

A Distributed Large Sensor Network Observing Global Environment



NiCT



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(NAIST / NICT)



Our belief

Sensor data

is

Common property

Live!

Weather Sensors

- attributes
 - temperature
 - humidity
 - pressure
 - rainfall
 - wind direction
 - wind speed
 - CO2



Vaisala WXT510



WM918



WMR968

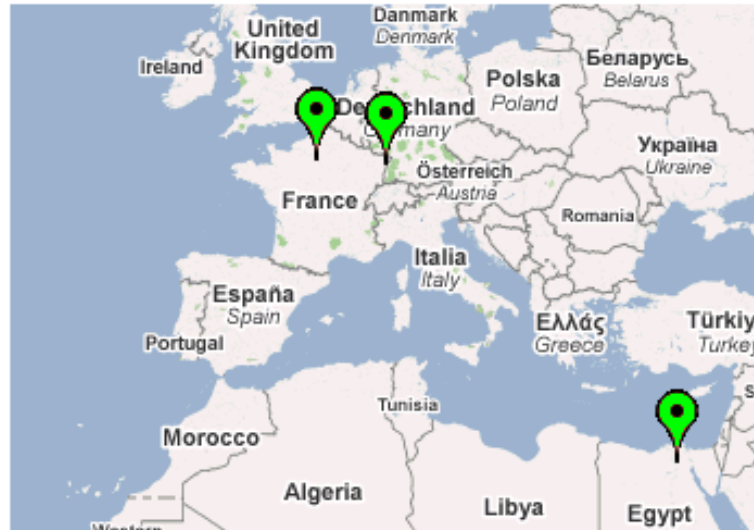


VantagePRO2



