GeoSensor Web Lab

Connect, Share, and Use World-wide Sensors

Temperature: 30 C
Humidity: 30%
Windspeed: 12 km/h
CO: 0.25 ppm
NO: 0.27 ppm
PM 2.5: 14 µg/m^3

Temperature: 29 C
Humidity: 29%
Windspeed: 11 km/h
CO: 0.23 ppm
NO: 0.22 ppm

Temperature: 30 C
Humidity: 29.2%
Windspeed: 6 km/h
CO: 0.22 ppm
NO: 0.24 ppm

Temperature: 29 C
Humidity: 29%
Windspeed: 11 km/h
CO: 0.23 ppm
NO: 0.22 ppm

Temperature: 29 C
Humidity: 29%
Windspeed: 11 km/h
CO: 0.23 ppm
NO: 0.22 ppm

Temperature: 29 C
Humidity: 29%
Windspeed: 11 km/h
CO: 0.23 ppm
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Windspeed: 11 km/h
CO: 0.23 ppm
NO: 0.22 ppm

Dr. Steve Liang
Assistant Professor
AITF-Microsoft Industry Chair on Open Sensor Web
steve.liang@ucalgary.ca

Mission Statement

- enable organizations to share, collaborate and use the information generated from the world around them

Solution

- developing open standard-based sensor data management systems make it simple to *publish*, *search for*, *understand*, and *use* environmental monitoring data
- in some cases, even to *control* the Internet-connected sensors and devices

"the number of Internet-connected devices will reach between 50 and 60 billion by the end of the decade"

Verizon and Ericsson, 2011

Source: Wall Street Journal
http://online.wsj.com/article/SB10001424052702303544604576434013394780764.html

geosensor web lab

@steveliang

3 Vs of BIG Data

- **Volume**
  - 5.6 billion mobile phones in use (2011)
  - 50~60 billion Internet-connected sensors by 2020
- **Velocity**
  - 30 billion pieces of content shared on Facebook every month
- **Variety**
  - Many kinds, fragmented, no sampling scheme, no metadata, no quality control

HOW TO LINK DIFFERENT SENSOR NETWORKS?

?

