

GEOCENS

GEOspatial Cyberinfrastructure
for ENvironmental Sensing

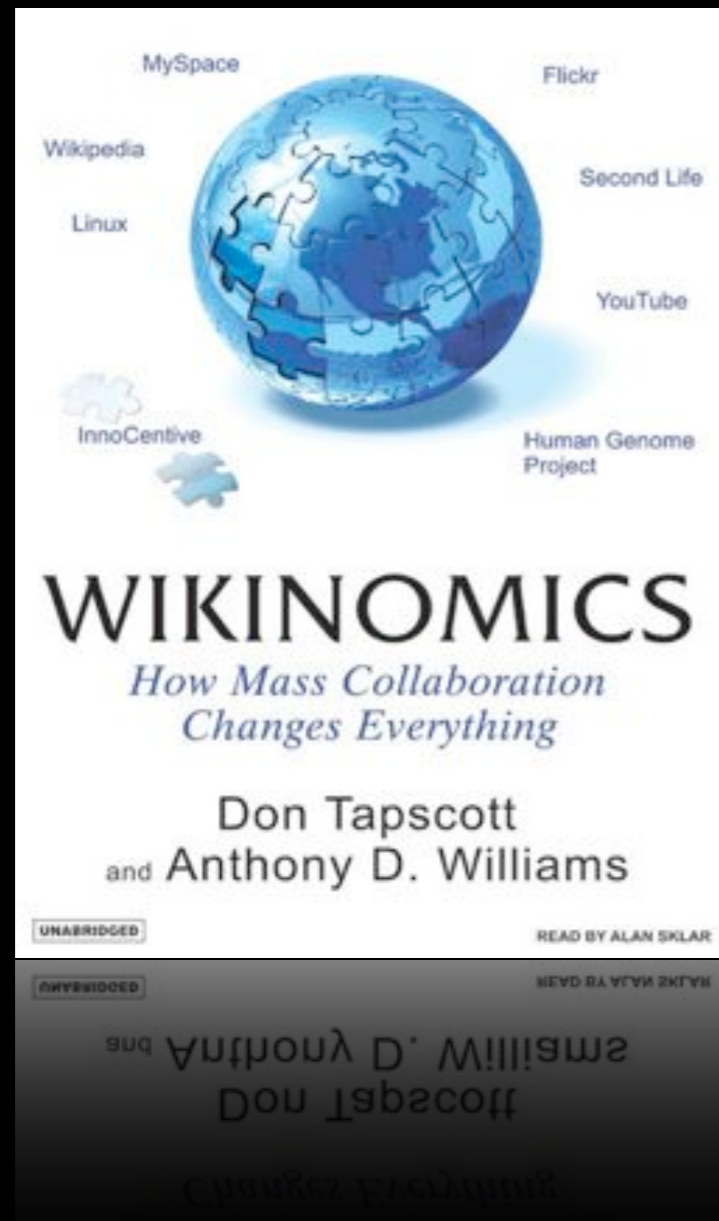
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GeoSensor Web Lab
University of Calgary

<http://sensorweb.geomatics.ucalgary.ca>

Open
Mass Collaboration
Web 2.0

How mass collaboration changes everything?



Goldcorp Inc., a Canadian gold company, couldn't find gold...

After years of struggling, the company “**open sourced**” one of its mining site (Red Lake, Ontario).

Mass collaboration found more gold that company could in previous years attempts.

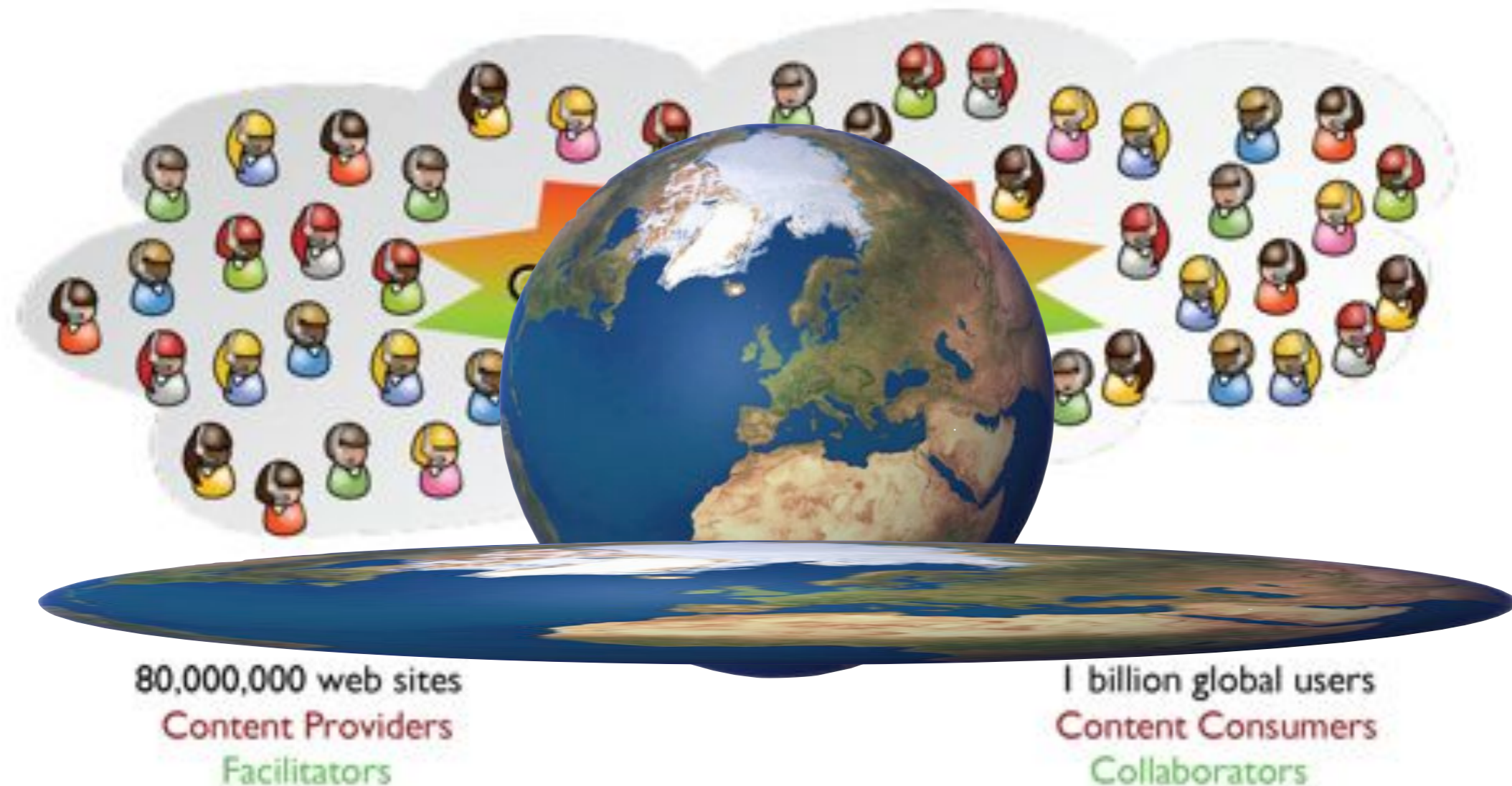
Results: Gave away proprietary data and got back a **\$ 9 billion** company. (Before that, it was a \$ 100 million company.)