One-Wire Weather Station

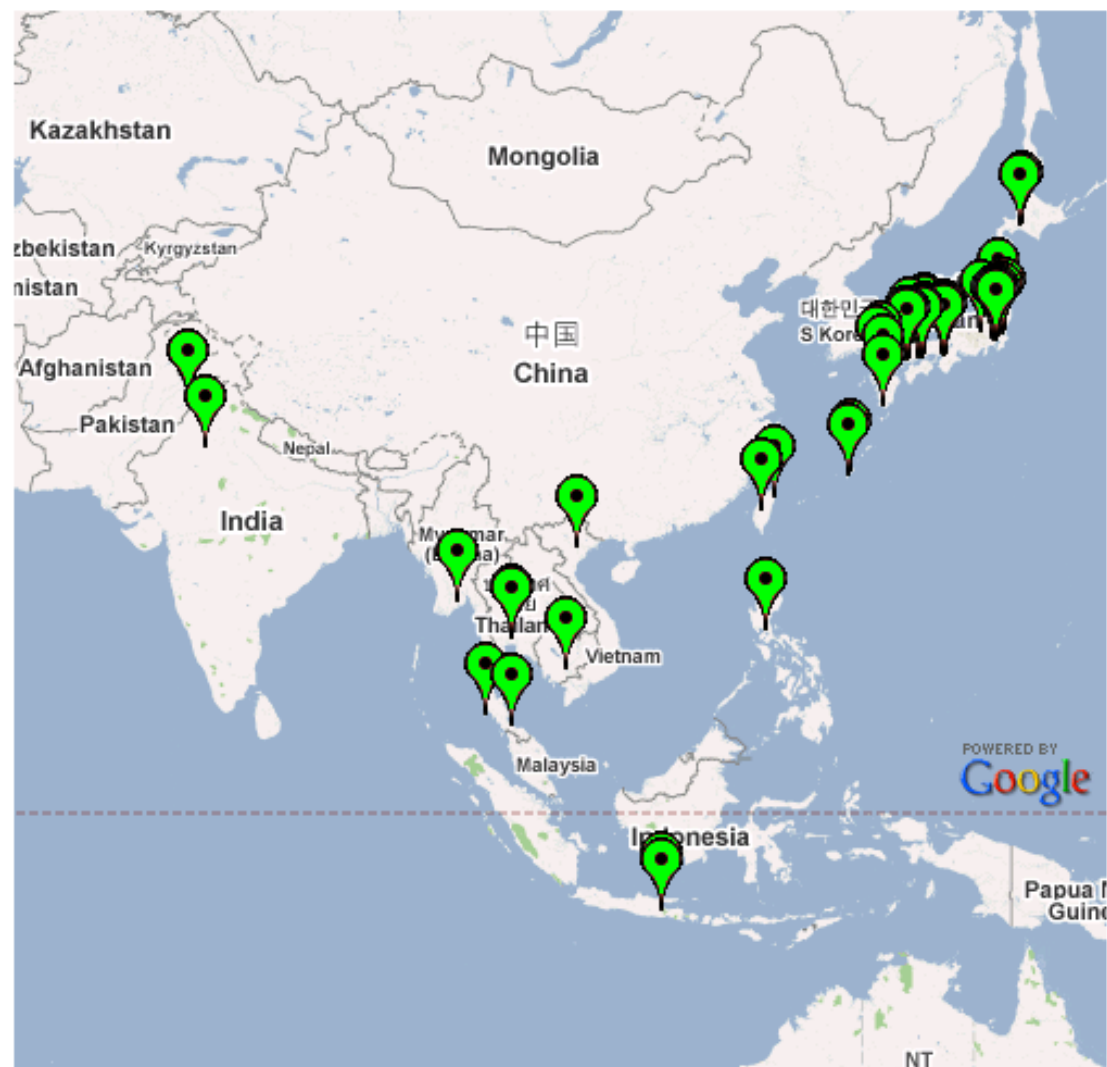
Live E! Sensor Deployment Status



Europe & Africa



North America



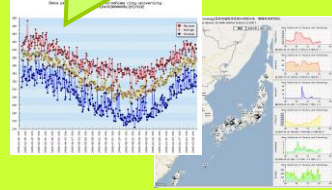
Asia

In Dec. 2008

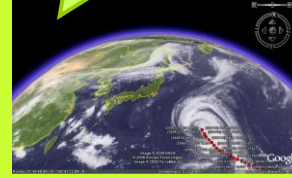
Disaster Management



Science



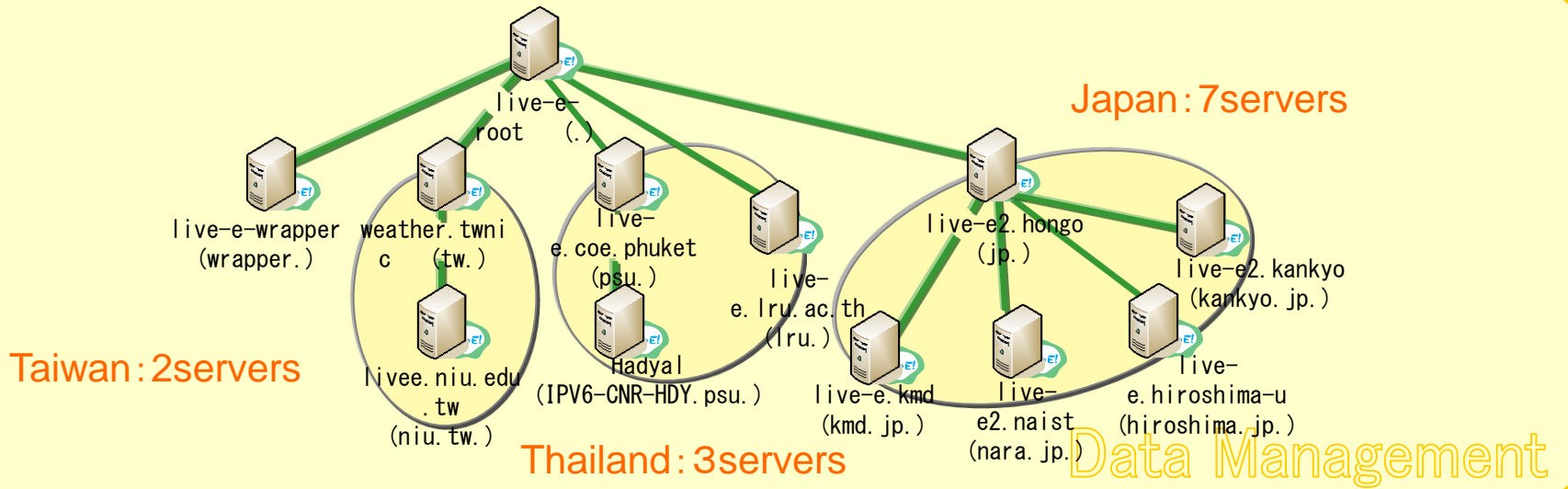
Education / Agriculture



Facility Management



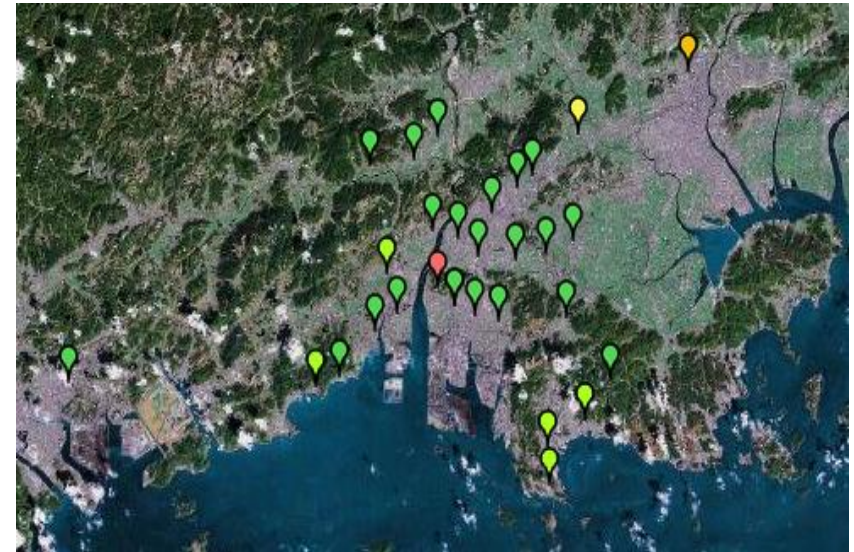
Applications