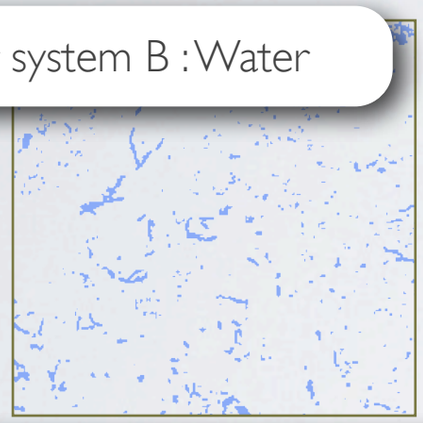
air quality

traffic

VISION: AN WORD WIDE SENSOR WEB

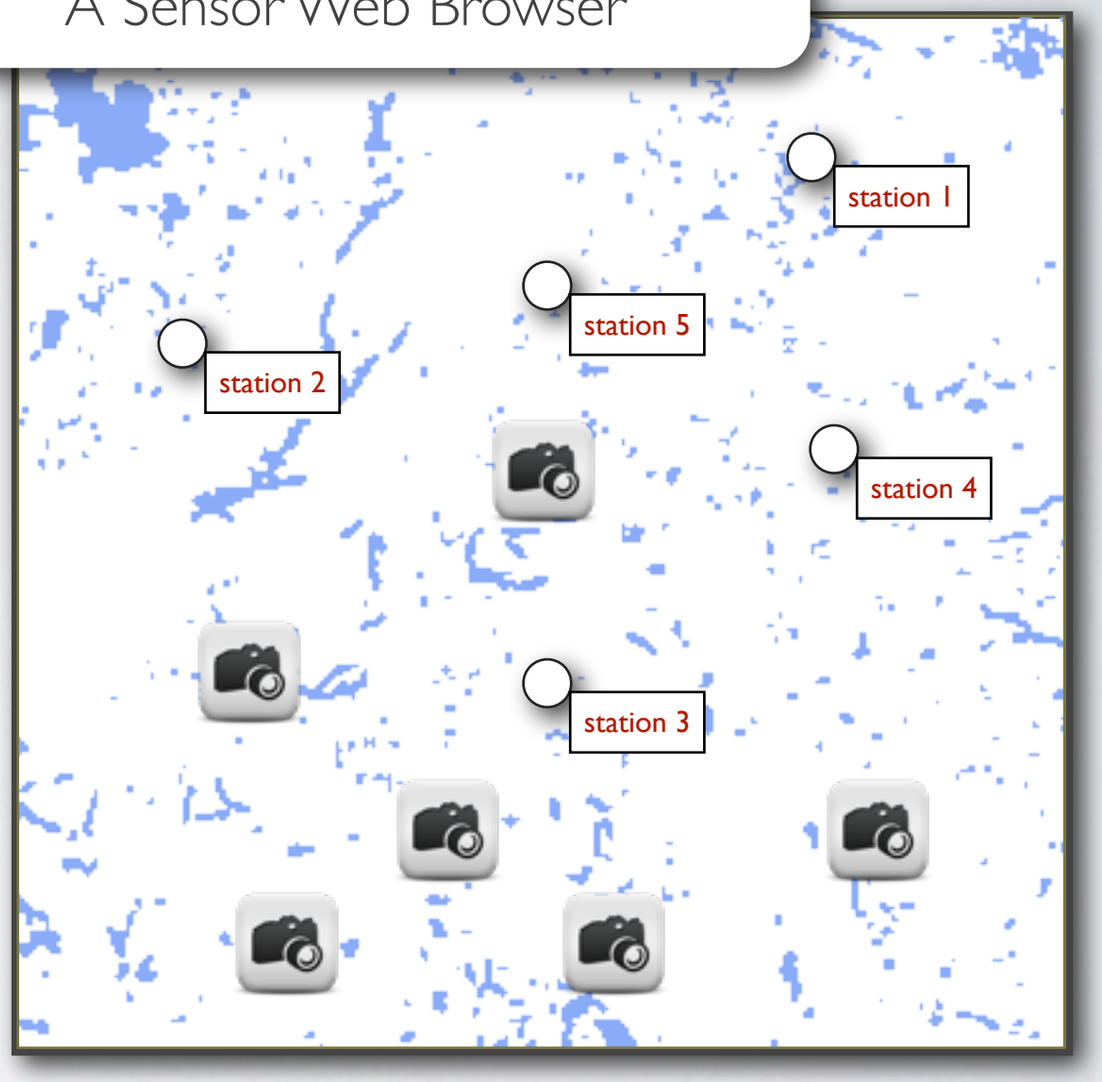
sensor system A : Air

sensor system B : Water



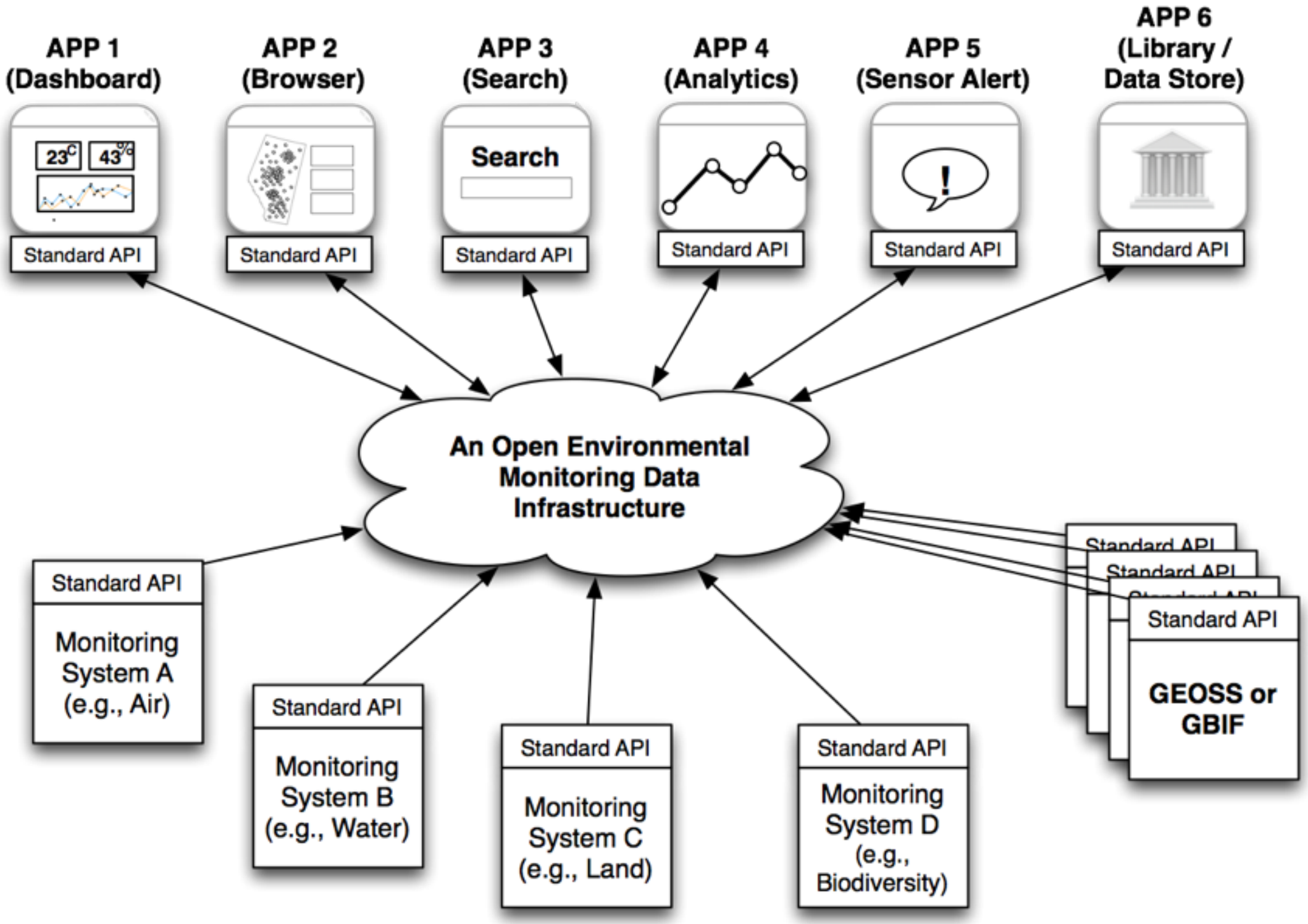
sensor system C : Smartphones

A Sensor Web Browser



Service Registry/
Search Engine

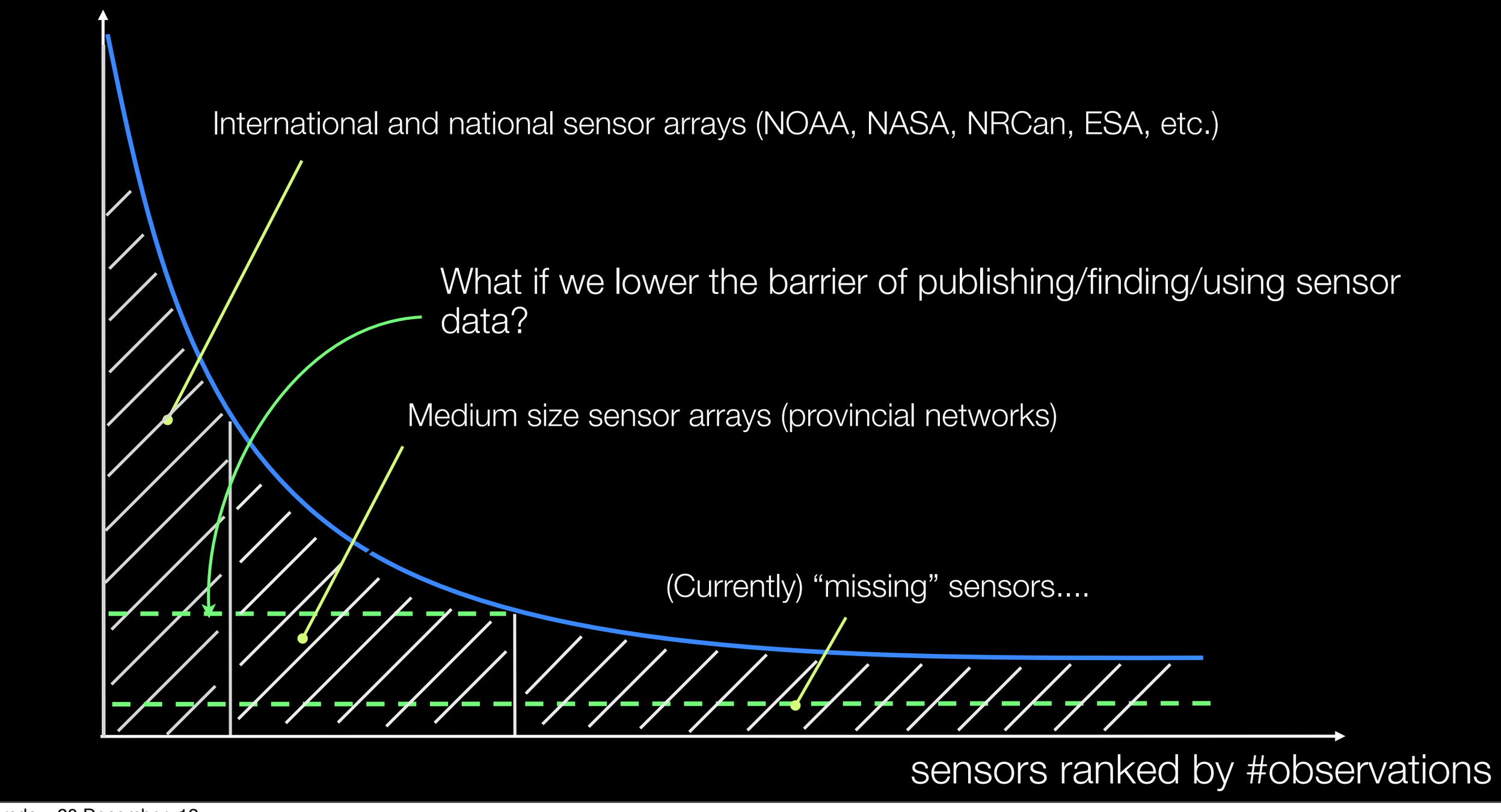
http://www.geosensorweb.org


APP 1
(Dashboard)
APP 2
(Browser)
APP 3
(Search)
APP 4
(Analytics)
APP 5
(Sensor Alert)
APP 6
(Library /
Data Store)
23C
43%
Search
!
Standard API
Standard API
Standard API
Standard API
Standard API
Standard API
An Open Environmental
Monitoring Data
Infrastructure
Standard API
Monitoring
System A
(e.g., Air)
Standard API
Monitoring
System B
(e.g., Water)
Standard API
Monitoring
System C
(e.g., Land)
Standard API
Monitoring
System D
(e.g.,
Biodiversity)
Standard API
Standard API
Standard API
Standard API
GEOSS or
GBIF

Sensor Data Long Tail

(Liang, 2010)

