Use of Sensors and SPARQL in Smart Room

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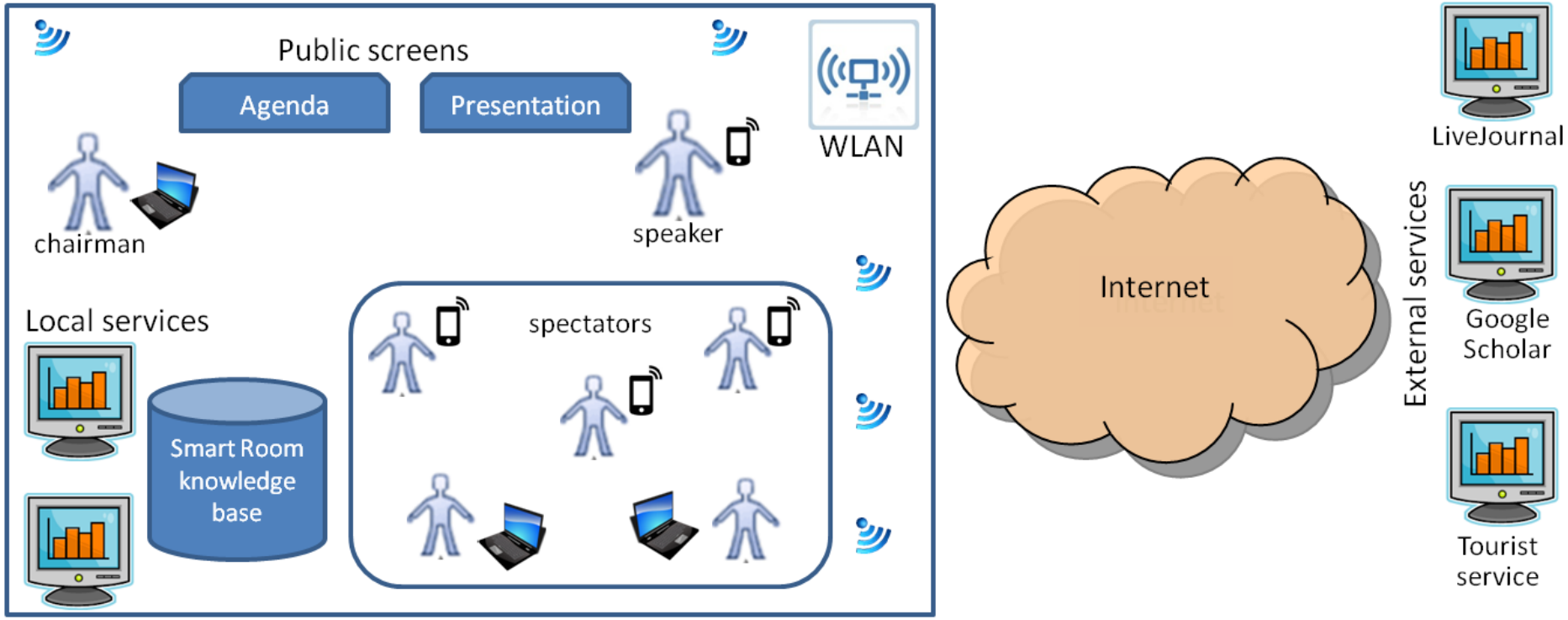
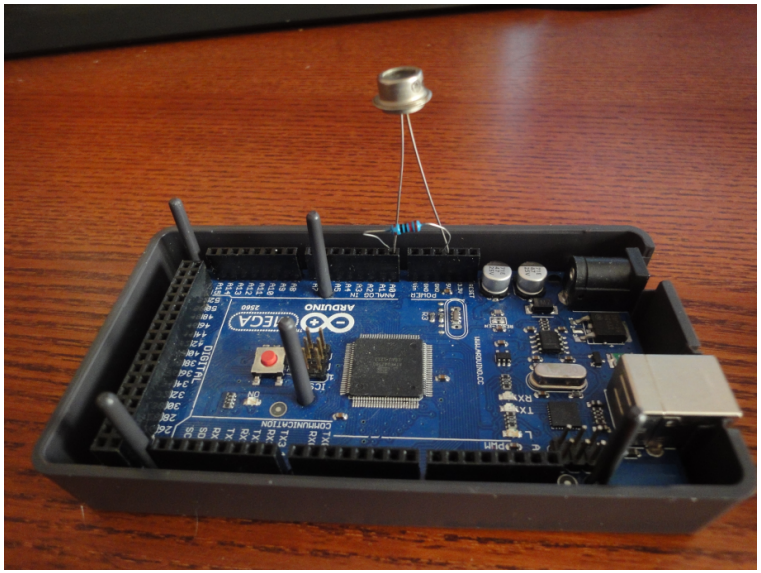
Smart Room description



