Publishing Linked Sensor Data

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Abstract. This paper describes a linked-data platform to publish sensor data and link them to existing resource on the semantic Web. The linked sensor data platform, called Sense2Web supports flexible and interoperable descriptions and provide association of different sensor data ontologies to resources described on the semantic Web and the Web of data. The current advancements in (wireless) sensor networks and being able to manufacture low cost and energy efficient hardware for sensors has lead to much interest in integrating physical world data into the Web. Wireless sensor networks employ various types of hardware and software components to observe and measure physical phenomena and make the obtained data available through different networking services. Applications and users are typically interested in querying various events and requesting measurement and observation data from the physical world. Using a linked data approach enables data consumers to access sensor data and query the data and relations to obtain information and/or integrate data from various sources. Global access to sensor data can provide a wide range of applications in different domains such as geographical information systems, healthcare, smart homes, and business applications and scenarios. In this paper we focus on publishing linked-data to annotate sensors and link them to other existing resources on the Web.

Key words: Linked-data, Semantic Sensor Web, Semantic Sensor Networks, Sense2Web

1 Introduction

The information collected from the physical world in combination with the existing resources and services on the Web facilitate enhanced methods to obtain business intelligence, enabling the construction of new types of front-end application and services, and could revolutionise the way organisations and people use Internet services and applications in their daily activities. There are currently a number of projects focused on developing large-scale sensor networks integrated into the Internet such as SENSEI[1], SensorWeb[2], and also there are

[1] http://www.ict-sensei.org
[2] http://research.microsoft.com/en-us/projects/senseweb/

existing works on creating service layers and data structures for sensor and actuator networks such as [1], [2], [3], the Open Geospatial Consortium (OGC)[3], and the Sensor Web Enablement (SWE) activities [4].

The above mentioned works are some of the ongoing efforts to develop underlying services for constructing global sensor networks. However, there is also a vital need to construct middle-ware services and applications that act as intermediaries for capturing, delivery and presentation of dynamic real world data to the consumer applications and users. Collaboration, scalability and semantic interoperability are the key features in designing large-scale sensor networks to support efficient resource distribution and data communication on top of these networks. This will result in generating networked resources which collect data from the physical world as well as data and services on the Web. Interlinking the data from the physical world and the Web will complement one of the key potentials of semantic Web to create a networked knowledge infrastructure [5]. Annotation, processing and reasoning sensor data on a large-scale will be a challenging task for applications that publish and/or utilise these data from various sources. On the other hand, this, to some extent, is similar to challenges that the semantic Web community faces in dealing with huge numbers of ontologies and semantically annotated data coming from different sources and applications.

Linked-data is one way to publish, share and connect data via URIs on the Web[4]. It focuses on interconnecting data and resources on the Web by defining relations between ontologies, schemas and/or directly linking the published data to other existing resource on the Web. The process can be done manually or (semi-) automatic mechanisms can be used to create the links. Publishing data as linked-data enables finding other related data and relevant information and facilitates interconnection and integration of data from different communities and sources. In this paper we describe a platform, called Sense2Web, to publish linked-sensor-data. Sense2Web publishes linked-data and makes it available to other Web application via SPARQL endpoints[5]. Our main focus in this paper is sensor description data. The sensor observation and measurement data can also be published following similar principals. However, publishing observation and measurement data raises other concerns such as time-dependency, scalability, freshness and latency. We have also implemented a mash-up application using data from Sense2Web to demonstrate reasoning and interpretation of linked-sensor data.

The rest of this paper is organised as follows. Section 2 describes semantic sensor networks. Section 3 discusses the linked data principles and describes current contributions to Web of Data and publishing linked-data. Section 4 explains linked-sensor-data and linking sensor descriptions to existing resources on the Web. Section 5 demonstrates the platform for publishing and accessing linked-sensor-data and shows a mash-up application using constructed linked-data. Section 6 concludes the paper and discusses the future work.