Web 1.0



Source: IBM 2007

Web 2.0 - The World is Flat



Source: IBM 2007

Wikipedia



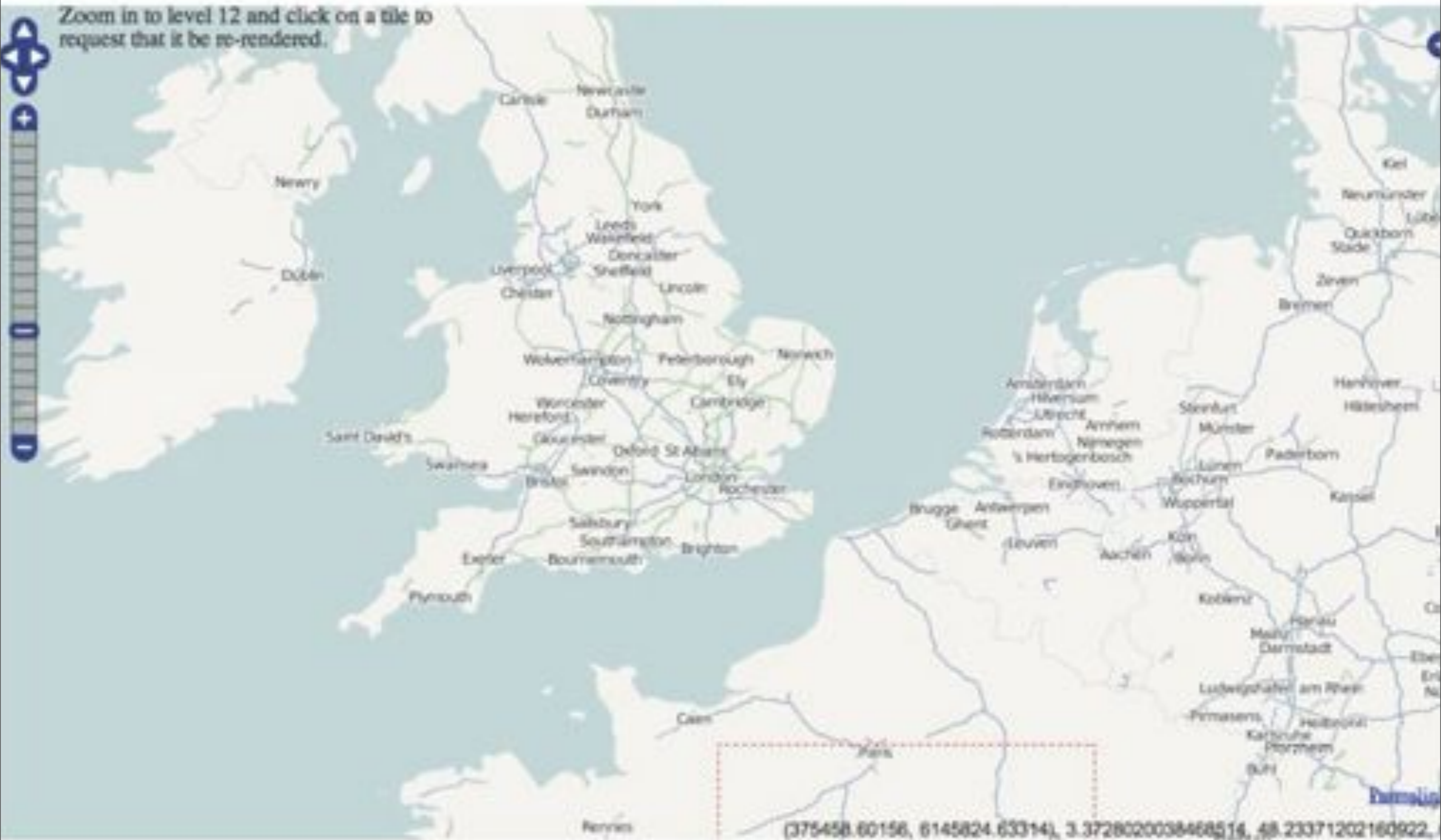
- 2 million English articles
- 15x encyclopedia Britannica
- 200+ languages
- 1 million+ editors
- 70,000 regular contributors
- 8th most visited site on the Web

Open Source Geospatial Data: OpenStreetMap



OpenStreetMap creates and provides free geographic data such as street maps to anyone who wants them. The project was started because most maps you think of as free actually have legal or technical restrictions on their use, holding back people from using them in **creative, productive** or **unexpected ways**.