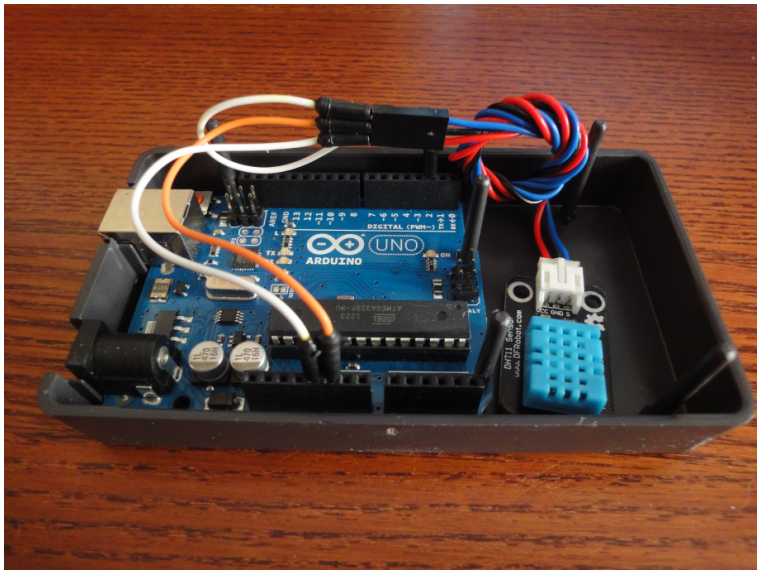
Sensors in Smart Room

- Lighting sensor (FR-764)
- Humidity (DHT-11)
- Temperature (DHT-11)

Lighting sensor:



Temperature and humidity sensor:



Sensor scenarios

- Control of lighting, temperature and humidity in room
- Get the big volume of sensor data and analyse it (detect noise)
- Analyse user activity

RDF data query language SPARQL

- Powerful query language for RDF (triplestore)
- Produced by the W3C RDF Data Access Working Group
- Latest recomendation: 21 March 2013 (SPARQL 1.1)
- Different query forms (select, construct, describe, ask)
- Modifiers (order by) and operators like filter, regex, count and more
- Similar to SQL
- Implemented in Redland SIB

Different types of querying

Triplet templates (with wildcards) in C KPI:

```
ss_add_triple(&req_triple, SUBJECT
    , PREDICATE, SS_RDF_SIB_ANY (
    means any object),
    SS_RDF_TYPE_URI,
    SS_RDF_TYPE_URI);
ss_query(&info, req_triple, &
    result_triples);
```

SPARQL:

```
ss_sparql_construct_query(&info, "
    CONSTRUCT {<SUBJECT> <
    PREDICATE> ?obj} WHERE {<
    SUBJECT> <PREDICATE> ?obj}", &
    results);
or ss_sparql_select_query(&info, "
    SELECT ?obj WHERE {<SUBJECT> <
    PREDICATE> ?obj}", &results, &
    number_of_bindings);
```

Advanced SPARQL query

Triplet templates (with wildcards)

```
ss_add_triple(&req_triple,
    SS_RDF_SIB_ANY, rdf:type, "http
    ://xmlns.com/foaf/0.1/Person",
    SS_RDF_TYPE_URI,
    SS_RDF_TYPE_URI);
ss_query(&info, req_triple, &
    result_triples);
...clear reg_triple, init k = 0 ...
for each (result_triples[i]) {
ss_add_triple(&req_triple,
    result_triples[i]->subject, "
    http://xmlns.com/foaf/0.1/
    status", SS_RDF_SIB_ANY,
    SS_RDF_TYPE_URI,
    SS_RDF_TYPE_LIT);
ss_query(&info, req_triple, &
    result_triples);
if (strcmp(result_triple[0]->object
    , "online") == 0){k++;}
... clear reg_triple...}
```

