Opportunistic Localization, Discovery & Computation in the Swarm

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http://terraswarm.org/

Data Stores

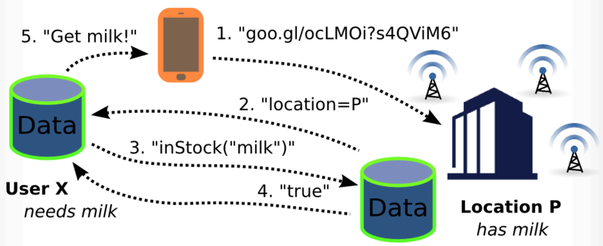
Users & Providers each have their own...

- Addressable, logical end-point
- Host for Swarmlets, that:
  - Process queries
  - Store and disseminate data
- Stable proxy for mobile devices
- Registry of trusted parties
- Universal sharing mechanism
  - Data not kept in "silos"

Swarmlets

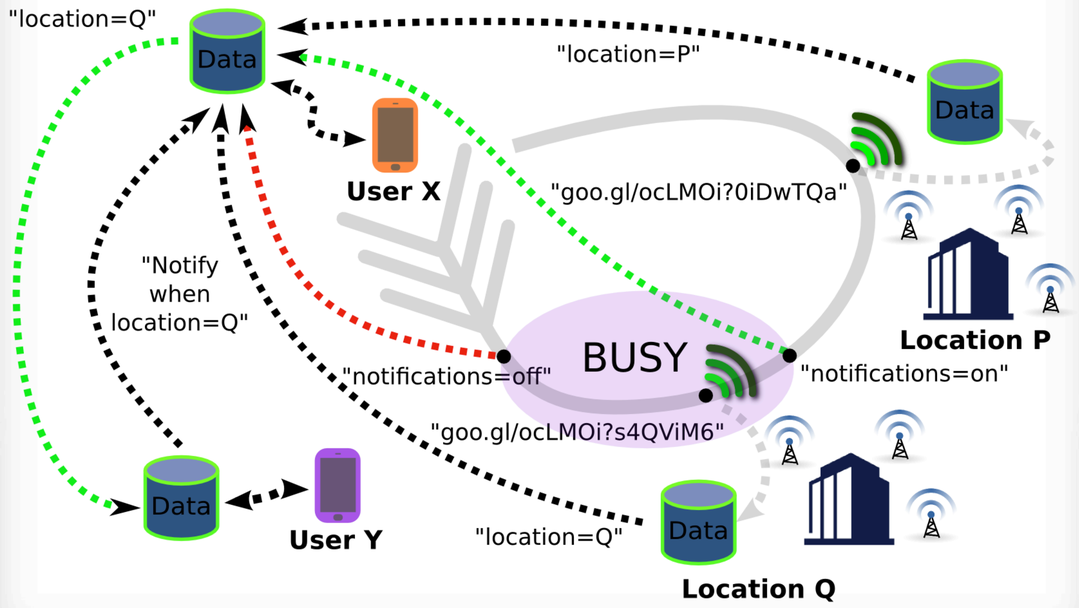
...can react to an influx of location updates and be leveraged for discovery purposes and do context-aware computing.

- **EXAMPLE** "Don't forget to buy milk"
  - Receive reminder, but only when at a **specific location** that sells milk



Depending on the interface offered by the Provider, this can get very advanced! E.g., have a Swarmlet solve a traveling salesman problem to provide the most efficient route through the store while getting all needed items—and ignore the ones that are out of stock.

Architectural Overview



Security

- Peer-to-peer authentication
- Query-level authorization

Vulnerability: location spoofing...

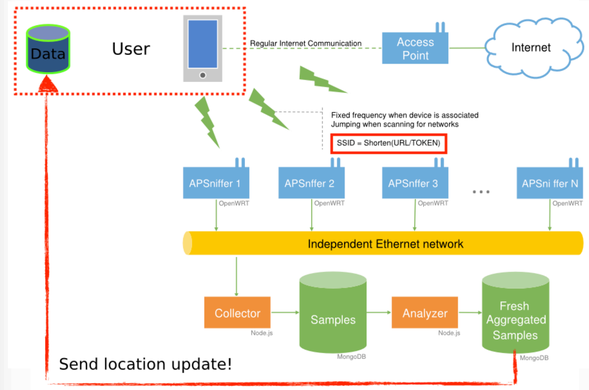
- Limit to trusted providers
- Use time-bound tokens
- Newtonian sanity check
- Anomaly detection

Privacy

- Anonymity
  - Token does not reveal identity
- Transparency
  - Location sharing is explicit

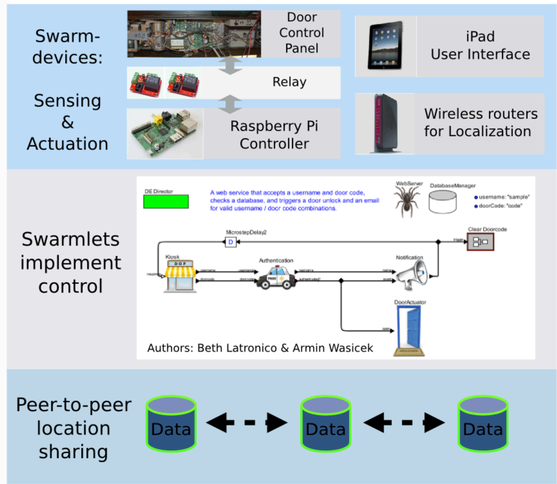
SHARING	vs.	SURVEILLANCE
voluntary access	(what)	***unvoluntary*** access
access ***witnessed***	(when)	access ***unwitnessed***
observer ***known***	(whom)	observer ***unknown***

Localization using WiFi



DOPresence

A test bed for sensing and actuating in the DOP Center, 545 Cory Hall in Berkeley...



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