Zoom in to level 12 and click on a tile to request that it be re-rendered.



(375458.60156, 6145824.63314), 3.3728020038468514, 48.23371202160922

n in to level 12 and click on a tile to test that it be re-rendered.



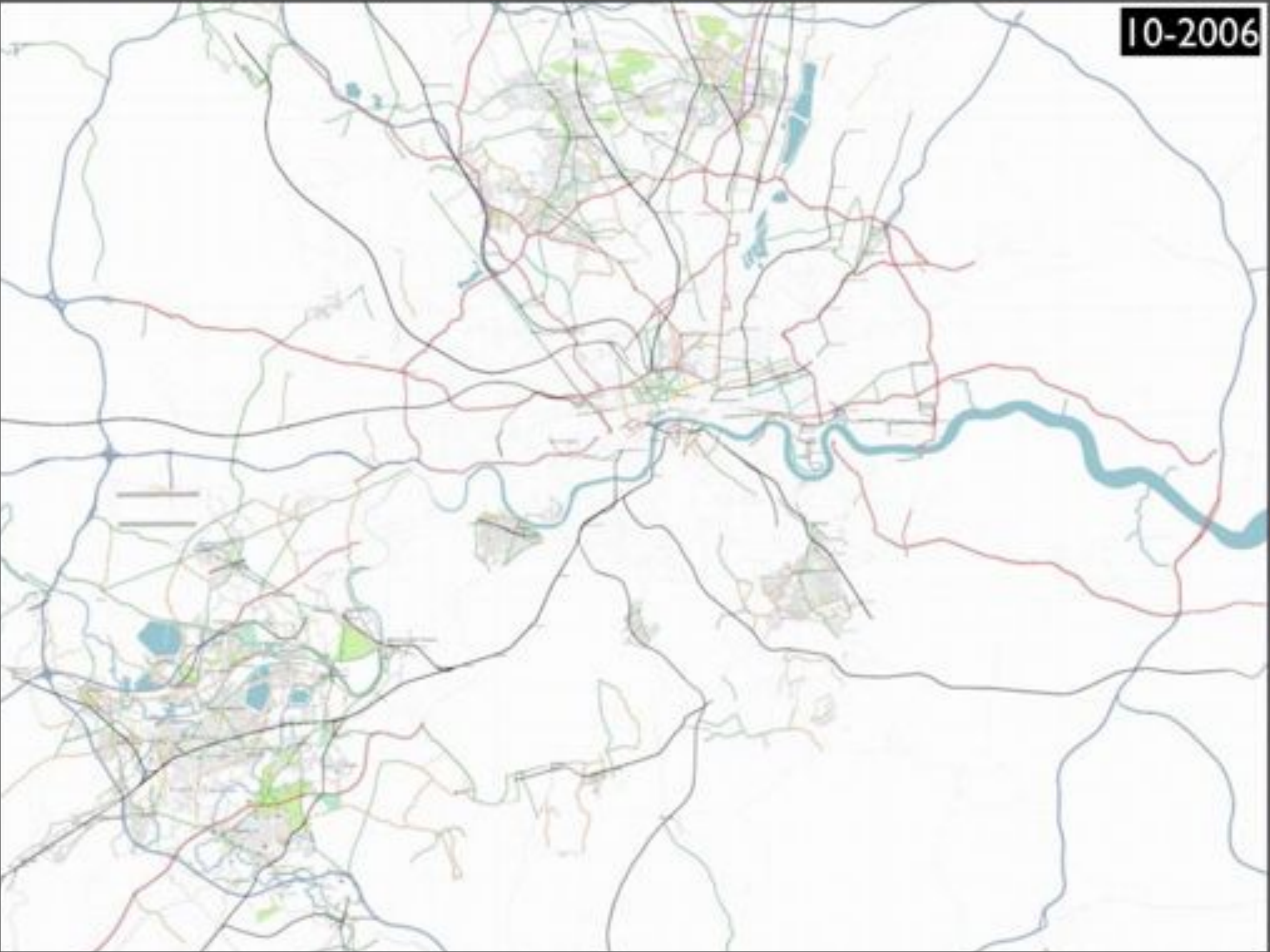
Zoom in to level 12 and click on a tile to request that it be re-rendered