SPARQL

```
ss_sparql_select_query(&info, "
    SELECT (COUNT(?status) as ?
    onlinePersonCount)
WHERE { ?person rdf:type <http://
    xmlns.com/foaf/0.1/Person>.
       ?person <http://xmlns.com/
           foaf/0.1/status> ?status
           .
       filter regex((?status), "
           online")}", &results, &
           number_of_bindings);
```

Sensor measuring and publishing

```
['Lighting', ' 73\r\n']
Temperature: 25.00

====================
2013-04-22 08:54:37.317499
Old data has been removed
Lighting: 73

['Lighting', ' 73\r\n']
Humidity: 33.00

====================
2013-04-22 08:54:39.319069
Old data has been removed
Lighting: 73

['Lighting', ' 73\r\n']
Temperature: 25.00

====================
2013-04-22 08:54:41.321111
Old data has been removed
Lighting: 75

['Lighting', ' 75\r\n']
Humidity: 33.00

====================
2013-04-22 08:54:43.324291
Old data has been removed
Lighting: 74

['Lighting', ' 74\r\n']
Temperature: 25.00

====================
2013-04-22 08:54:45.325021
Old data has been removed
Lighting: 55
```

```
====================
2013-04-20 16:36:32.257731
Old data has been removed
Traceback (most recent call last):
  File "test_serial_read.py", line 106, in <module>
    first_usb_data = first_usb_port.readline()
  File "/usr/lib/python2.7/dist-packages/serial/serialposix.py", line 456, in read
    raise SerialException('device reports readiness to read but returned no data (device disconnect
serial.serialutil.SerialException: device reports readiness to read but returned no data (device di
buti@buti-AOD257:~/repositories/git/smartroom/services/local-services/sensors/lighting-sens
or$ cd
buti@buti-AOD257:~$ ssls X::10010
Smart space list $Id: ssls.py,v 1.39 2010/07/23 17:04:03 vluukkal Exp $
['X'] 0 > ls
ns_1:hasMeasurementProperty,rdf:type,rdf:Property
ns_2:Temperature-sensor,ns_1:hasMeasurementProperty,"Temperature"
ns_2:Temperature-sensor,rdf:type,ns_1:Sensor
ns_2:Lighting-sensor,ns_1:hasMeasurementProperty,"Lighting"
ns_2:Lighting-sensor,rdf:type,ns_1:Sensor
ns_2:Lighting-sensor,ns_1:hasValue,"69"
ns_2:Humidity-sensor,ns_1:hasMeasurementProperty,"Humidity"
ns_2:Humidity-sensor,rdf:type,ns_1:Sensor
ns_2:Humidity-sensor,ns_1:hasValue,"33.00"
ns_1:hasValue,rdf:type,rdf:Property
ns_1:Sensor,rdf:type,rdfs:Class
['X'] 0 > l
```

Sensor data consumer

Sensor information consumer

Sensor emulator

Controller

```
kirill@kirill-VirtualBox:~/HelloSensors$ ./controller
KP join to SS. Press ctrl+C to exit.
Sensor http://example.org/#TemperatureSensor hasValue 87
Sensor http://example.org/#LightingSensor hasValue 87
Sensor http://example.org/#TemperatureSensor has new value 3
Sensor http://example.org/#TemperatureSensor old value 87
Sensor http://example.org/#LightingSensor has new value 3
Sensor http://example.org/#LightingSensor old value 87

Sensor http://example.org/#TemperatureSensor has new value 30
Sensor http://example.org/#TemperatureSensor old value 3
Sensor http://example.org/#LightingSensor has new value 30
Sensor http://example.org/#LightingSensor old value 3

Sensor http://example.org/#TemperatureSensor has new value 83
Sensor http://example.org/#TemperatureSensor old value 30
Sensor http://example.org/#LightingSensor has new value 83
Sensor http://example.org/#LightingSensor old value 30
```

Sensor emulator

```
kirill@kirill-VirtualBox:~/HelloSensors$ ./sensor
KP join to SS. Press ctrl+C to exit.
Publishing values from these sensors:
1.TemperatureSensor (status: on)
2.LightingSensor (status: on)
Enter number of sensor to start or stop publish:
```

Demo showing

- Interacts with Smart Room demo
- Consists of three sensors (humidty, temperature, lighting)
- Uses the Smart Room ontology