# of missing sensors >> # of currently available sensors



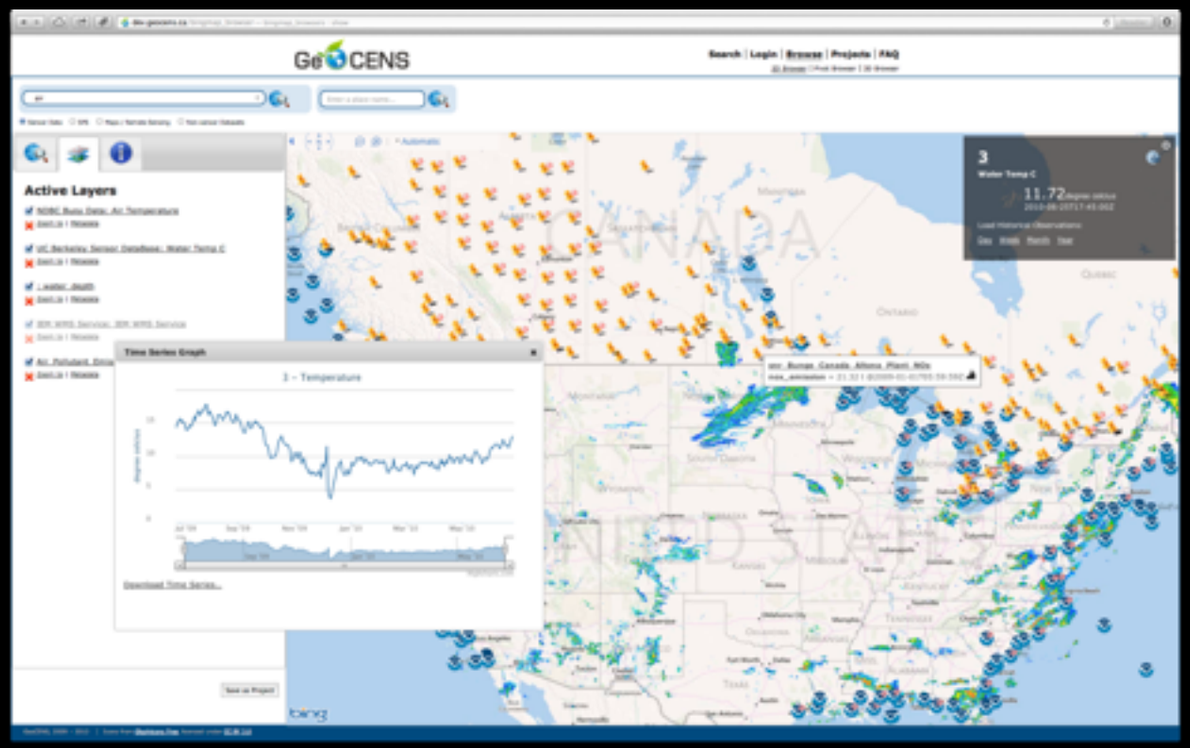
Unleash the Power of Sensors

Innovation in Assembly

A Web of Sensors

– Dr. Steve Liang – http://sensorweb.geomatics.ucalgary.ca –

Example - GeoCENS



GeoCENS

- An $1.08 million project funded by Canarie and Cybera
- An open sensor data portal (★★★★★)
- Very easy to use
- High performance
- More than 1000 users per month

Challenges

How to ***connect*** multiple data sources in a coherent environment?

How to ***find*** the data you want?

How to ***browse*** the sensor web in case you don't know what you are looking for?

How to ***process*** the sensor data streams efficiently?

How to automate as much ***QA/QC*** as possible?

How to maintain ***Openness*** and ***Privacy*** at the same time?

bingmap_browsers : show

dev.geocens.ca/bingmap_browser

GeoCENS

Welcome GeoCENS

Search | Browse | Projects | Share Data | Discuss | FAQ | Logout

2D Browser | Pivot Browser | 3D Browser

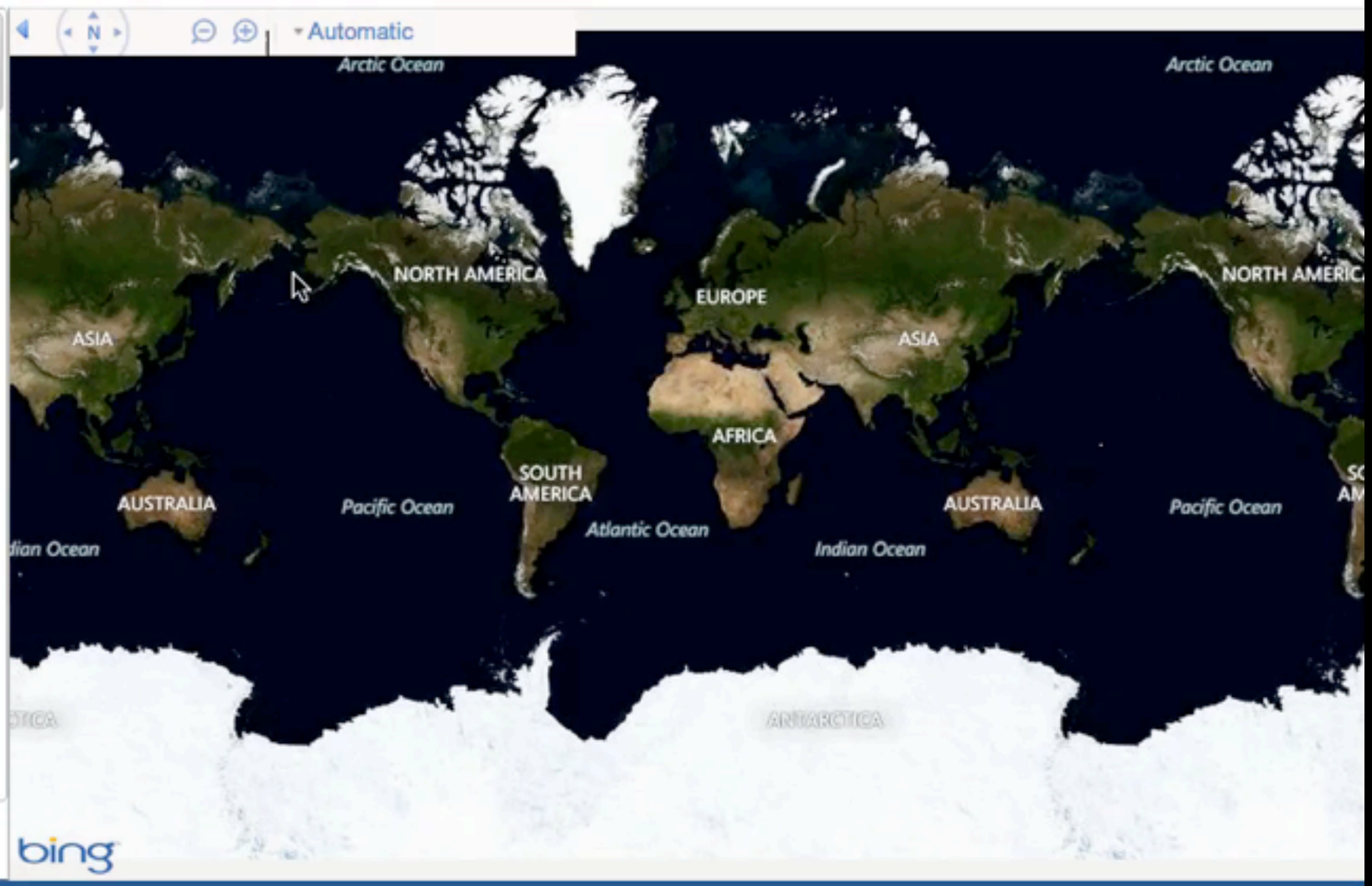
Enter a keyword...

Enter a place name...

Sensor Data | SPS | Maps / Remote Sensing | Non-sensor Datasets

Active Layers

Save as Project



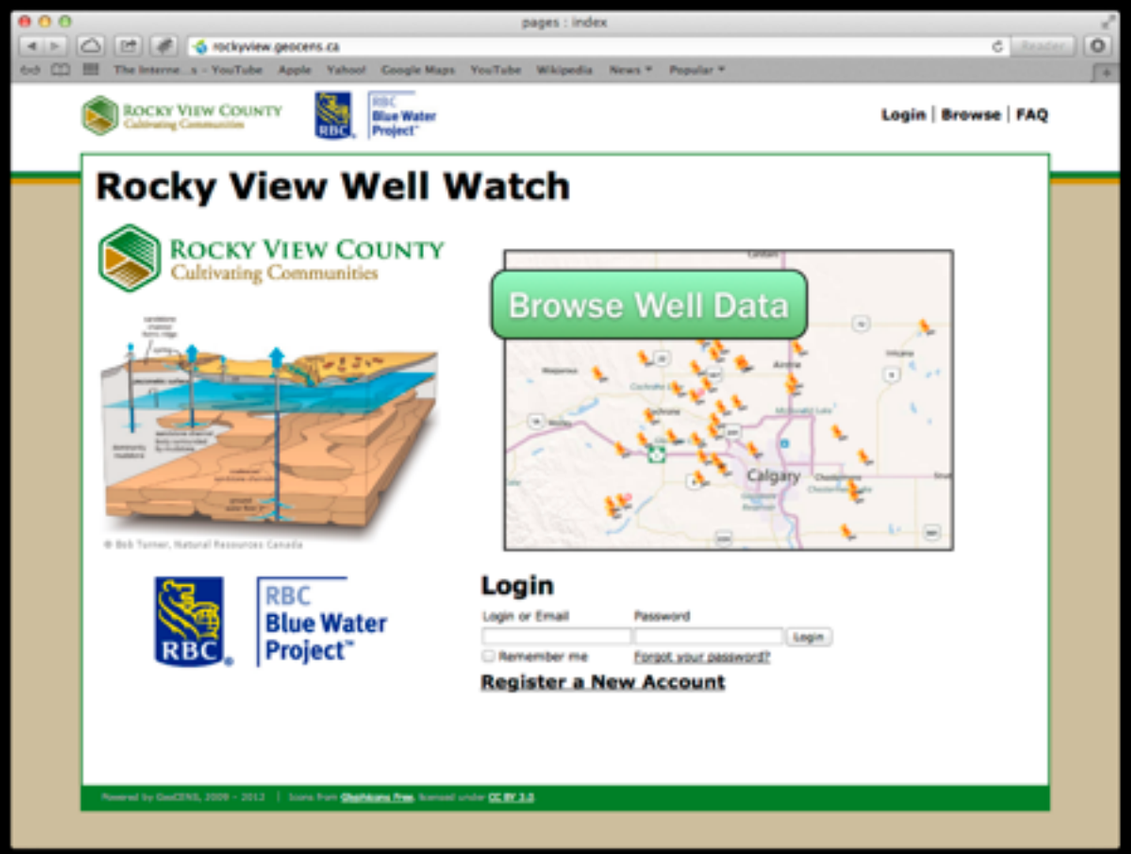
GeoCENS, 2009 - 2012 | Icons from Glyphicons Free, licensed under CC BY 3.0.

