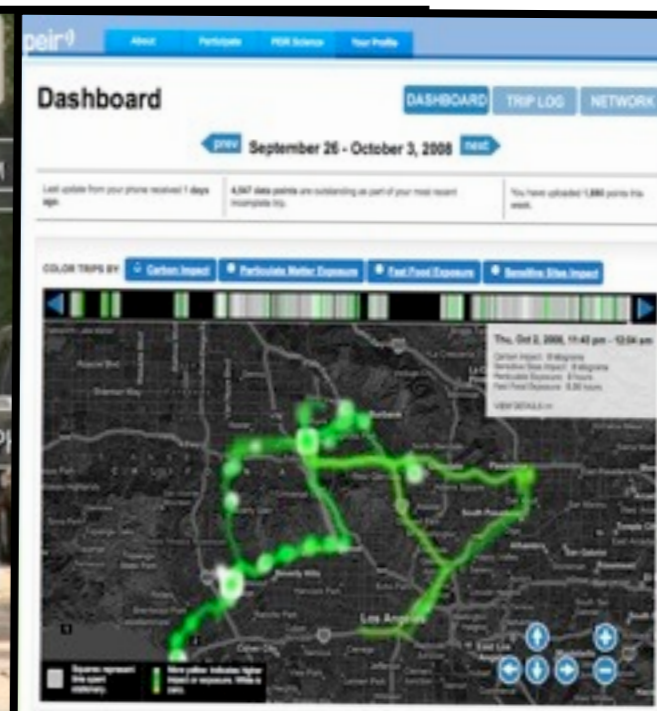
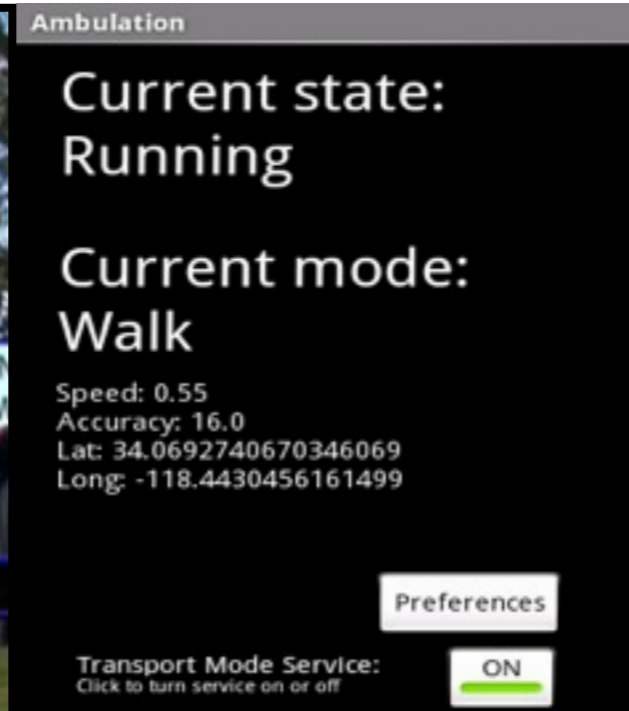
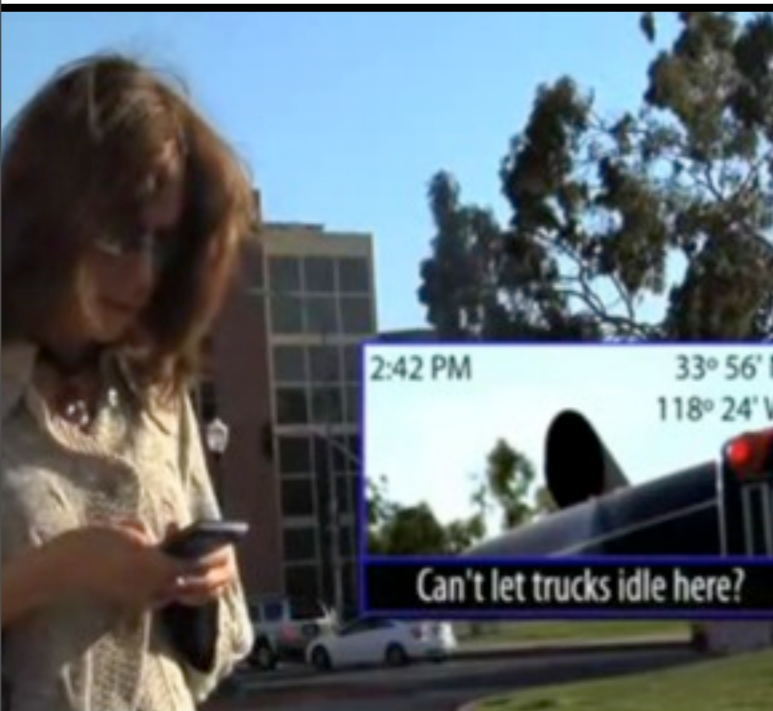


Creating a Shared, Open, and Scalable mHealth Platform for Health(care/research) Innovation

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In collaboration with Ida Sim (MD, PhD), Michael Swiernik (MD), Mark Hansen (PhD), ...

mHealth: Use mobile devices to enhance health and wellness by extending health interventions beyond the reach of traditional clinical care.



