GeoCENS
GEOspatial Cyberinfrastructure
for ENvironmental Sensing

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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

250,000 web sites
Content Providers

Published Content

User-Generated Content

45 million global users
Content Consumers

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.
Log in to level 12 and click on a tile to request that it be re-rendered.
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Sensor Networks
Sensors are everywhere
Many sensors are equipped with communication devices
Sensor Networks Evolution

MIT 1984  Crossbow  Ember  Sensoria  Dust, Inc.
TelosB Mote

- humidity, temperature, and light
- $132.10 CAD
Open Source Hardware

Arduino Platform

Controller + temperature + movement + light = $65.16

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?
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
- [Social network diagram]
Query the physical world from anywhere at anytime....
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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

Executive Committee
- Dr. Ed Johnson (BGS)
- Dr. Steve Liang (UofC)
- Patrick Mann (Cybera)

Scientific Committee
- Dr. Ed Johnson (BGS)
- Dr. Caterina Valeo (UofC)
- Dr. John Porcher (UofS)
- Dr. Steve Matter (UCin)
- Dr. Mary Power (CBC)

Development Team
- Dr. Steve Liang
- Patrick Mann (Cybera)
- Kim Wagstaff (Cybera)
- Dr. Ingo Simons
- Sr. Developer
- Research Associates/PDFs

International/Standards Advisory Committee
- Dr. Ed Johnson (BGS)
- Dr. Jim McMahon (NEON)
- George Percival (OGC)
- Patrick Hogan (NASA)

Roles & Responsibilities
- Governance & Management
- Standards & Advisory
- Operational Model

Users
- BGS Researchers
- IP3 Researchers
- UCin Researchers
- NEON Researchers
- CBC Researchers
GeoCENS
Prototype Demo
Connect Data
New Computing Platform: Data Driven Computing

Bell’s Law (Gordon Bell, 1972)

"A new computing class every 10 years"

(Polastre, 2004)