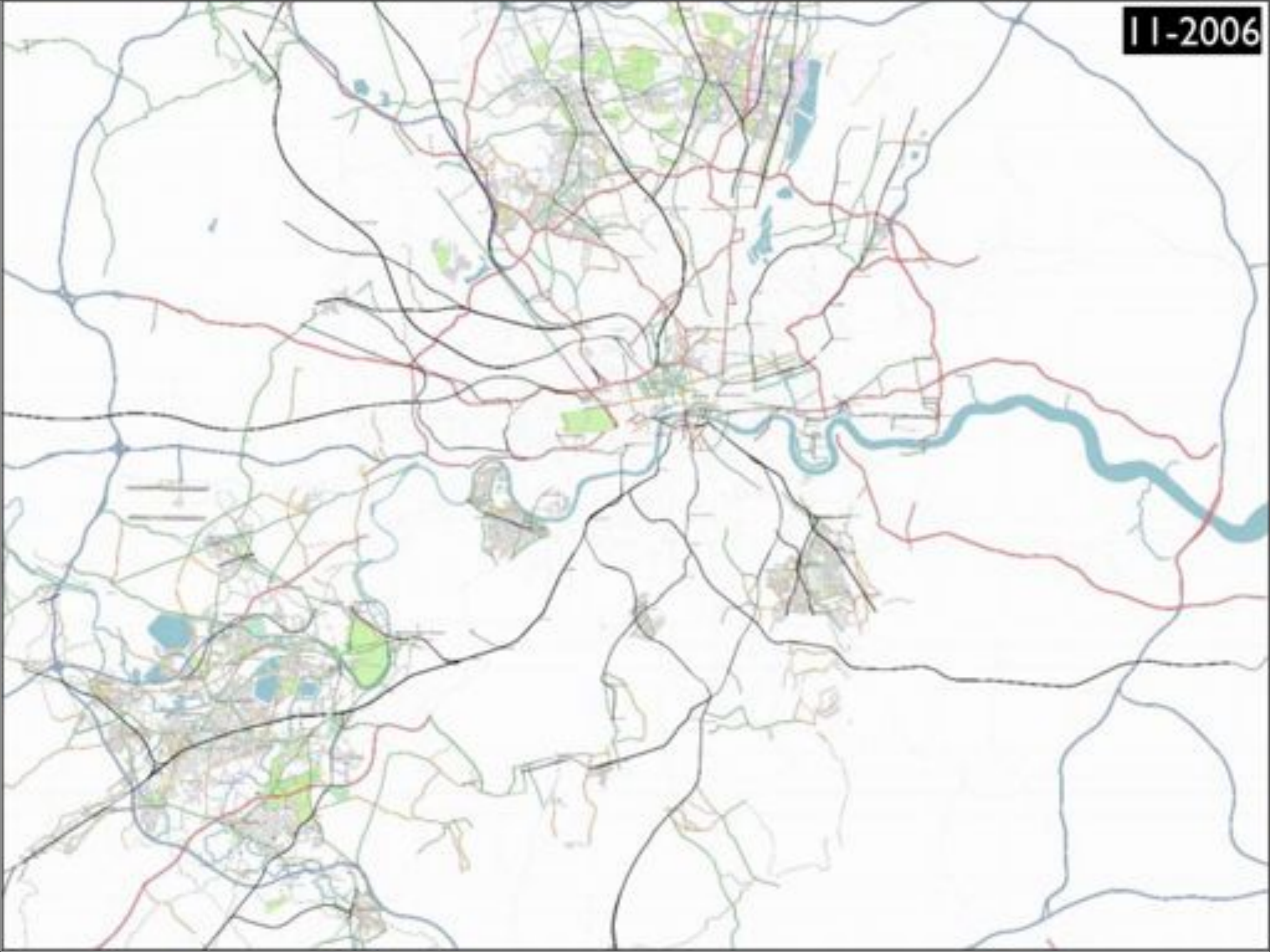
Zoom in to level 12 and click on a tile to request that it be re-rendered.



