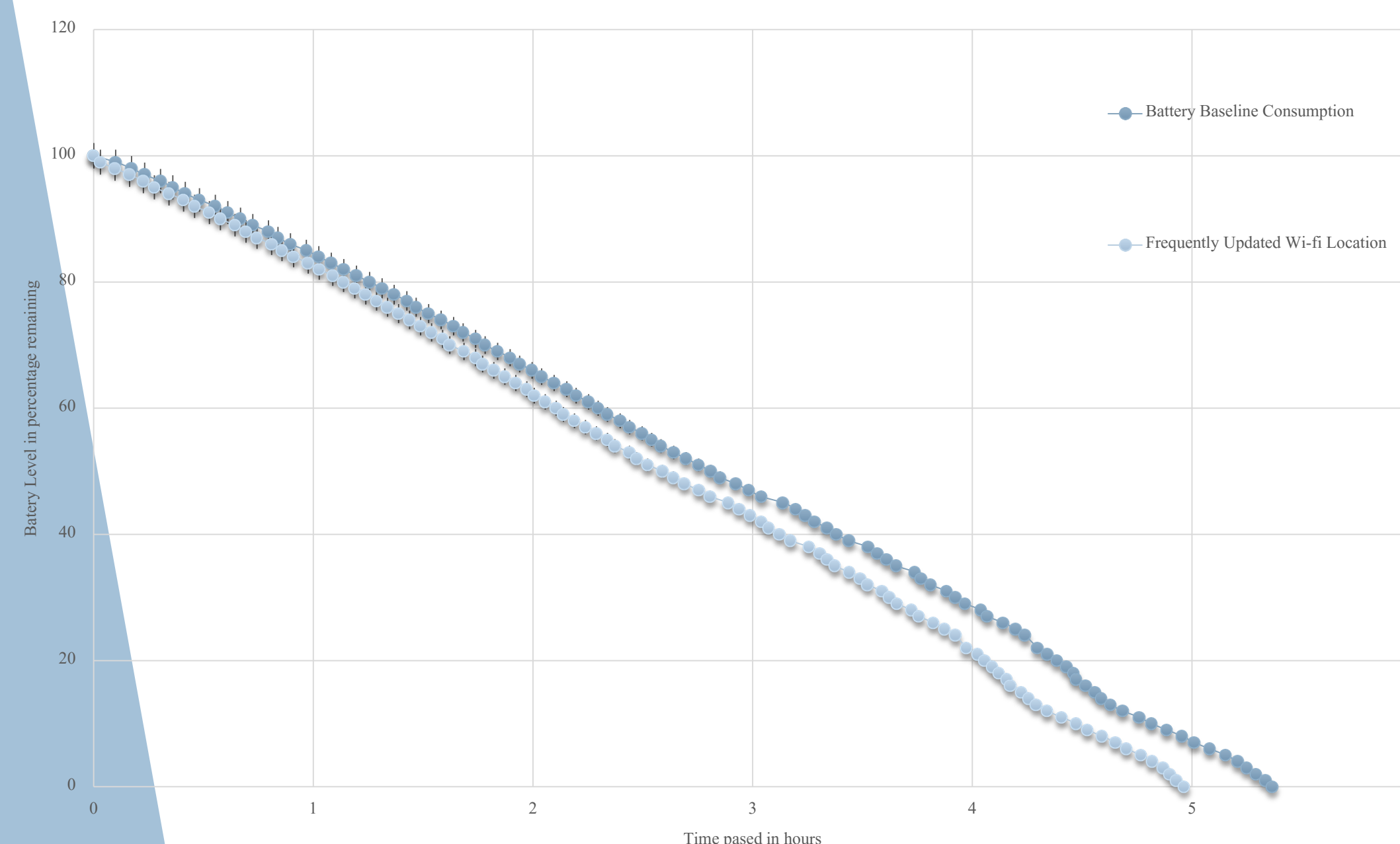
- Modern smartphones are capable of gathering massive amounts of data about a user and her context.
- User data and context leakage issues, especially true as most enterprises are going to a Bring-Your-Own-Device (BYOD) model.
- In ongoing work, we have shown application and user context-dependent information sharing policies - can control data flow among applications dynamically and at a very fine-grained level
- Gathering context and applying policies however, has a significant impact on energy consumption as system needs to keep the user's context updated at all times
- Thus, an Energy Efficient Model is needed.