Our Project Portfolios - AAFC Drought Monitoring Network

AAFC Drought Monitoring Network

- Agriculture and Agri-Food Canada is deploying soil moisture monitoring networks across Canada
- use GeoCENS as the main frontend to manage, share, and visualize data
- online early next year

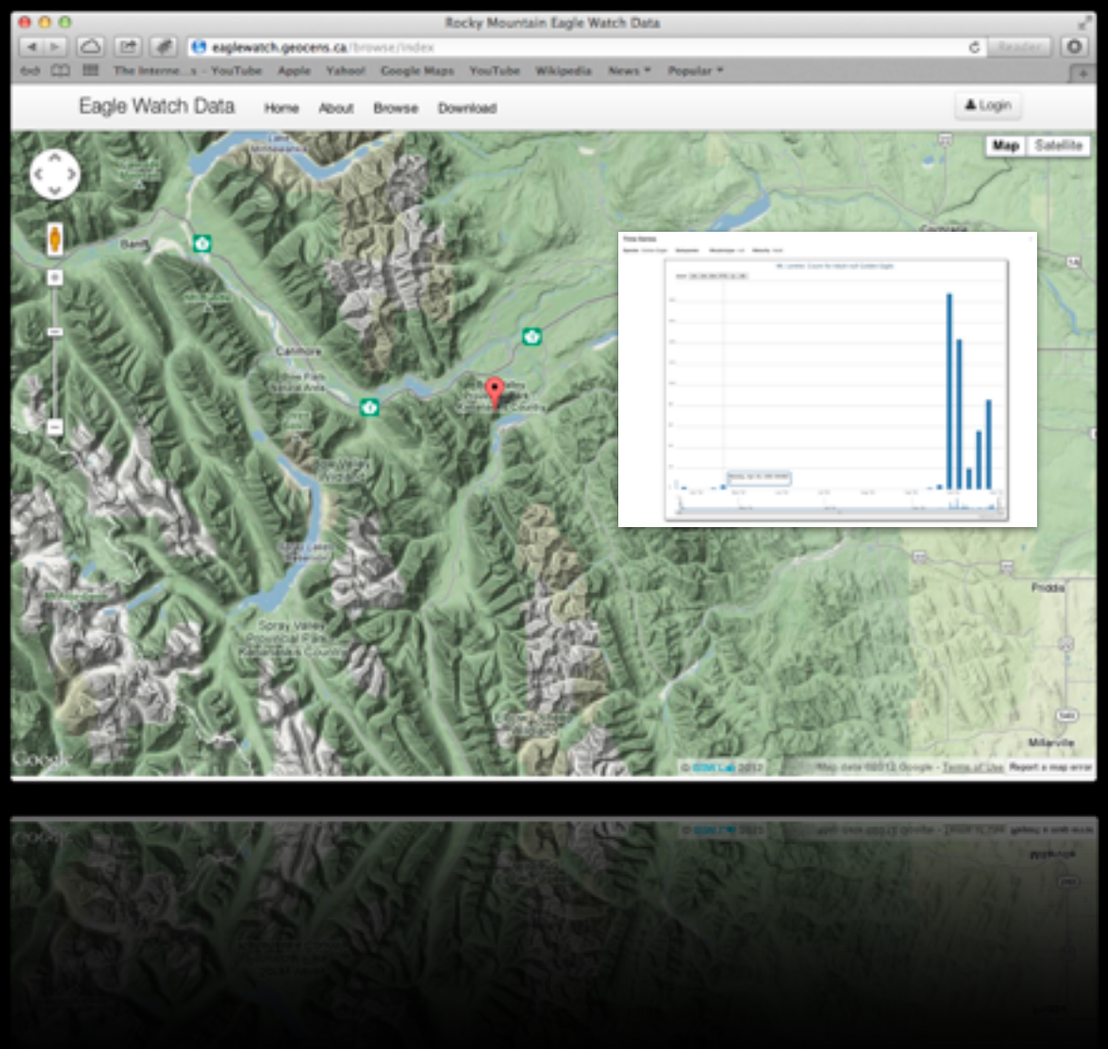
Our Project Portfolios - Rockyview



Rockyview Well Watch

- A RBC Blue Water Project
- long term groundwater monitoring
- more than 40 well owners
- well owners use the platform to upload their well readings
- data since 2008
- QA/QC by UofC Hydrologists

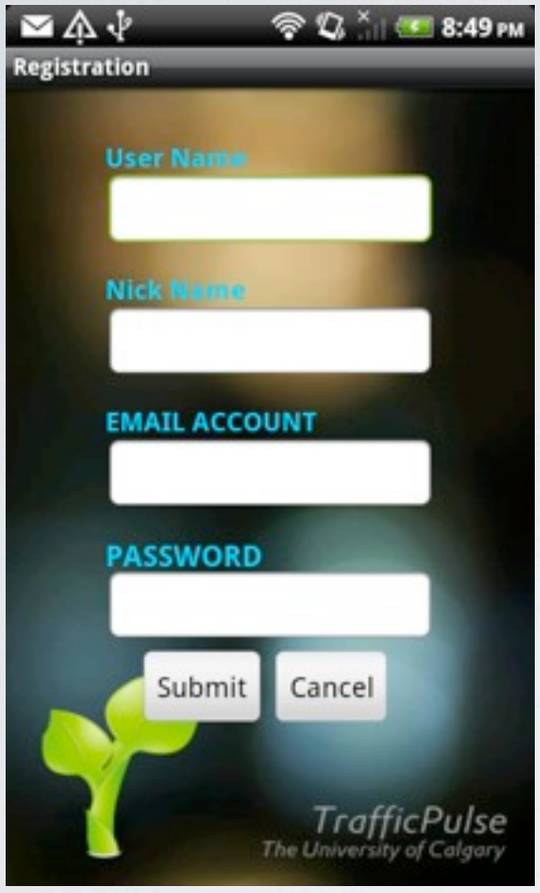
Our Project Portfolios - Eagle Watch



Eagle Watch

- a citizen sensing project counting eagles for more than 20 years in the Rockies
- used to use paper and excel data sheets to record and share data
- the Eagle Watch portal *significantly simplify* the data entry, processing, and sharing work