10-2006



11-2006



12-2006



01-2007



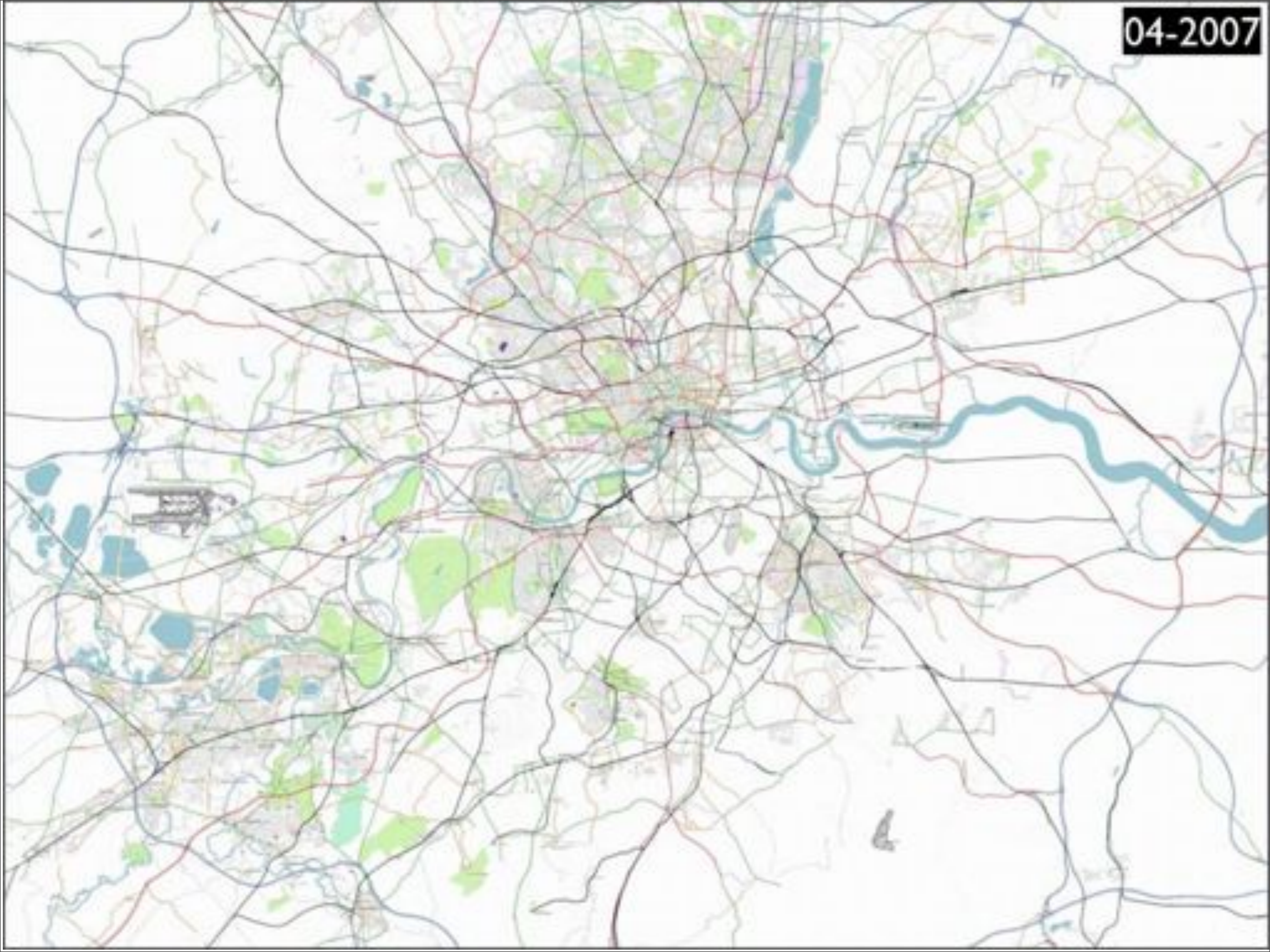
02-2007



03-2007



04-2007

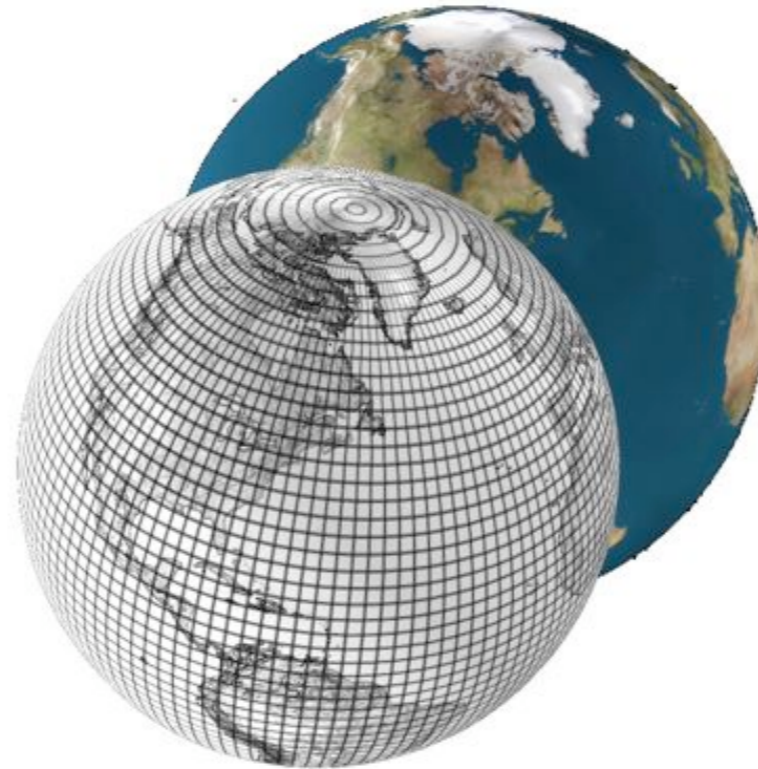


2009-10-16

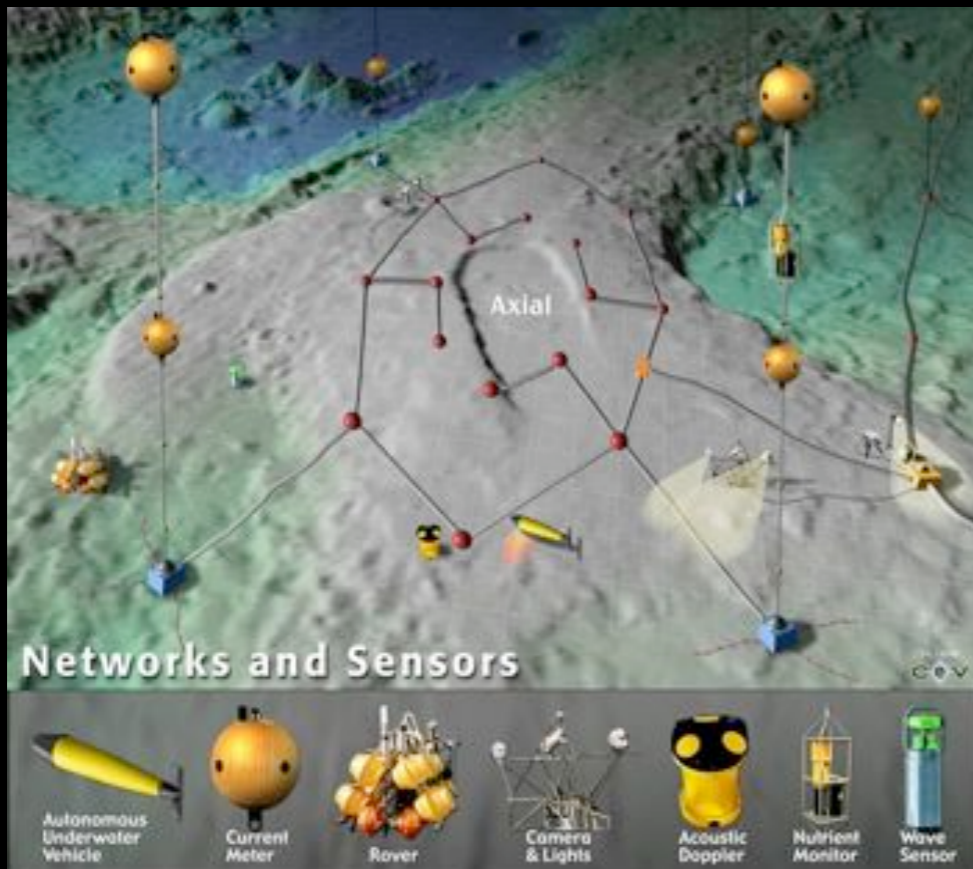


Sensor Networks

Sensors are everywhere



Many sensors are equipped with communication devices



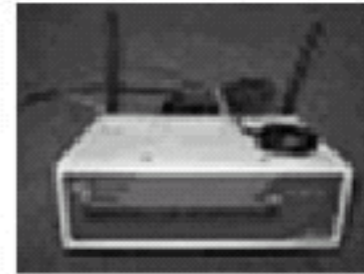
Sensor Networks Evolution



Crossbow



Ember



Sensoria



Dust, Inc.



