

Discovering the Sensor Web through Mobile Applications

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Sensor Web 2.0

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Review

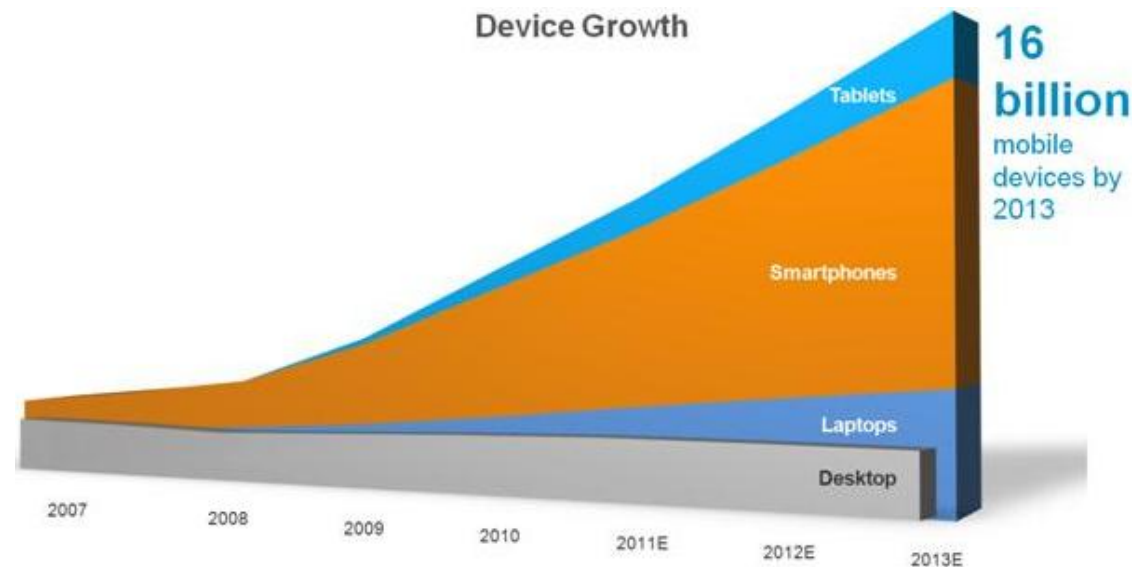
New Generation Sensor Web Enablement

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Christoph Stasch ¹, Steve Liang ⁵ and Rob Lemmens ²

... is defined as an infrastructure which enables an interoperable usage of sensor resources by enabling their **discovery**, **access**, **tasking**, as well as **eventing** and **alerting**... [Bröring et al. 2011]

Discovery in mobile applications

- OpenSearch
 - REST-based interface
 - Simple API
- Sensor Web 2.0
 - Discovery
 - Eventing



Source: Gartner Research; Smartphone, Tablet, and PC Forecast, December 2010

Use case – EEA air quality

PM10 annual average, 2005

Overview map

Select Air Quality Map

- Ozone
- Particulate Matter
- Nitrogen oxides
- Sulphur dioxide

Map legend and layers

- Rural background stations
 - ≤ 10 ug/m3
 - 10 - 20 ug/m3
 - 20 - 40 ug/m3
 - 40 - 45 ug/m3
 - > 45 ug/m3
- Urban and suburban backg
 - ≤ 10 ug/m3
 - 10 - 20 ug/m3
 - 20 - 40 ug/m3
 - 40 - 45 ug/m3
 - > 45 ug/m3
- Country border

PM10 annual average, 2005

- ≤ 10 ug/m3
- 10 - 20 ug/m3

Find location

Map view | Download | Disclaimer | Map Explanation

Interpolation dataset: AirBase Viewer version 2

Air quality reporting stations

See where reporting stations are located, what their characteristics are and what they measured. You can zoom map or by writing the name of a place. When you zoom in, the background map will also show land cover info station to display its data.