A motivating scenario – A day in Alice's life

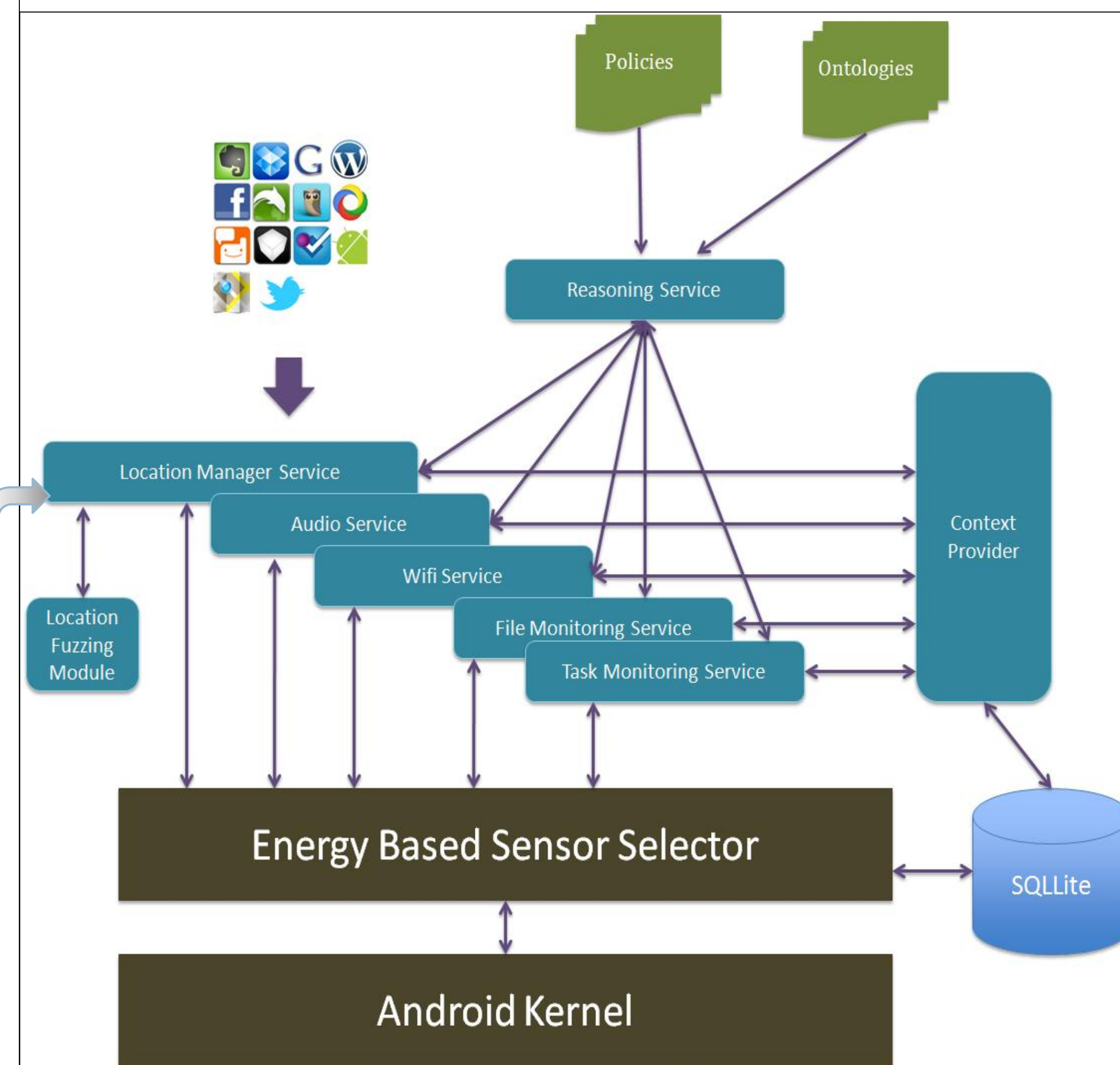


Ongoing experimental results

Battery Energy Baseline Consumption vs Frequently Updated Wi-Fi Location Trends



Proposed Architecture and Solution



Ongoing Experimental Setup

- ✓ Measure baseline energy consumption pattern (in airplane mode).
- ✓ Measure other components' energy consumption pattern.
- ✓ Collect data using an Android smartphone.
- ✓ Create model for energy consumption.
- ✓ Use Three-Fold Solution to minimize energy costs

Three-fold solution

- ✓ Switch-on only the sensors required at a particular instant of time and detect and gather sensor data for multiple simultaneous request
 - ✓ Use the sensor with the lowest energy footprint, or one that is being used already
 - ✓ Evaluate the predicates of the rules in increasing order of energy usage.
- Policy based privacy mechanism has been created in the Android framework [1, 3], implementation of energy optimization is ongoing.
 - Currently gathering data on energy usage of various sensors on Android OS for Samsung Galaxy Nexus

Conclusion

- Security mechanism developed in our recent work [1, 3, 7], extremely fine grained and suitable for smart phones
- Creates the overhead of high energy consumption
- In our on-going work we are building up into the Android framework an energy efficient security mechanism
- Energy trade-offs are being measured using Android apps.
- Energy Baseline vs High Wi-Fi usage graph for trade-off measurement can be seen on the right.

Future Work

- Experimentally evaluate the proposed, energy efficient mechanism.
- Standardize results across devices with different hardware configurations.
- Identify the features that impact battery consumption.
- Use Machine Learning techniques to learn the battery consumption pattern on any device on the go.

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