MIT 1984

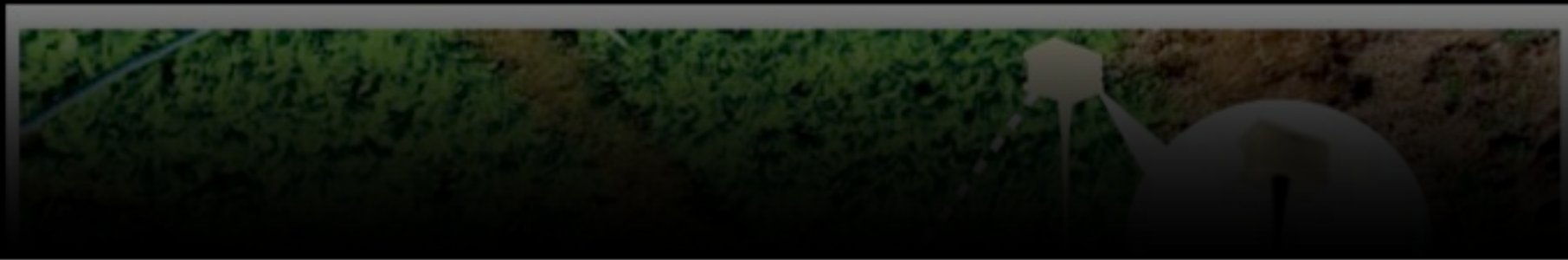
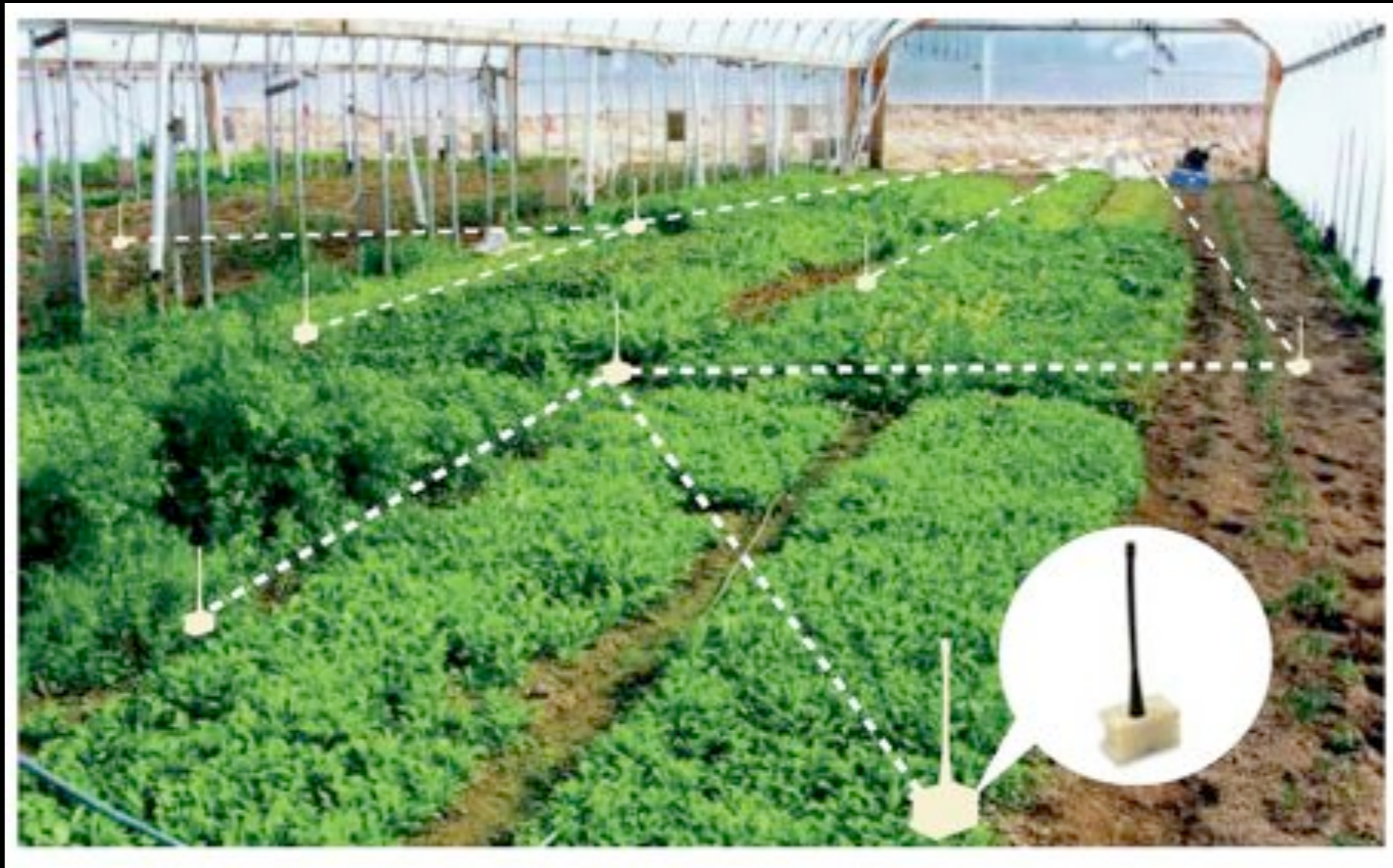
Crossbow

Ember

Sensoria

Dust, Inc.