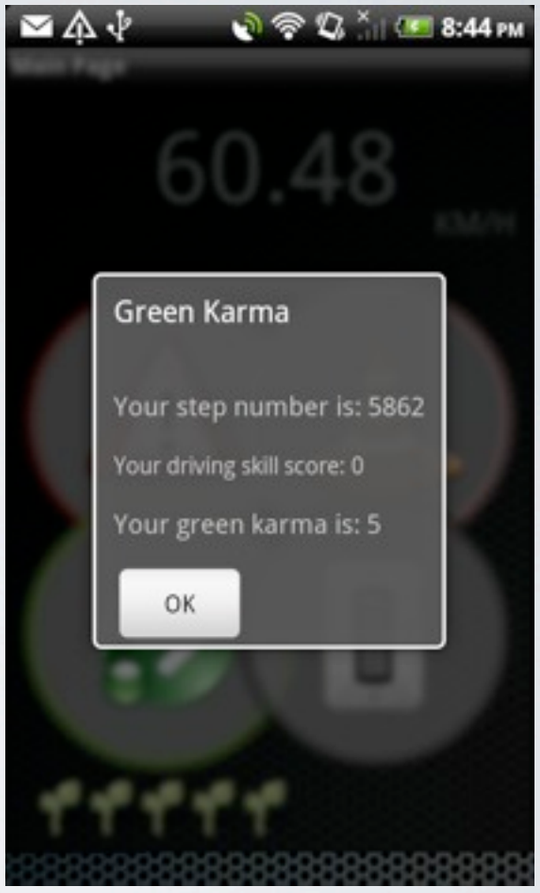
TRAFFICPULSE: *USER INTERFACES (1)*



Login/Register

Menus

Main Page



Green Karma

TRAFFICPULSE: *USER INTERFACES (2)*

Accidents
Constructions

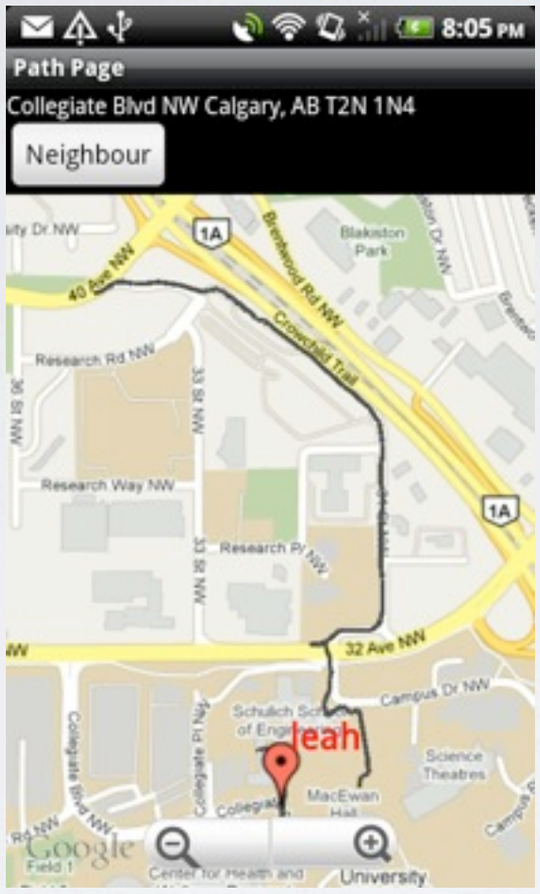
Rating
+/-

Safe Mode

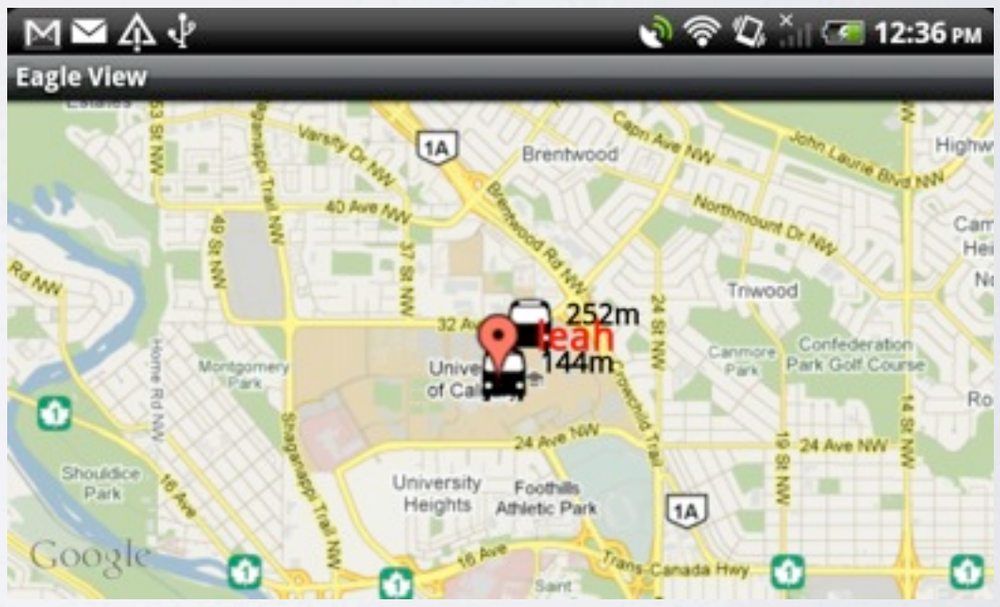
Settings

TRAFFICPULSE: *USER INTERFACES (3)*

Neighbours



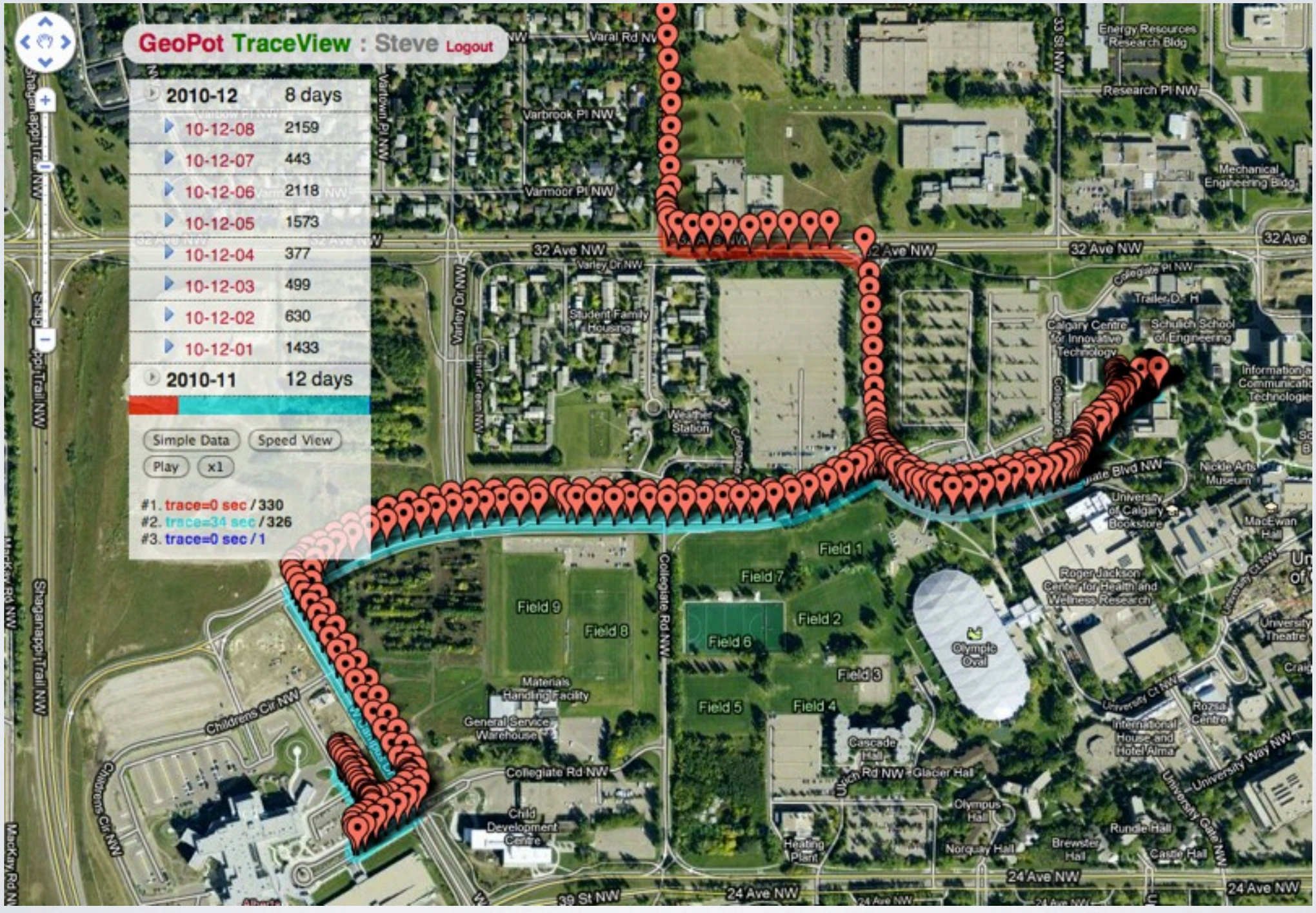
Traces



Augmented Reality
Bus Stop Guide

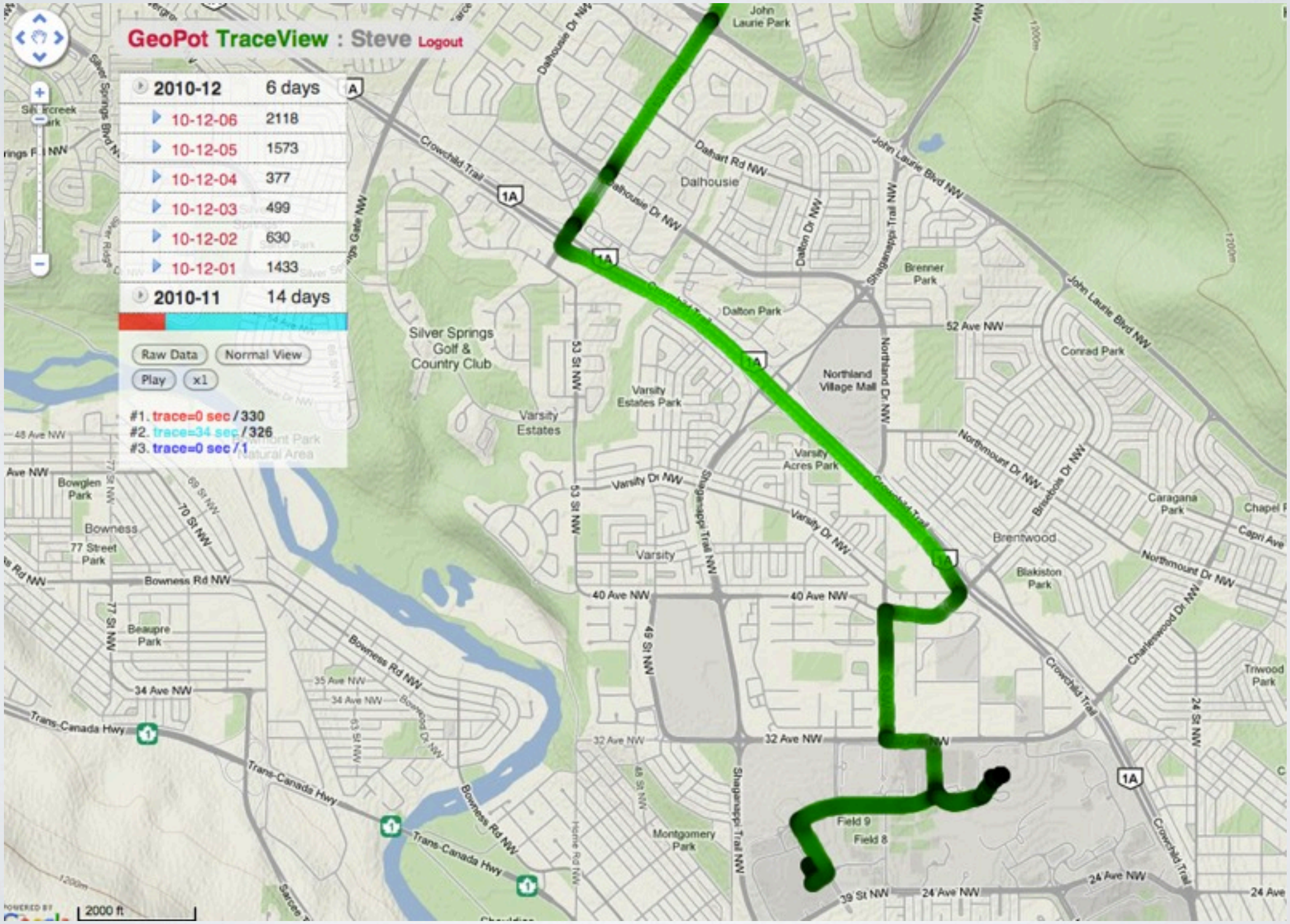