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[3] http://www.opengeospatial.org

[4] http://linkeddata.org/

[5] http://semanticweb.org/wiki/SPARQL_endpoint

2 Semantic Sensor Networks

There are currently ongoing efforts to define ontologies and to create frameworks to apply semantic Web technologies to sensor networks. The Semantic Sensor Web (SSW) proposes annotating sensor data with spatial, temporal, and thematic semantic metadata [6]. This approach uses the current OGC and SWE specifications and attempts to extend them with semantic web technologies to provide enhanced descriptions to facilitate access to sensor data. W3C Semantic Sensor Networks Incubator Group (SSN-XG)[6] is also working on developing an ontology for describing sensors. Effective description of sensor, observation and measurement data and utilising semantic Web technologies for this purpose, are fundamental steps to construct semantic sensor network. SSN-XG provides a state-of-the-art report on the current activities in this area[7]. However, associating this data to the existing concepts on the Web and reasoning the data is also an important task to make this information widely available for different application, front-end services and data consumers.

Semantics allow machines to interpret links and relations between different attributes of a sensor description and also other resources. Utilising and reasoning this information enables the integration of the data as networked knowledge [7]. On a large scale this machine interpretable information (i.e. semantics) is a key enabler and necessity for the semantic sensor networks.

We have developed a framework to publish sensor data description and link this data to other resources on the Web. The framework will make descriptions (and also sensor-generated information) usable as a new and key source of knowledge and will facilitate integration of this information into the (existing) information spaces of communities. The semantically enriched data will be accessible at HTTP level to make it available for business processing methods and data integration and collaboration services. Another important aspect is interoperability and scalability of the framework. Utilising metadata and semantic annotations to describe sensor data and in general physical world resources in a scalable and heterogeneous platform enables different communities to exploit the emerging data and exchange information and knowledge in a collaborative environment. User annotated resources and services similar to those employed by social Web and semantic Web, as well as common machine-interpretable description and query interfaces are key aspects in the designing of the framework. Figure 1 shows an example of integration of data from different sources in a collaborative environment. Imagine the parcel is tagged with an RFID tag that is scanned every time it is loaded or unloaded, the post delivery van has also a GPS sensor which reports the location and a twitter service is deployed to report the status of the parcel to interested twitter followers. In a semantic integration scenario each of these sensors and services need to be able to describe and/or discover what type of information is published, who can consume this information and what the information is all about. This includes the sensor or

[6] http://www.w3.org/2005/Incubator/ssn/

[7] see: http://www.w3.org/2005/Incubator/ssn/wiki/State_of_the_art_survey

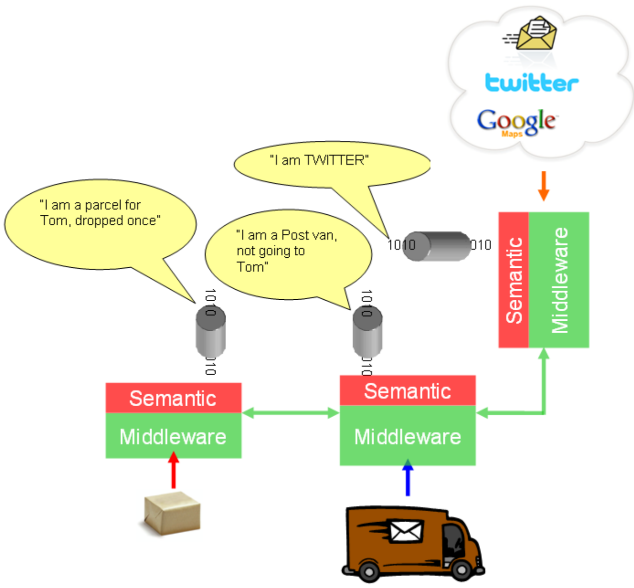

Fig. 1. Publishing data from sensors and services on the Web

service description and also the data reported from sensors and services. In the current work we describe how sensor descriptions are published as linked-data and how a consumer application can query and access this data using standard interfaces.

3 Linked-data

Publishing data on the semantic Web with machine interpretable representations facilitates more structured and efficient access to the resources; however semantic descriptions without being linked to other existing data on the Web would be mostly processed locally and according to the domain descriptions (i.e. ontologies) and their properties. Linking data to other resources on the Web enables obtaining more information across different domains. The linked-data initially was introduced by Tim Berners-Lee in 2006 [8]. Berners-Lee suggested four main principles to publish linked-data:

- using URIs as names for data,
- providing HTTP access to those URIs,
- providing useful information for URIs using the standards such as RDF and SPARQL,
- Including links to other URIs.

Publishing annotated and interconnected data is the underlying principal of the Web of Data [8]. The Web of Data can be browsed as traditional HTML pages on the Web. However, in the Web of Data instead of HTML links between the pages, the resources are connected via links that can be queried and interpreted using discovery and search agents [9]. Linked-data enables users to navigate between different data sources by following links. This allows the linked-data consumers to start with one data source and then browse through a vast number of resources connected by machine interpretable links (e.g. RDF links).