Embedded Sensing



TelosB Mote



- humidity, temperature, and light
- \$132.10 CAD

Open Source Hardware



Arduino Platform

Controller + temperature +
movement + light = \$ 65.16

<http://www.robotshop.ca/New-arrivals/arduino-usb-microcontroller-sensor-experimentation-kit.html>

The Macroscope Vision

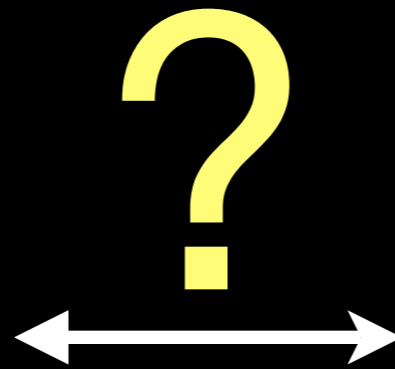
- The unprecedented amount of sensors will allow us to
 - observe the world at very **high spatial resolution**
 - perform these observations **continuously**
 - collect them in **digital form**
- They can be considered as **intelligent computers in the field** rather than dumb data collectors

Sensor Networks

to

Sensor Web

Links between different sensor networks are missing



What if we can **remix**
different sensor
networks for
unexpected uses?

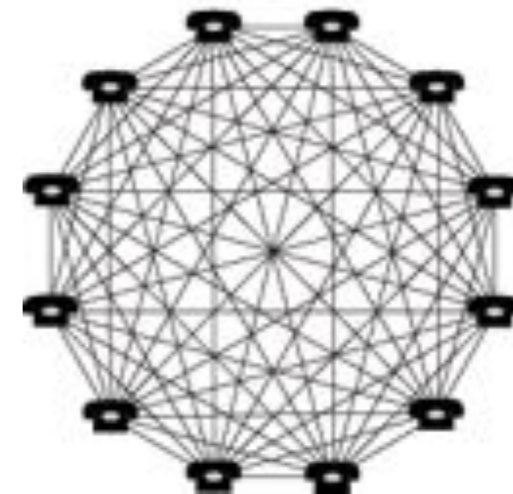
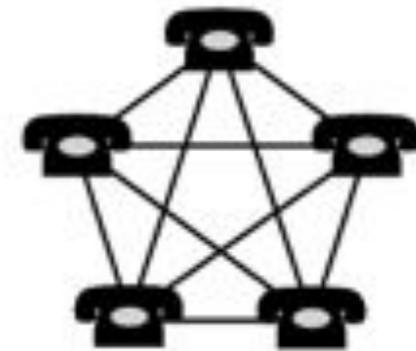
Innovation in Assembly Network Effect

The value of a network is proportional to the square of the number of links of the system (n^2).

How many unique links in a network?

Examples:

facebook



GeOCENS

GEOspatial Cyberinfrastructure
for ENvironmental Sensing

canarie



CYBERA

OGC



UNIVERSITY OF
CALGARY

GeoCENS Mission Statement

To Enable scientists

- to collaborate on a scale not currently possible and ;
- to share and access scientific (sensor) data in a way not currently possible.

Function Goals

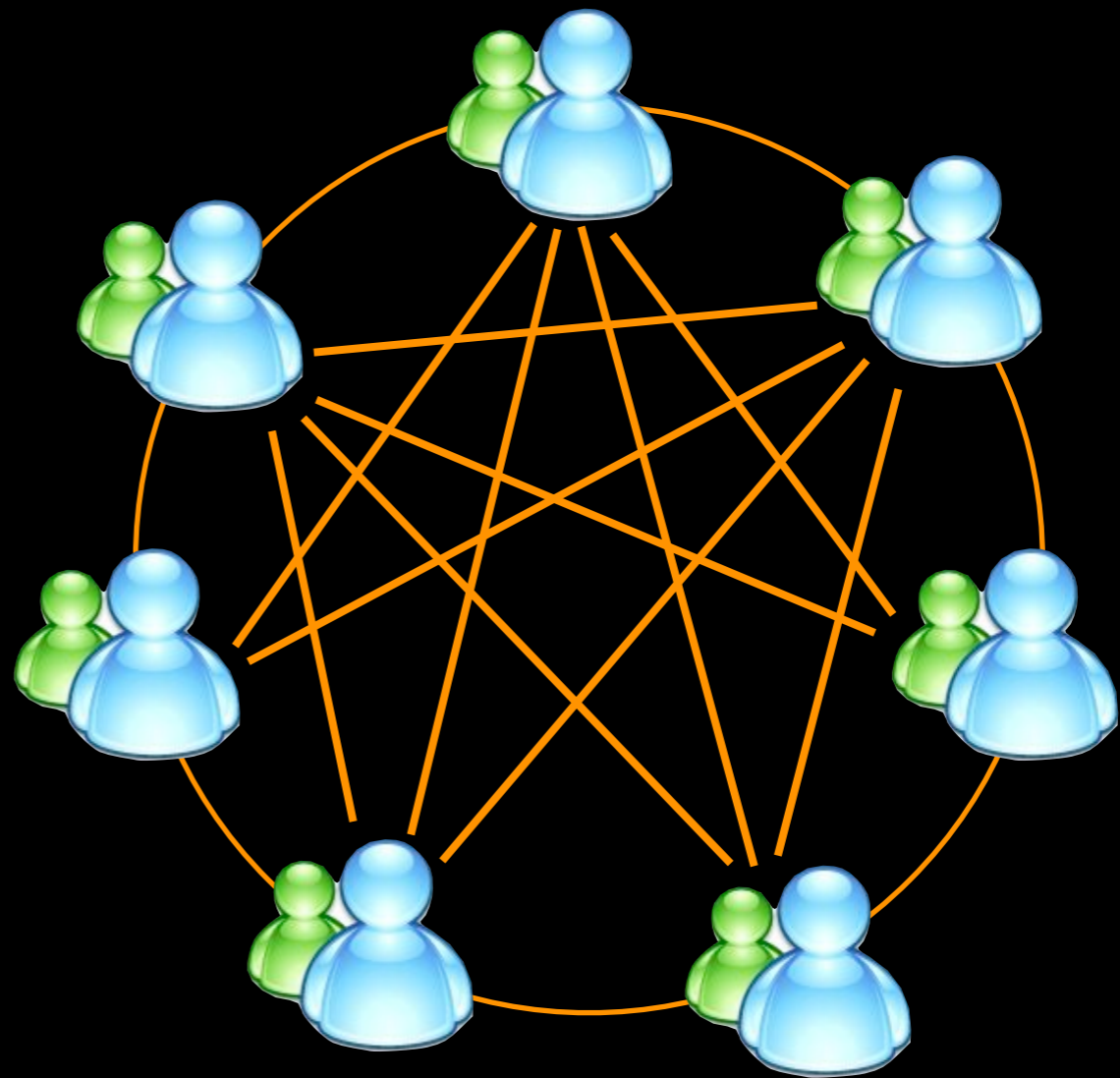
- Enable scientists, using an intuitive geographical interface, to browse, search for, and access biogeological sensors and data sets
- Enable sensor/data providers to publish new sensors/data sets and make them search-able and access-able
- Enable users to control sensors when possible
- Enable users to receive notifications when sensing tasks have been completed
- Enable scientists to build focused, collaborative networks through the use of social networking tools
- Enable users to utilize the CANARIE network to access, transfer and share various data sets and collaborate more effectively with colleagues around the world