TRAFFICPULSE: *TRACE VIEW*

Web Site for Users History



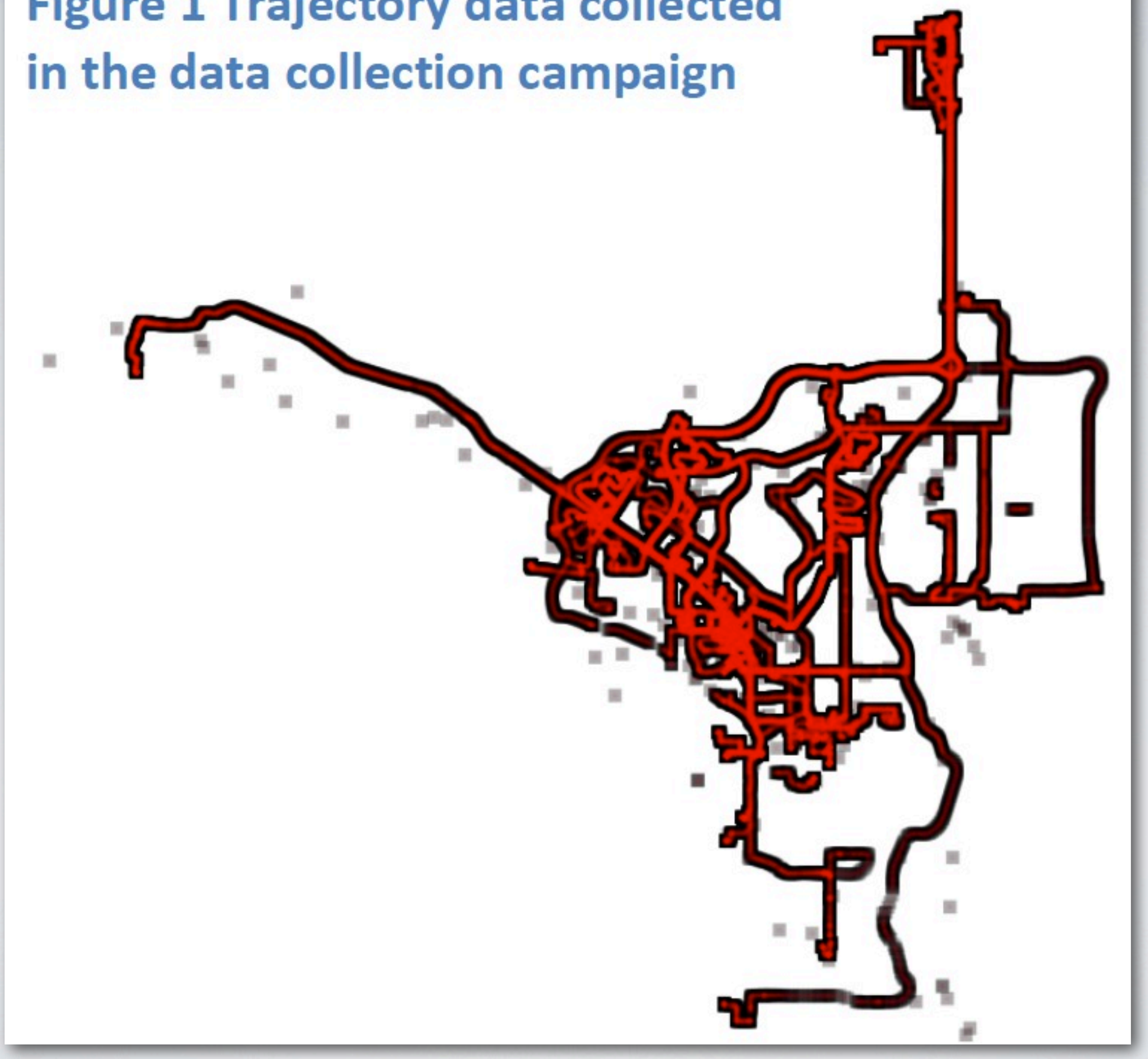
TRAFFICPULSE: *SPEED VIEW*

Web Site for Users History



Train

Figure 1 Trajectory data collected in the data collection campaign



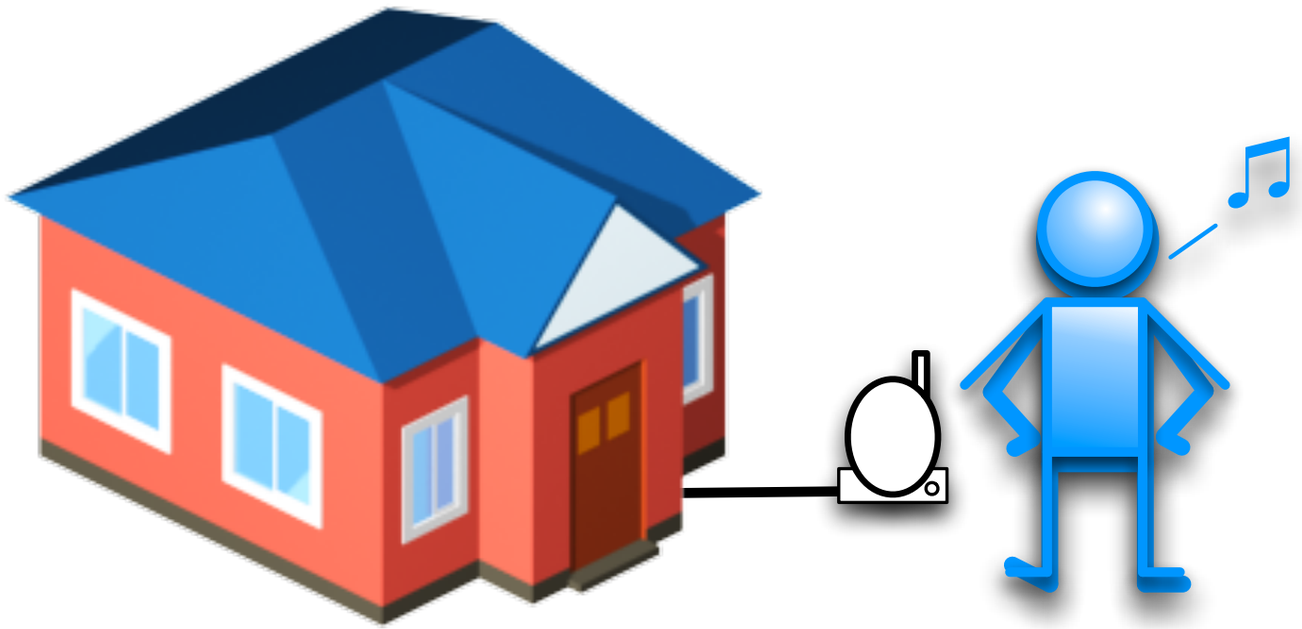
An Exciting New Direction: Internet of Things

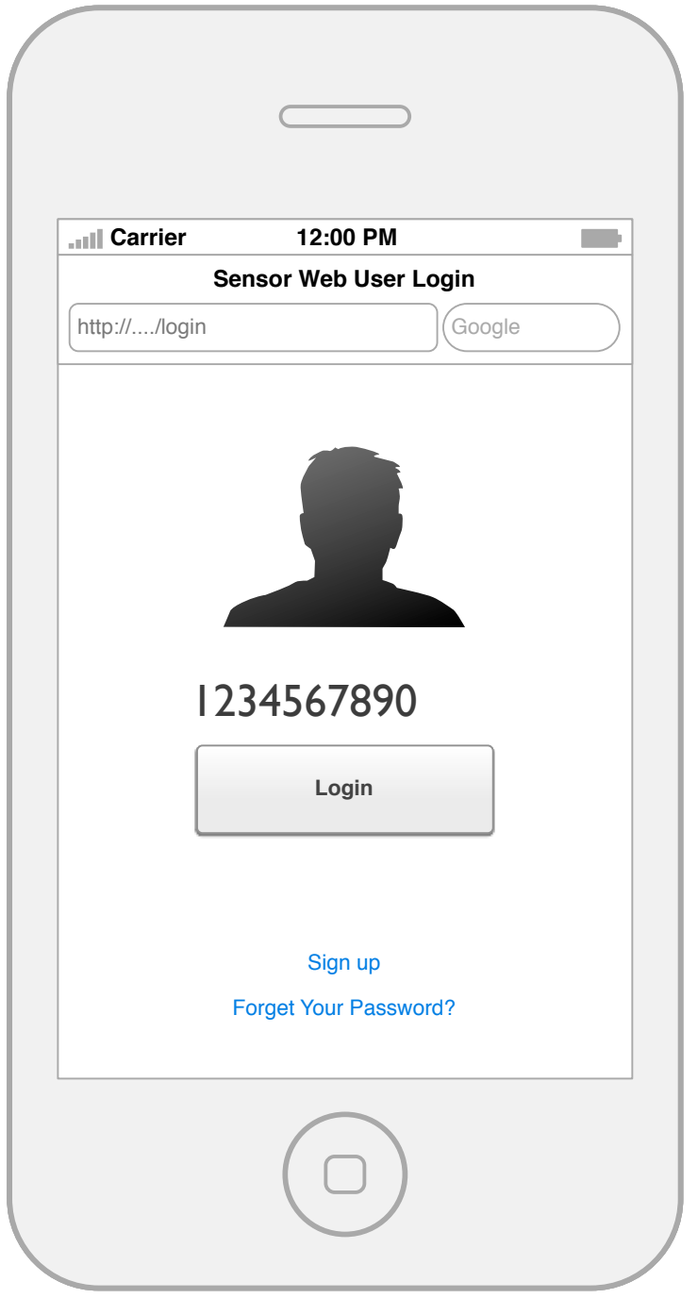
We propose to build

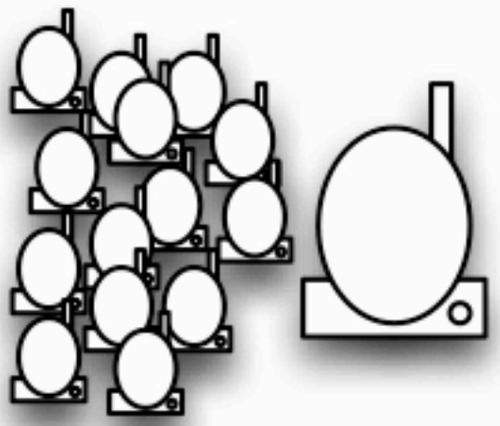
- a low-cost networked sensor allows *anyone* to collect very high resolution environmental readings outside of their home.