Why mHealth?

- 3 lifestyle behaviors (poor diet, lack of exercise, smoking) cause 1/3rd of US deaths; 50% Americans have 1 or more chronic diseases; age of onset getting younger.
- mHealth apps will allow care support/data collection 24x7--chronic disease prevention/management/research as part of daily life
- mHealth's affordability/adoptability could support groundswell of medical discovery, evidence-based practice about treatment/prevention

vision: support individuals, communities, clinicians to continuously improve patient-centered, personalized, treatment and wellness

mHealth apps: observations in daily living

self-report/experience sampling, activity trace, media capture

Our Actions



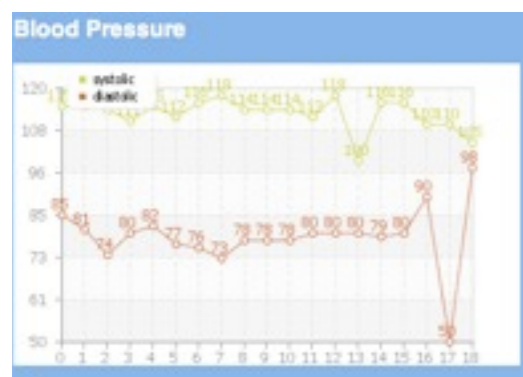
Our Self Report



Private Data Storage

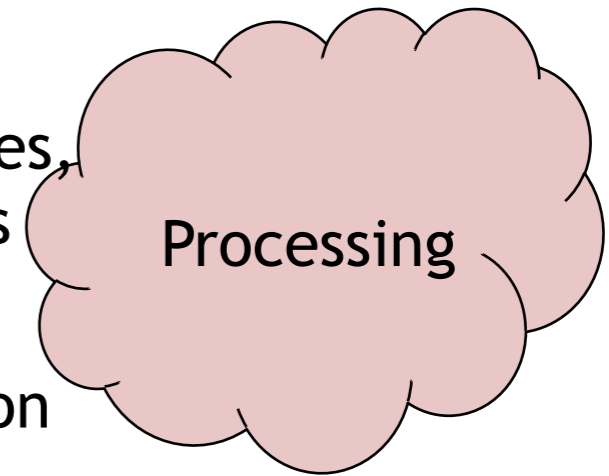


Geocoded and time-stamped EMAs
 Mobility traces



aggregate measures, trends, patterns

event detection



Visualization

Photo - Marshall Astor

Whose mHealth?

- **A woman who is pre-diabetic** tracks how eating/exercise habits effect weight and energy levels; also explores effective, comfortable Blood Pressure Rx dosage.
- **A soldier returning to civilian life with epilepsy** conducts prompted self-reporting on number, duration, severity of each seizure experienced; reveals patterns that were difficult to accurately report during bi-monthly checkups.
- **A middle-aged woman who does not respond well to medication for psoriasis** monitors diet, stress, environmental factors; initiates data campaign via social networking site for psoriasis sufferers. Each volunteer runs mHealth app for 2-months to create large data set to mine for patterns that precede flare-ups.
- **A young man who is struggling to find a treatment plan for depression** believes medication dose is ineffective; doctor blames poor sleep habits/nonadherence. Patient self-monitoring includes medication reminder/verifications, sleep survey, activity traces, to guide adjustments in care plan, discussion of root causes.

Importance of an open platform: avoid silos, promote innovation

Bootstrap rapid cycle of learning, sharing, deployment

- Basic capabilities can be specialized to particular populations, diseases, treatment protocols, while 80 % (guesstimate) system components shared/reused.

Facilitate research in methodology, treatment

- Systems gather usage data automatically for evaluation, iterative improvement
- Comparative effectiveness studies, natural experiments in natural environments
- Explore adherence protocols, incentive mechanisms across diseases, demographics
- Encourage modularity and sharing in methodologies, practice