Architectural Goals

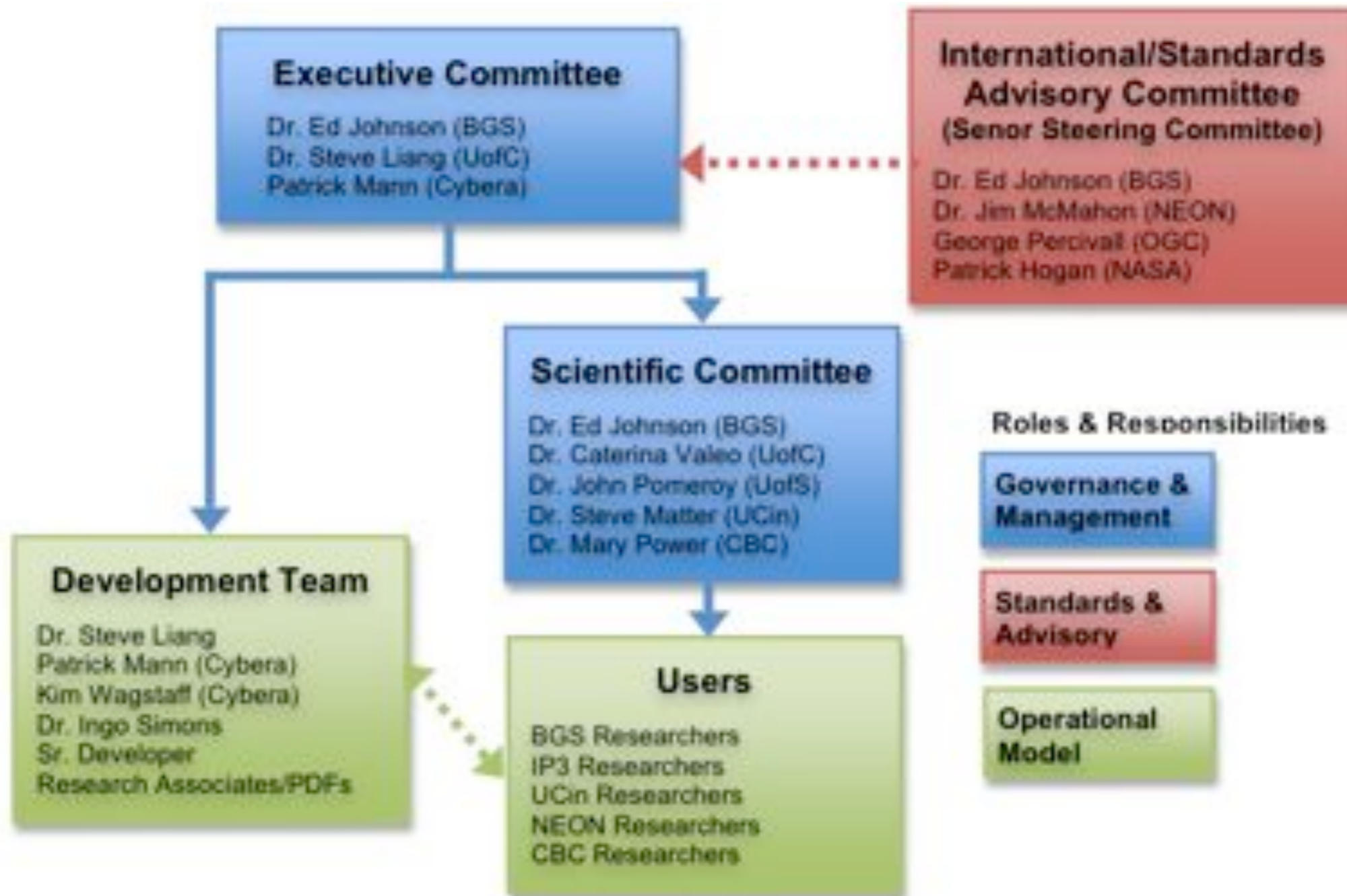
- Interoperable
- Scalable
- Extensible
- Rich User Experience
- Performance
- Sustainable

How do we know we achieve the above goals?

- Users!!
- Network Effect!!



Team in a big picture



GeoCENS

Prototype Demo

Connect Data



NOKIA

Connecting ~~People~~

Data/Sensor

New Computing Platform: Data Driven Computing

Bell's Law (Gordon Bell, 1972)

- A new computing class every 10 years