- two components:
  - sensor
  - a sensor cloud infrastructure

Differentiation

- low cost (<$100)
- anyone can set up (plug-N-play)
- real-time monitoring (Internet-connected)
- open system (open APIs, no vendor lock-in)
- large scale (due to its low cost)
- rich context

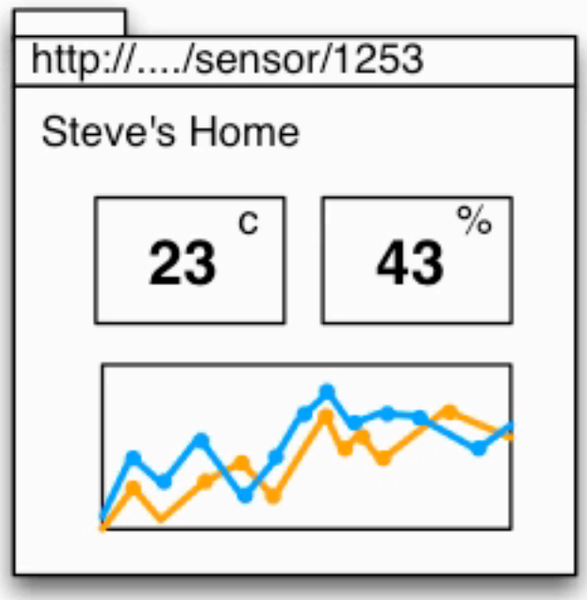



Carrier
12:00 PM
Sensor Web User Login
http://..../login
Google
1234567890
Login
Sign up
Forget Your Password?