Sensors

Disaster prevention

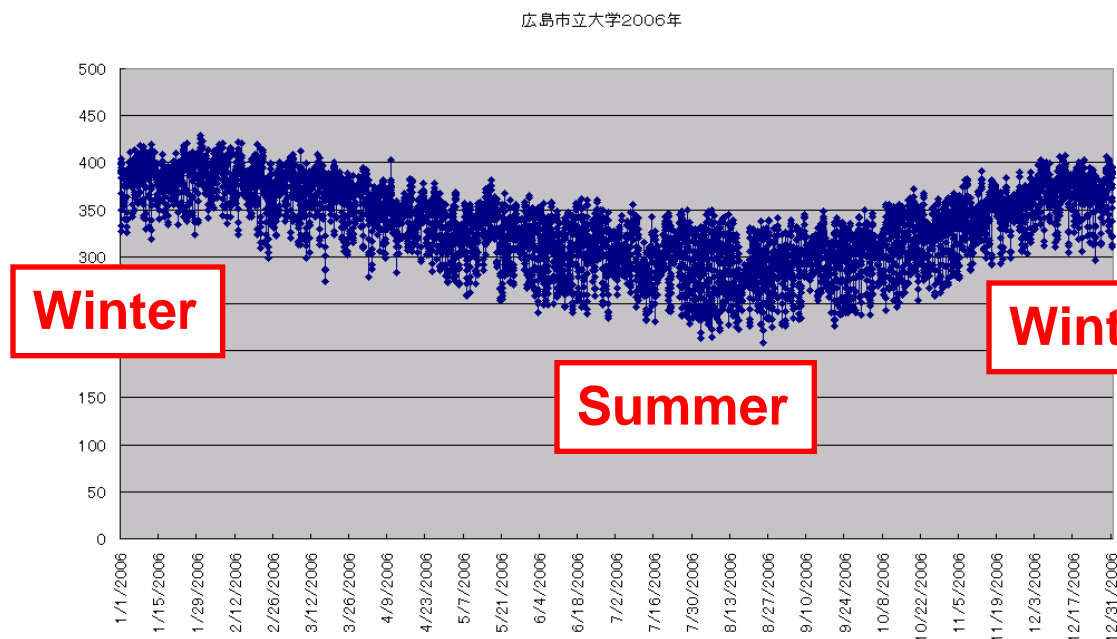
- Kurashiki City (Japan)
 - Evacuation instructions
 - Weather sensors at schools
 - 3km × 3km
 - 20, 30 times than AMeDASs



<http://live-e.naist.jp/map/>

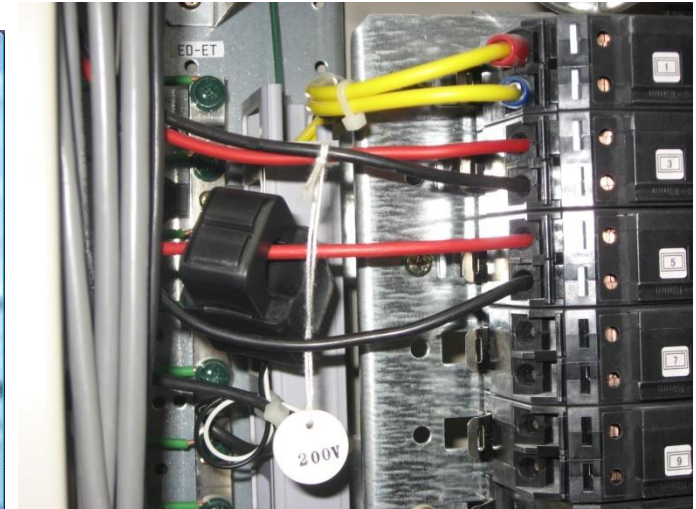
Educational materials

- Hiroshima Pref. (in Japan)
 - Educational applications
 - Making graphs of CO2 data
- Remote school between Japan & Thai