AirBase Stations Overview

Overview map

Map legend

Station Types

- Industrial
- Background
- Traffic
- Unknown

Country border

EU and EEA Member and Coll

Find location

Filter Options

- Go to Main Filter List
- Main filter: Components
- All included components

11123 records from 1025 station(s) in filter

Countries: all available

Component: Particulate matter < 10 µm (aerospol)

Station Areas: rural, urban

Station Types: Industrial, Traffic

Query

Map view | Map Explanation | Station list

Access dataset here. AirBase Viewer version 1.0

Airbase data description:
<http://www.eea.europa.eu/data-and-maps/data/airbase-the-european-air-quality-database-3>

Source: EEA Air quality viewer -
<http://www.eea.europa.eu/the-mes/air/airbase/map-statistics>

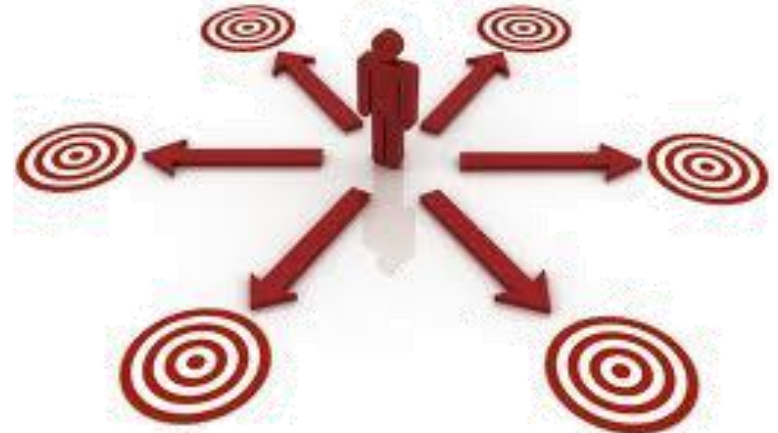
European Environment Agency

Requirement – Resource efficiency



Minimized communication & processing
overhead

Requirement – spatial context



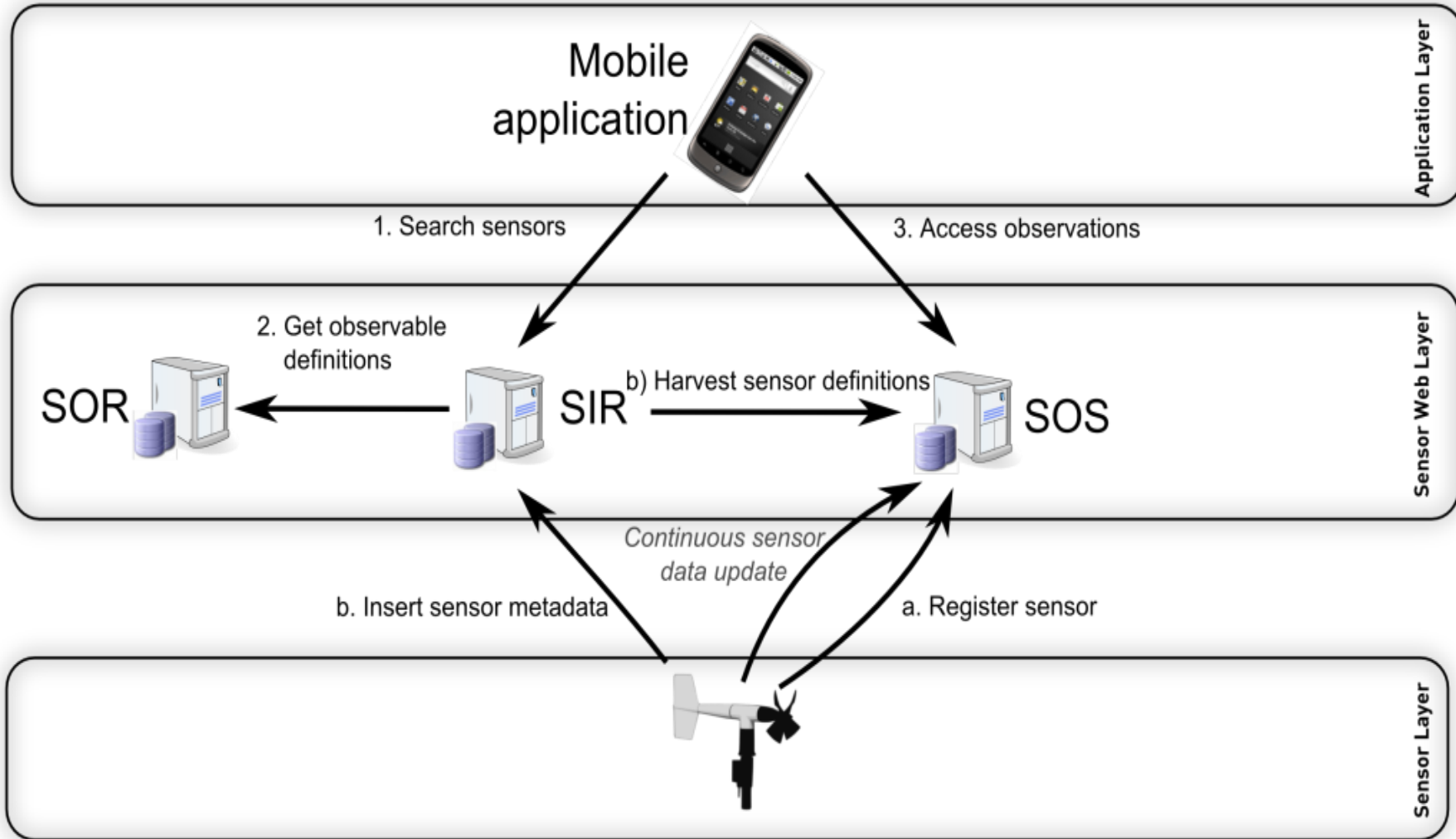
Requirement – temporal context



Requirement – thematic context



Architecture



Register, search & access

Implementation

- SIR Interface Extension

<sir:SearchResultElement>

```

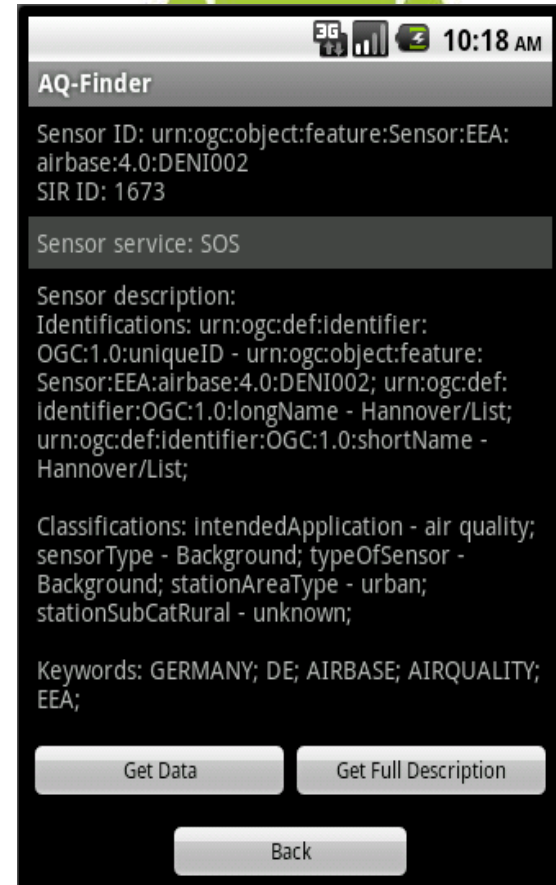
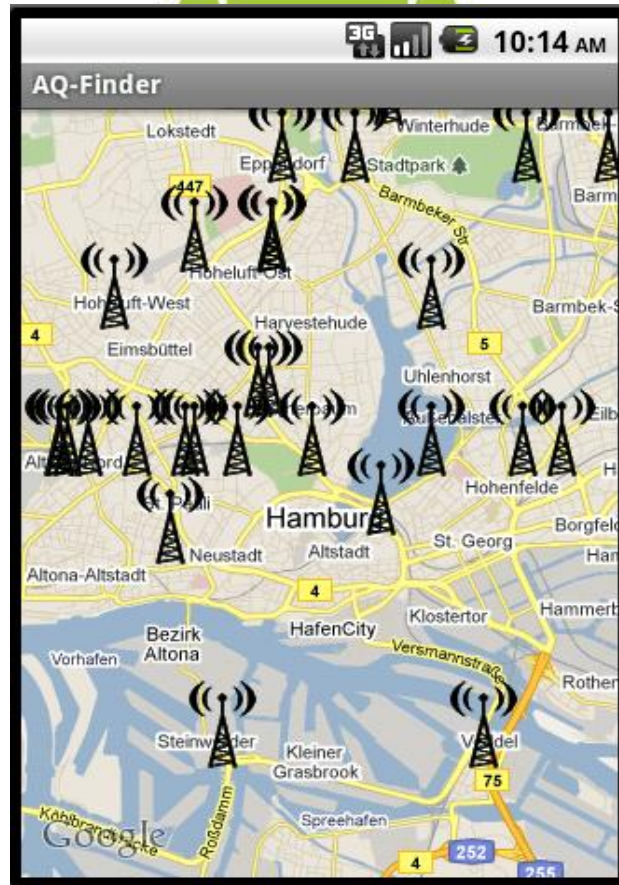