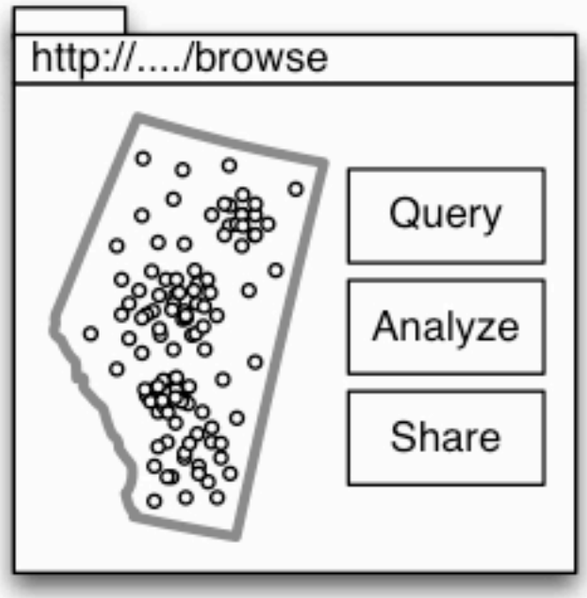


Sensor Data and Analytics Cloud

Personal Sensor Dashboard



Browse all sensor readings



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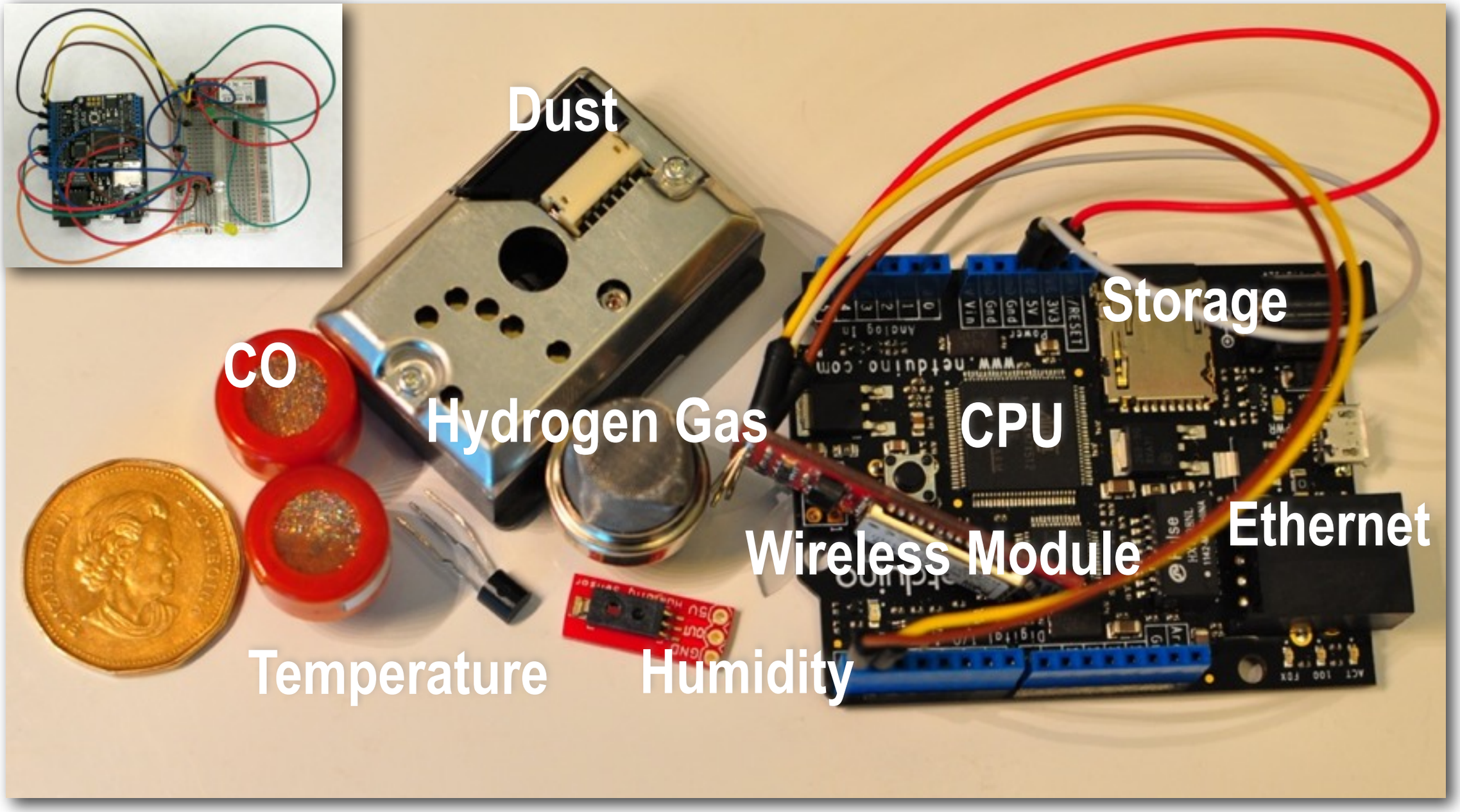
Citizens as Sensors
(current prototype at UofC)



What can be measured

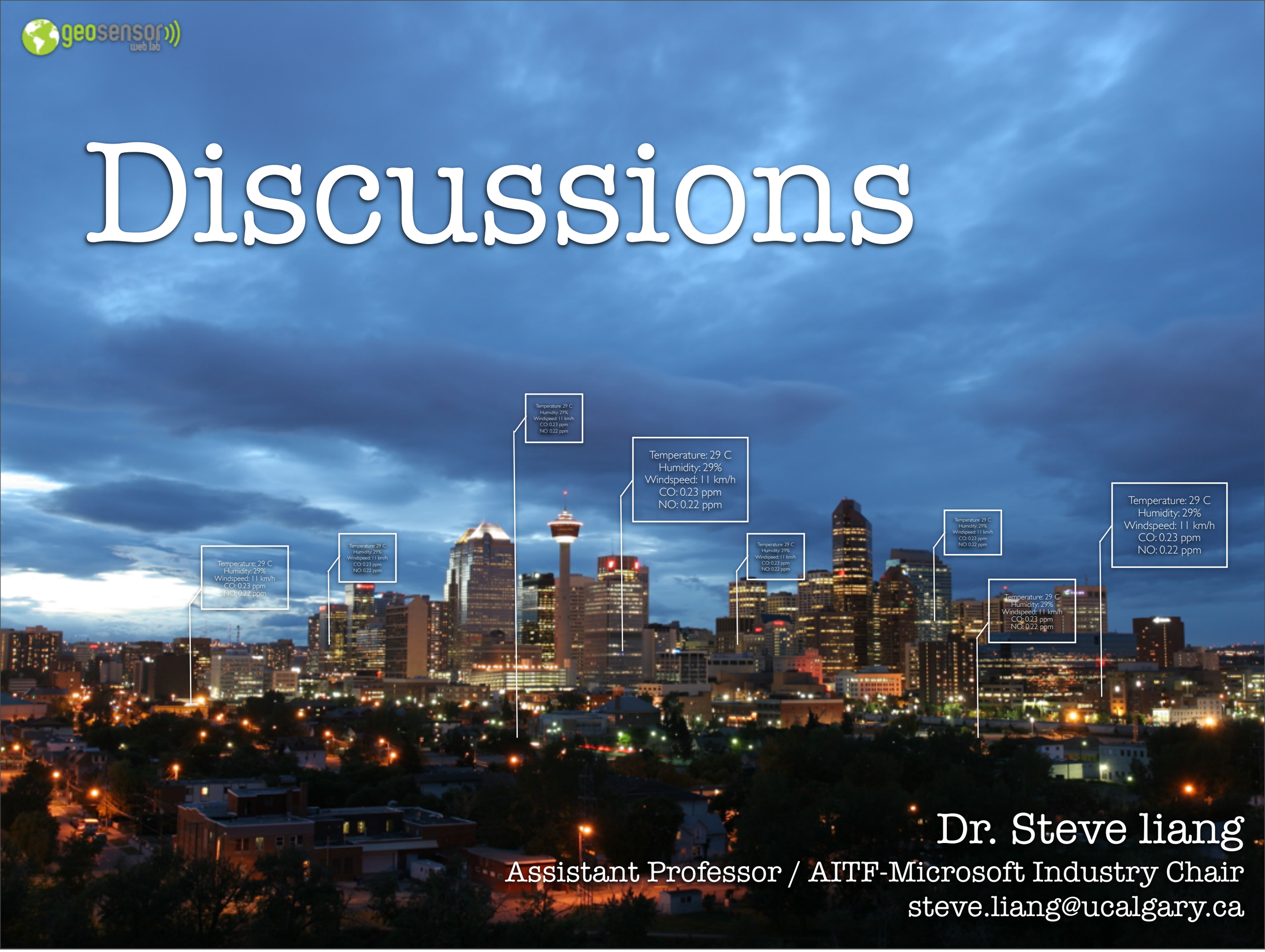
- CO
- NO2
- OZone
- Humidity
- Temperature
- Dust (PM 5)
- Gas
- Light
- Radiation
- Energy use

*the final configuration depends on applications and cost

Similar Projects

- the Air Quality Egg project (AQE)
  - London, Antwerp
- the Smart Citizen project
  - Spain

Discussions



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Assistant Professor / AITF-Microsoft Industry Chair

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