<http://center2.ipc.hiroshima-cu.ac.jp/~kaori/live-e/CO2/>

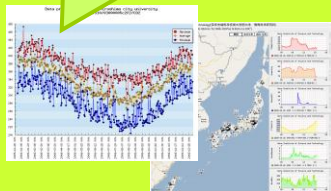
Visualize power consumption



Disaster Management



Science



Education / Agriculture



Facility Management



Applications

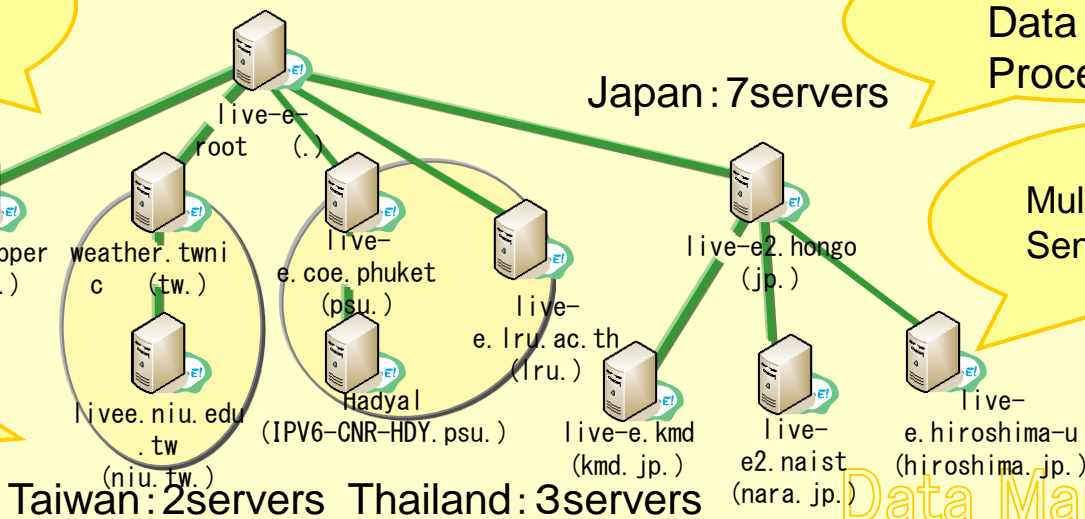
Multi-Attribute search

In-Network Data Processing

Sensor & Overlay

Multi-Domain Sensor Networking

Live E! on PIAX



Data Management

Delay Tolerant Network

Embedded gateway



Sensors



examples of our activities

2nd Live E! Workshop@Thai Chiangmai Univ.



C40@the Tokyo Metropolitan Government



3rd Live E! Workshop(APNG CAMP)@Thai, AIT



Live E! Symposium@Tokyo Univ.



