

Global Sensor Networks

Integrating Heterogeneous Sensor Networks





Ali Salehi

Distributed Information Systems Laboratory (LSIR)
Department of Computer Science
Ecole Polytechnique Fédérale de Lausanne

2nd December 2005

Aims

- The technology today we have.
- Practical problems.
- Research problems.
- Introducing the Global Sensor Network.
- Supported systems,
- Implementation details

			
12 Mhz	200 Mhz(linux)	55 Mhz(linux)	—
512Kb	16 MB	8 MB	8 Byte - 16KB
230 Kbps	802.11b	10/100 Eth.	—
Light Temperature Sound Barometric Pressure 2-Axis Accelerometer 2-Axis Magnetometer GPS	640X480 @ 30fps	—	—

Realities in the wireless sensor networks :

- Heterogeneous devices \Rightarrow heterogeneous streams.
- Different abstractions.
- Different capabilities.
- Hard and costly to deploy.
- Changes are difficult.

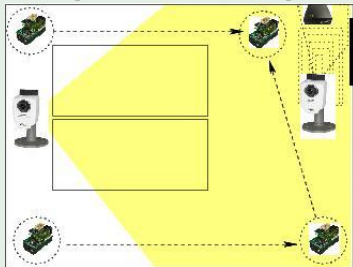
Example

Experience shows that development time for publishing data from a **single** sensor network to the web with a search and notification service takes 2 to 3 months.

The real-power of sensor networks is when one can *combine and correlate* information obtained from *multiple*, possible *heterogeneous* sensor networks.

Example

4 Motes (Light and Temperature)[last 10 seconds], 1 RFID reader[last 1 value], 2 Wireless Cam[last 10 seconds]



```
SELECT camera WHERE
(AVG(Temperature) > 30 OR
RFIDReader.value NOT IN
(SELECT TAG_ID
FROM personel
WHERE personel.lab = LSIR ) )
```

Global Sensor Networks

GSN is an Internet scale infrastructure for rapid deployment and integration of heterogeneous sensor networks.

Functionalities of GSN :

- Directory and Discovery service.
- Uniform abstraction.
- Stream query processing.
- Declarative configuration.
- On-the-fly modifications of the sensor networks.
- Platform for implementing the mobility.
- Integrated Notification system (e.g., Email, SMS ,...).

What if I have one sensor network ? Is GSN useful for me ?



- Rapid deployment.
- History management.
- Easy modification.
- Platform for future integration.
- Real-time notification.
- Various optimizations.

What hardware we **currently** support ?

Motes	TinyOS compatible motes such as : <ul style="list-style-type: none">● Mica, Mica2, Mica2Dot, MicaZ.● Shockfish motes.
RFID Readers	TI S6350, TI S6550, TI MFR and compatible
Cameras	<ul style="list-style-type: none">● Http based wireless cameras.● OV519 and OV530 USB cameras.

Question 1

What are the steps needed to **add** a new **supported** sensor network ?

Answer

Writing a the XML configuration file describing the sensor network.

Typically 40-70 XML lines.

GSN connects to the sensor network and manages the rest.

Question 2

What are the steps needed in order to **add** a new **unsupported** sensor network ?

Answer

Step 1 : Writing a wrapper for the new hardware.

Step 2 : Introducing the wrapper to the GSN.

Step 3 : Back to question 1.

Question 3

How much effort is needed to write a **new wrapper** ?

Answer

TinyOS	180 Lines
Wireless Camera	120 Lines
RFID reader	140 Lines
USB Camera	350 Lines

GSN In Action

Structure of the demo :

Three GSN instances

Two Wireless Camera and one RFID reader

Several tags inside different objects such as Key-chains,
Mobile, Mugs.