Development in the context of real applications and use

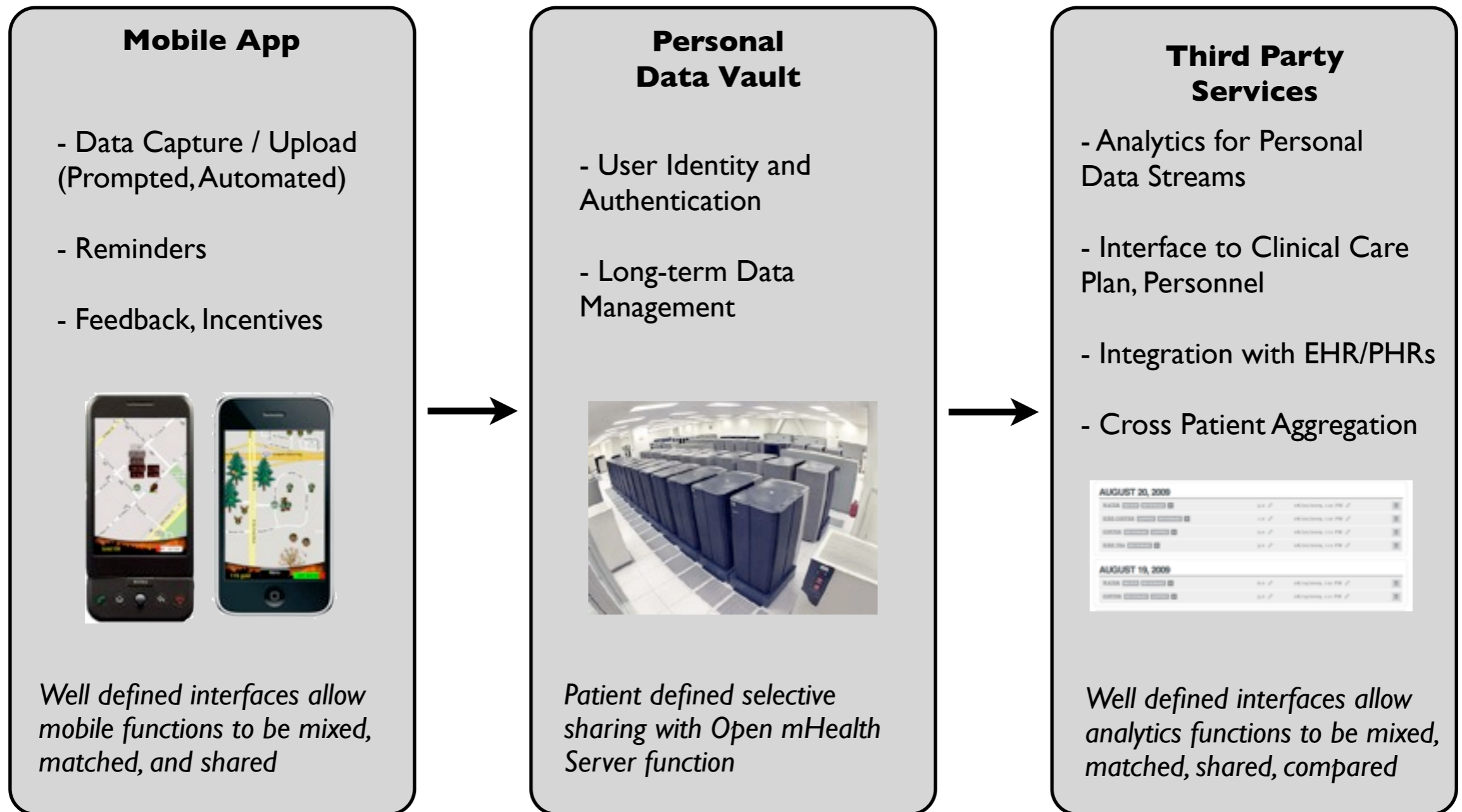
- Collaborative/participatory design process with continual feedback from users: providers, researchers, participants.
- Not an abstract/general purpose software architecture effort: diverse targeted pilots inform generalization, adaptation, expansion.

Explore balancing of privacy protection and data sharing

- Systems can support variety of privacy/sharing policies
- Support greater transparency of research and data processes for participants

Personal Data Vault (PDV):

allow participants to retain control over their raw data



vault + filters = granular, assisted control over what you send to who, what that data says about you, whether you reveal who you are or share anonymously, ...

Why focus on mhealth, smart phones, and open?

mHealth

access to participants:
all 168 hours of the week...
all 1440 minutes of the day...
(not all 365 days a year...)

smartphones

real time (always on),
real place (always carried)
real context (always connected)
real powerful (apps, usability)

open

broad applicability
heterogeneous uses
evolving methodologies
innovation ecosystem



Challenges: technological and methodological

Technological

- **Continuous activity**/context classification
- **Usability**, HCI, personalization
- **Data visualizations**, modeling
- **Interoperability** across smartphones, health records
- **Selective sharing**, usability

Methodological

- **Incentivizing** sustained use.
- **Validity**, comparability
- **Privacy**/sharing practices: balance individual, research, IRB
- **Open systems** to foster rapid innovation in infrastructure, methodology and evidence.

Acknowledgments: Collaborators and Sponsors

Collaborators

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