SC08/SC09@Austin/Portland, USA



2nd Sensor & Overlay workshop@SFC

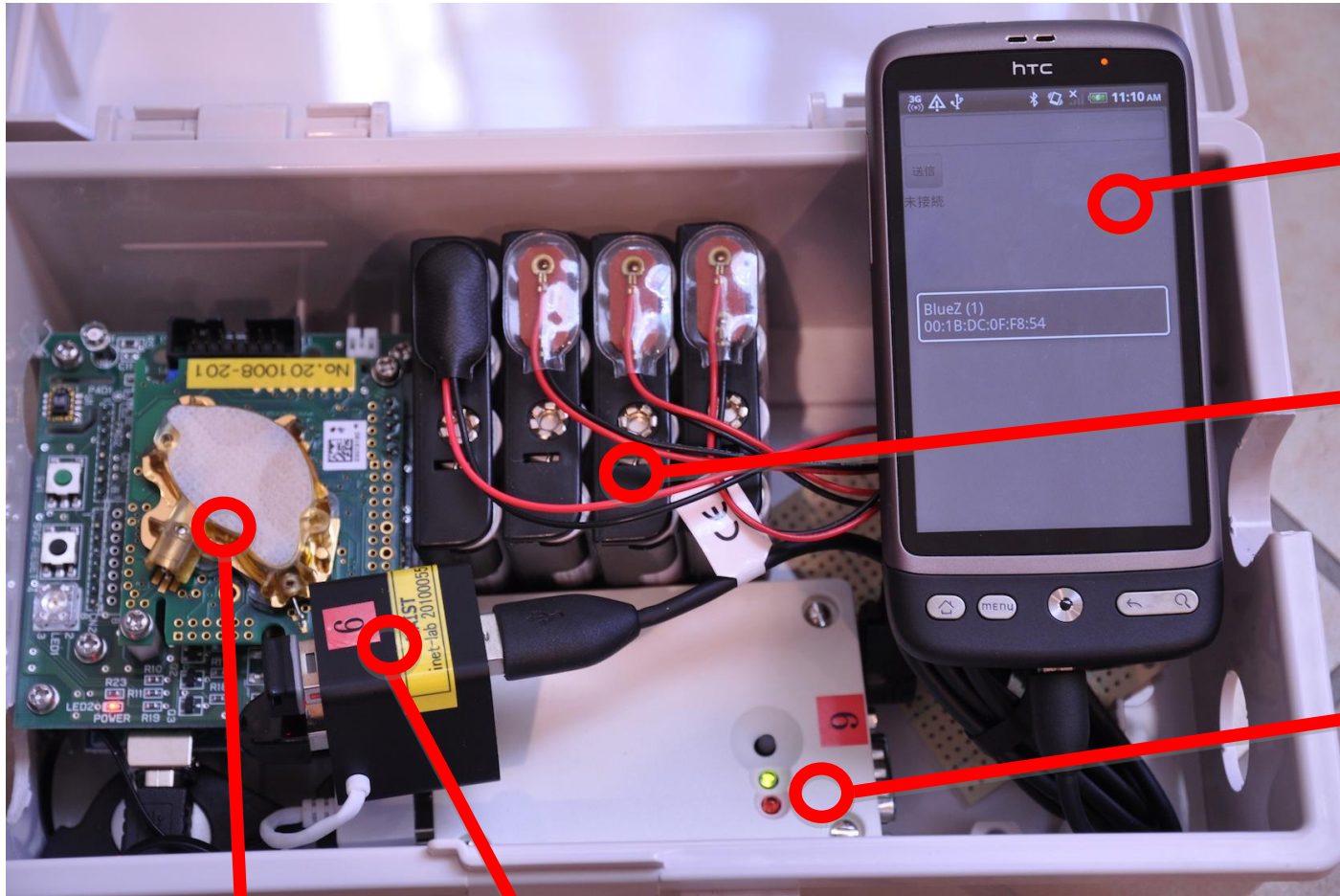


CO2 in a shopping mall

- examine relationship between the number of people and CO2 density
- set up 19 sensors
 - 10 sensors have the Internet connection
 - 9 sensors are stand-alone



sensor node equipment



Android
(with SIM card)

Battery 4.8V
(1.2V, 1,900mAh * 4)

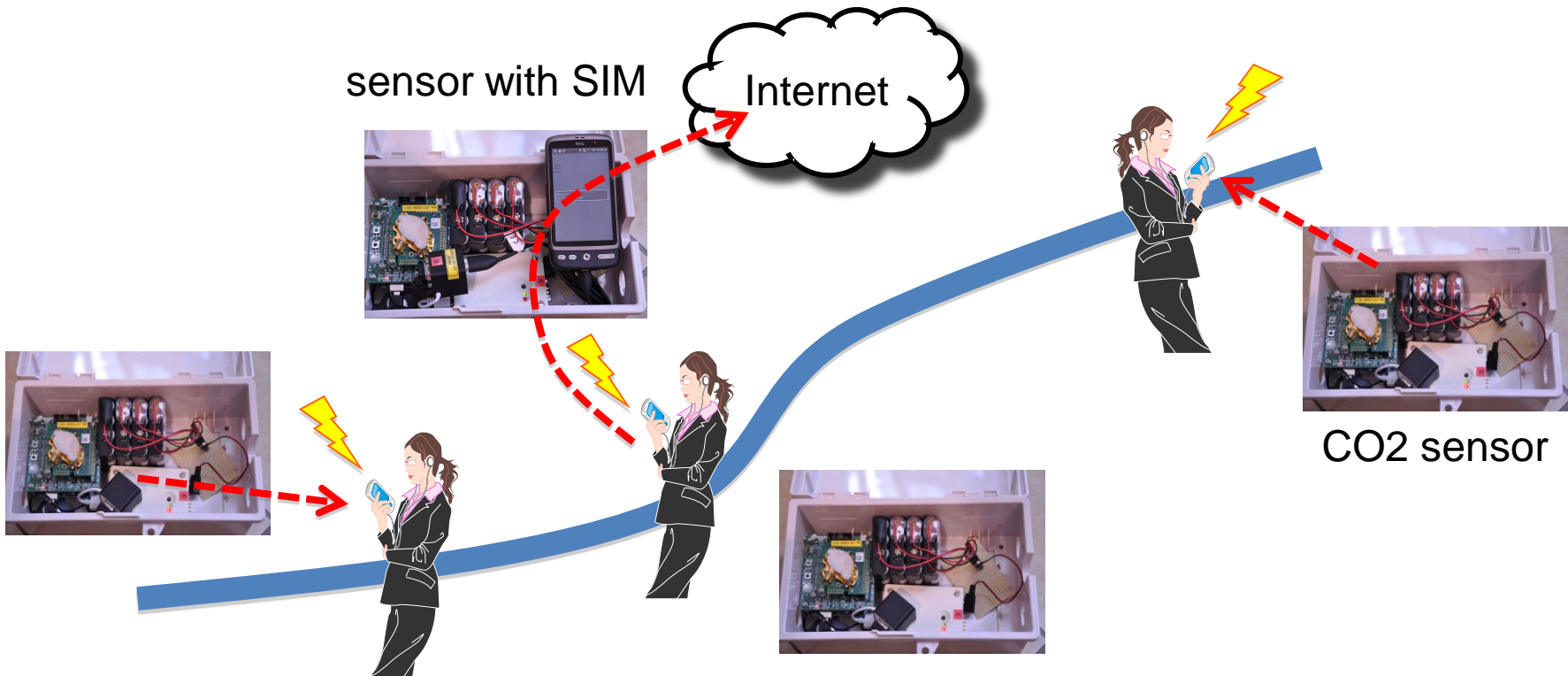
Armadillo 220
(embedded Linux)

