



CitySense

An Open, City-Wide Wireless Sensor Network

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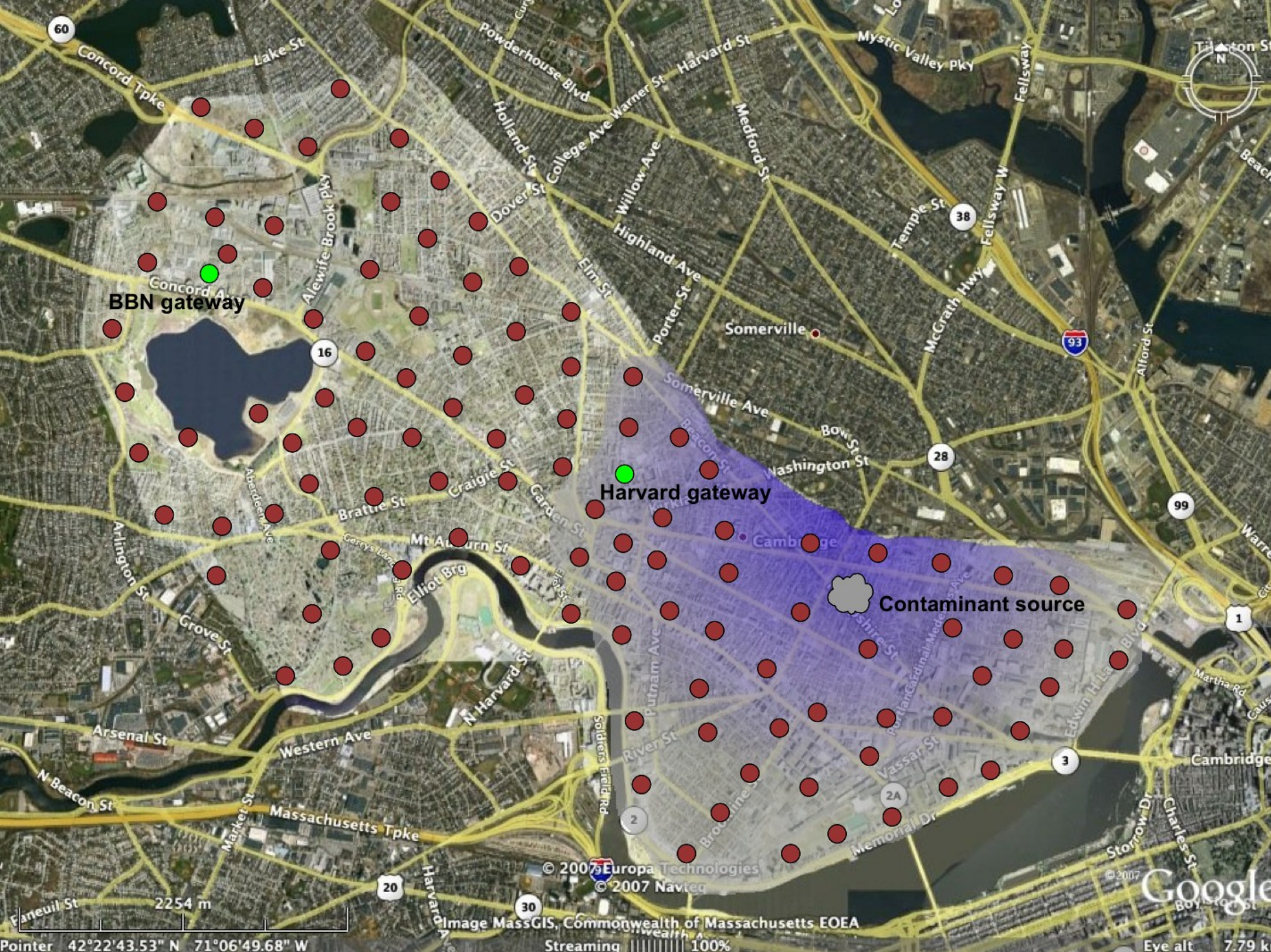
CitySense Concept

100+ Linux PCs with 802.11a/b/g
on buildings and streetlights throughout a city
(current target is Cambridge, MA)

Sensors for monitoring air quality, weather,
road traffic, contaminants, ...