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  <sir:SimpleSensorDescription>
    <sir:SensorDescriptionURL>http%3A%2F%2Fgiv-genesis.uni-
muenster.de%3A8080%2FSIR%2Fsir%3Fservice%3DSIR%26amp%3Bversion%3D0.3.1%26amp%3BREQUEST%3DDescribeSensor%26amp%3BSENSORIDINSIR%3D383</
sir:SensorDescriptionURL>
    <sir:DescriptionText>![CDATA[
Identifications: urn:ogc:def:identifier:OGC:1.0:uniqueID - urn:ogc:object:feature:Sensor:EEA:airbase:4.0:DEHB005;
urn:ogc:def:identifier:OGC:1.0:longName - Bremerhaven; urn:ogc:def:identifier:OGC:1.0:shortName - Bremerhaven;
Classifications: intendedApplication - air quality; sensorType - Background; typeOfSensor - Background; stationOzoneType - urban;
stationAreaType - urban; stationSubCatRural - unknown;
Keywords: GERMANY; DE; AIRBASE; AIRQUALITY; EEA;
]</sir:DescriptionText>

    <sir:ObservedBoundingBox crs="-1" dimensions="2">
      <ows:LowerCorner>53.559998 8.569406</ows:LowerCorner>
      <ows:UpperCorner>53.559998 8.569406</ows:UpperCorner>
    </sir:ObservedBoundingBox>
  </sir:SimpleSensorDescription>
  <sir:ServiceReference>
    <sir:ServiceURL>http://giv-uw.uni-muenster.de:8080/AQE/sos</sir:ServiceURL>
    <sir:ServiceType>SOS</sir:ServiceType>
  <sir:ServiceSpecificSensorID>urn:ogc:object:feature:Sensor:EEA:airbase:4.0:DEHB005</sir:ServiceSpecificSensorID>
</sir:ServiceReference>
</sir:SearchResultElement>

```


Implementation (contd.)



Customized app to access EEA data as available in the Sensor Web

Requirements met

Requirement for mobile applications	Discovery Approach
Resource efficiency	Communication minimized by specific queries
Spatial context	Query according to spatial context over all services available in the SIR
Temporal context	Temporal context of the sensor stored in the SIR
Thematic context	Thematic context semantically ensured by SOR

Conclusion

- Interoperable discovery of real-time sensor data
 - EEA data
 - Mobile application
 - Standards compliant
- Sensor Web 2.0
 - Discovery
- Requirements met
 - Context-sensitive, resource efficient

Source code available through



www.52north.org/android

Thanks for your attention!



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Welcome to the *Sensor Web, Web-based Geoprocessing, and Simulation Lab!* SWSL is a competence center for geosensor networks and distributed geoprocessing at the [Institute for Geoinformatics \(IFGI\)](#) of the University of Münster, Germany.

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