CO2 sensor

Bluetooth,
USB storage

Delay Tolerant Network

- people wander the shopping mall with Android
 - people gather CO2 through Bluetooth communication
 - upload CO2 data if people connect a sensor with SIM



3F

SIM

2. softbank

3. smoking room

1. sofa

4. service counter



キッズスペース
柏の森
クライミング
ウォール

P5
P4
立体
駐車場



スモーカーズ
ラウンジ



コミュニティ
ダイニング
(フードコート)

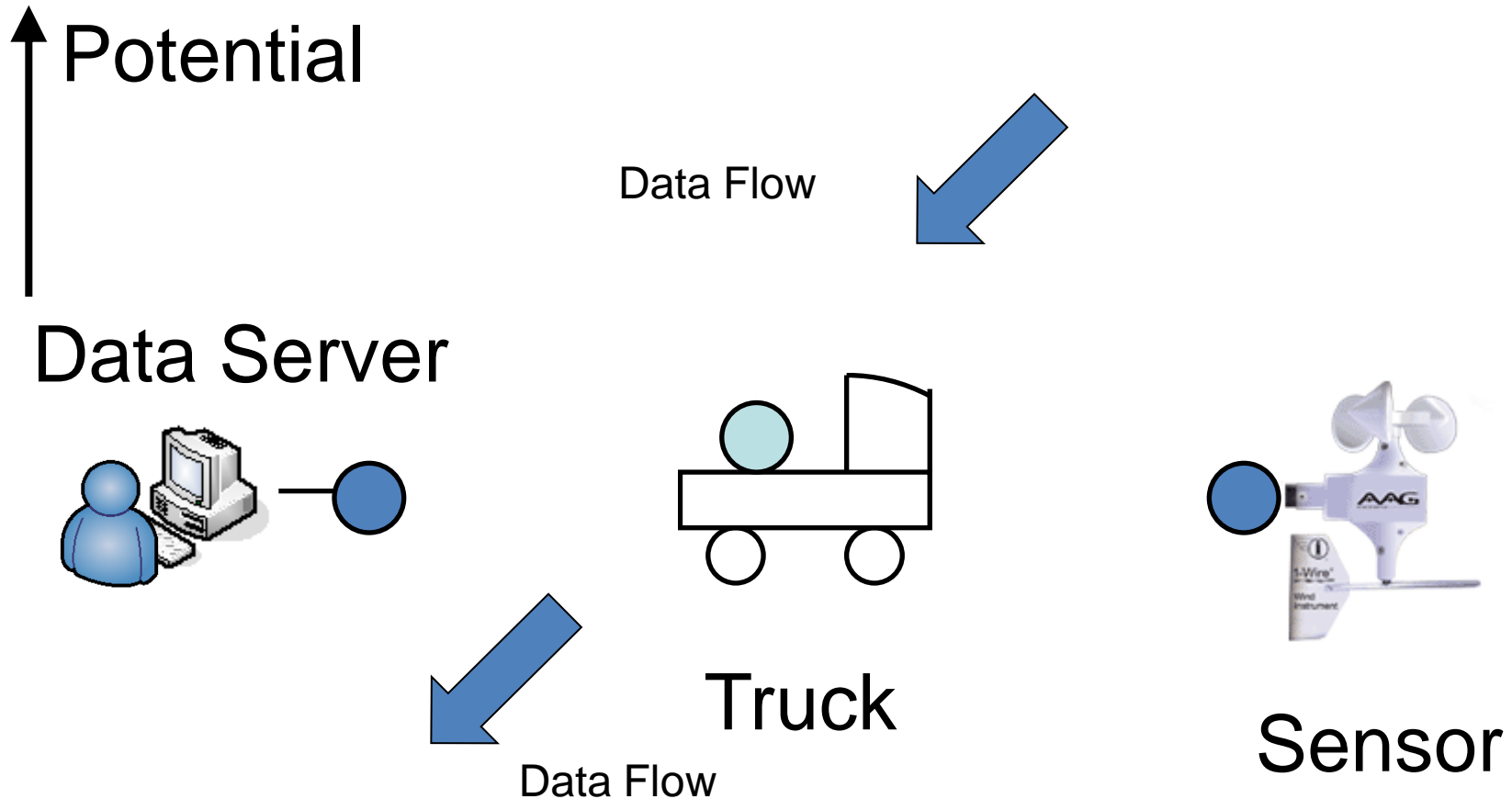


sensor



Internet
connectivity

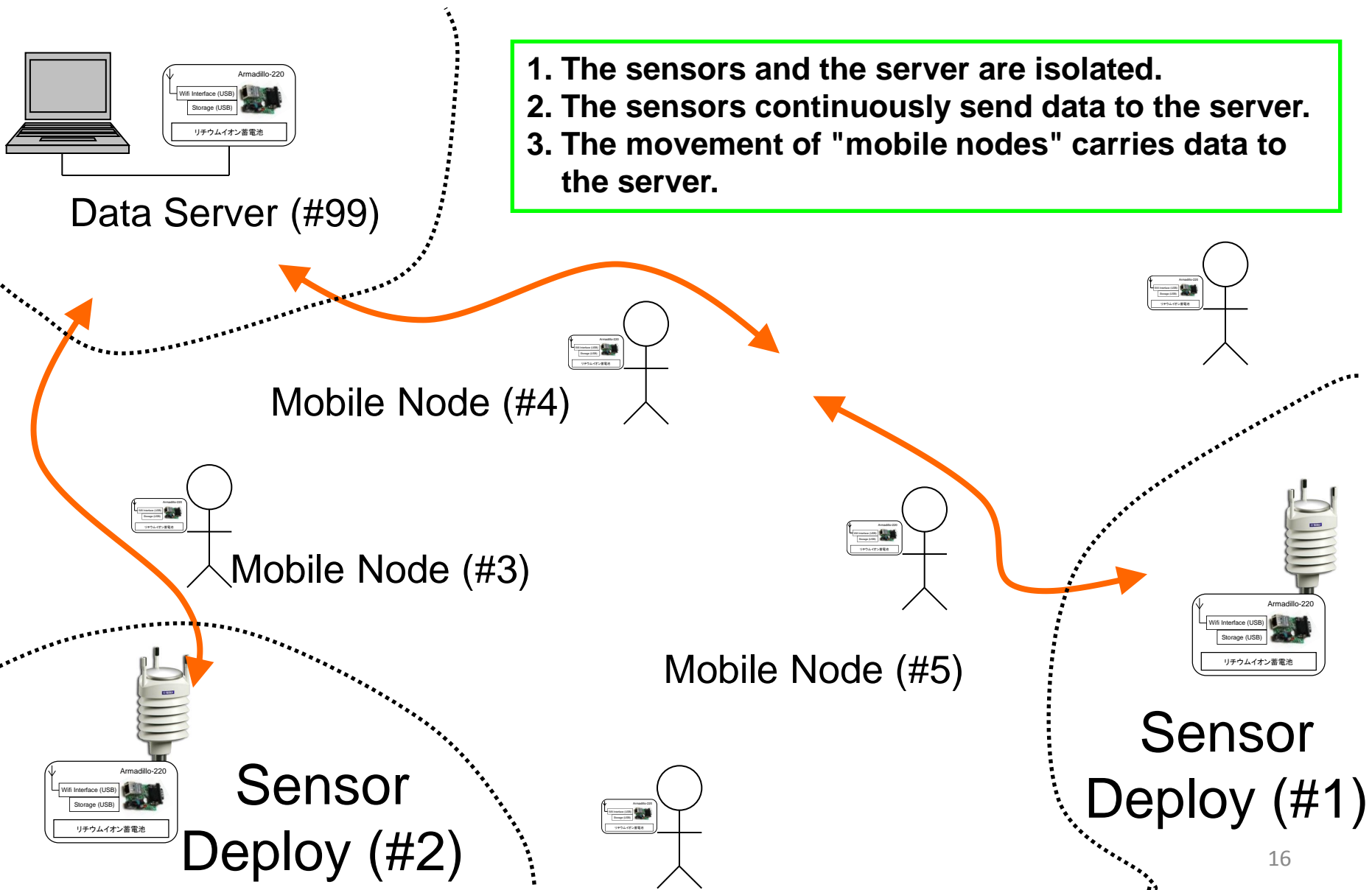
Routing in DTN: Potential-Based Routing (PBR)