The network is programmable
by anyone (this means you)!





2254 m

Pointer 42°22'43.53" N 71°06'49.68" W

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Image MassGIS, Commonwealth of Massachusetts EOE

Streaming 100%

Google

Eye alt 7.79 k

CitySense Node Design

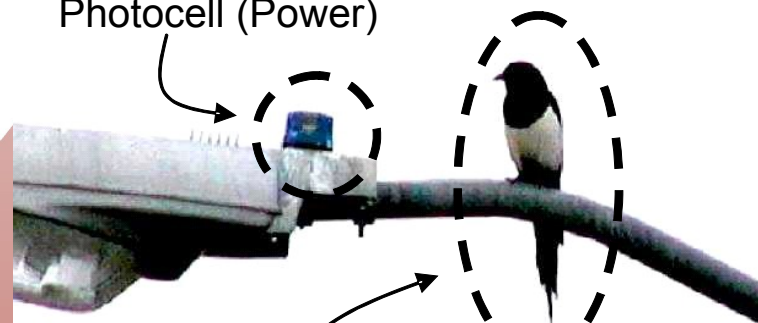
Soekris net4826 embedded PC running Linux

- 256 MB of RAM+flash, 1 GB USB flash drive
- Two Atheros 802.11a/b/g radios, 8.5 dBi omni antennas

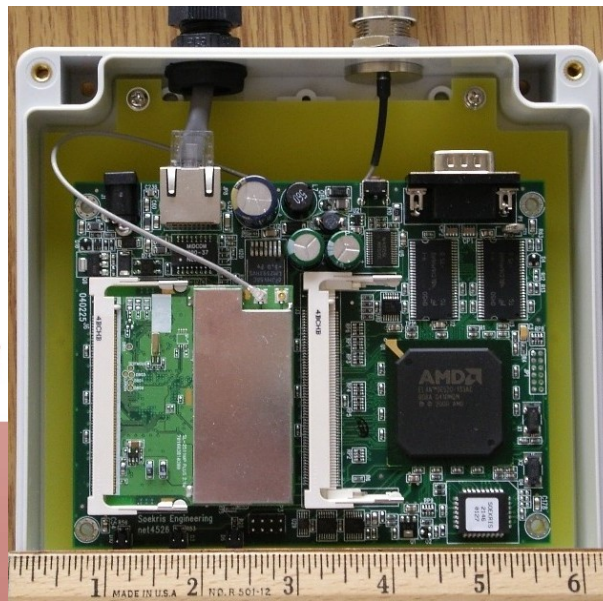
Various sensors driven by app requirements

- Vaisala Weather Sensor (temp, humidity, pressure, wind, rain, ...)
- Air particulate sensor (PM10 for air quality studies)
- Gas sensors (CO₂, CO, NOX, ...)
- ~~Microphones? Cameras?~~

Photocell (Power)



CitySense Node goes here



CitySense Networking

CitySense nodes will use mesh networking over 802.11 to communicate.

Only a few nodes will have wired connections to the Internet, acting as data sinks.

Plan to leverage existing mesh solutions if possible.



Why an *open* testbed?

Our goal is to support a wide range of research:

- Sensor networks, wireless mesh, distributed applications.
- CitySense : Wireless :: PlanetLab : Internet

Anyone will be able to get an account and program the CitySense nodes, over a Web interface.

- Collect sensor data, run experiments, develop new applications.

We want your crazy ideas.

- If we build it, we hope you will come.



Some Research Challenges

Resource management and sharing

- How to support many applications? Fairness? Security? Sandboxing?

Programming models and languages

- What is the right programming abstraction for a city-wide sensor network? ssh into every node? SQL? Something in between?

Robustness and administration

- How to administer and maintain a network of 100+ nodes over a wireless mesh, without physical access?



More Research Challenges

Security and privacy

- How to prevent script kiddies from taking over the network?
- Access to raw data may be limited by various policies

Interfacing to mobile and low-power sensors

- Tie-in with data collected by cell phones, mote networks, vehicular sensors

Extensibility and customization

- Tension between supporting many users and customizing for specific application needs



Thanks

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<http://www.citysense.net>