To deliver sensor readings to the data server

● : Wireless device

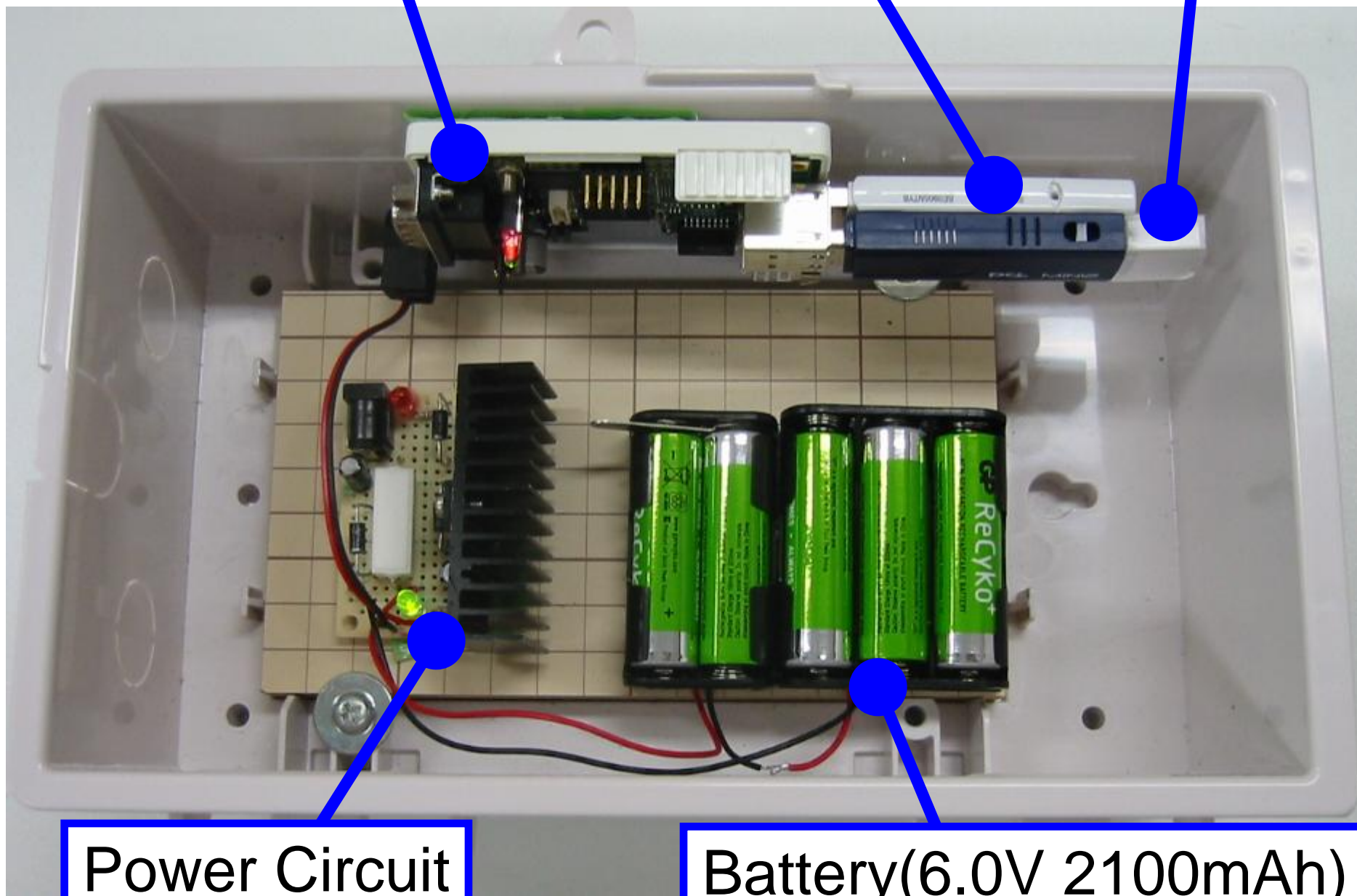
Experiment Scenario



Armadillo220

Storage(2GByte)

Wifi 802.11g



Power Circuit

Battery(6.0V 2100mAh)

demo

1521 (NICT)

2156 (NAIST)