The Web of Data is supported by the Semantic Web and in particular the Linking Open Data community project in the W3C Semantic Web Education and Outreach Working Group[8]. The Linking Open Data community project started in 2007 and, as reported November 2009, the data sets that have been published and interlinked consisted of over 13.1 billion RDF triples which are interlinked by around 142 million RDF links[9]. The project includes various open data sets available on the Web such as Wikipedia[10], Wikibooks[11], Geonames[12], and WordNet[13]. In practice, the linked-data published on the Web is RDF data that is accessible through query interfaces and, as proposed in the current linked-data projects, SPARQL endpoints. Recently even the public organisations and government data is also published as linked-data; for example the UK government now provides linked-data [10] and the proposed data is available via SPARQL endpoints[14].

Emergence of sensor data as linked-data enables sensor network providers and data consumers to connect sensor descriptions to potentially endless data existing on the Web. By relating sensor data attributes such as location, type, observation and measurement features to other resources on the Web of data users will be able to integrate physical world data and the logical world data to draw conclusions, create business intelligence, enable smart environments, support automated decision making systems among many other applications. The linked-sensor-data can be also queried, accessed and reasoned based on the same principles that apply to linked-data. This creates an open platform to publish and consume interoperable sensor data.

4 Linked-sensor-data

Sheth *et al.* in [6] defined semantics of sensor Web within Space, Time, and Theme attributes. There have been different approaches to provide semantic models for each of these attributes independently or in relation to sensors. Some of the common ontologies are SIMILE location ontology[15], DAML location on-

[8] http://esw.w3.org/SweoIG/TaskForces/CommunityProjects/LinkingOpenData
[9] http://esw.w3.org/TaskForces/CommunityProjects/LinkingOpenData/DataSets/Statistics
[10] http://www.wikipedia.org/
[11] http://www.wikipedia.org/
[12] http://www.geonames.org/
[13] http://wordnet.princeton.edu/online/
[14] http://data.gov.uk/sparql
[15] http://simile.mit.edu/2005/05/ontologies/location

tology[16] for spatial attributes, OWL time ontology[17] for time and common ontologies and vocabularies such as CyC[18], DBpedia[19] for thematic data. In a previous paper, we described annotating sensor observation and measurement data according to these attributes [11]. In this paper, we discuss publishing linked-sensor-data and association of these attributes to the existing resources and especially those that are currently a part of the Web of Data and follow linked-data principles.

4.1 Spatial attributes

Location specific information for sensors could include very specific geo-locations defined as altitude and latitude and/or high level information that describe the location in high-level terms and relation to other domain concepts (e.g. postcodes). In OGC SWE standard *Sensor Observation Service (SOS)* [4] to provide sensor observation and measurement data, the descriptions are expected to include location attributes that are explained using GML[20] elements. Patni *et al.* [12] describe a linked-sensor-data platform that uses location attributes in OGC SWE standards and associate them to high-level concepts and related resources using GeoNames and LinkedGeoData[21] resources. Location concept could be specified in different levels of granularity. It could be again a detailed specification of a room or a corridor in a building in a detailed level and on a higher level referring to a campus, site or a city, and so on. The main challenge for describing sensor location data is how to provide a high level of granularity on a global scale without ending up modelling the world. For applications with limited scope it is possible to define a location ontology and populate it with domain instances.

However, on a global scale the location instances could refer to potentially endless location data. To address this challenge in Sense2Web we propose using two location attributes in describing the sensor data. The first attribute refers to an instance of a local ontology which is a model of the current location that the sensor is deployed in. This could include high granularity and detailed information of the physical location such as rooms, corridors, floors, buildings. This ontology could be populated and used in different applications. We have defined a basic schema for such an ontology which is discussed in Section 5; however, the sensor data publisher may opt to use a different ontology and as long as the schema link definitions are available to data consumers this will not affect the query and accessing of the linked-sensor-data. The second location attribute is selected from high-level location concepts that are available on the Web of Data. In particular, we have used concepts referring to places selected from DBpedia. The following SPARQL code shows and example of querying location resources from DBpedia.

[16] http://www.daml.org/experiment/ontology/location-ont
[17] http://www.w3.org/TR/owl-time/
[18] http://cyc.com/cyc/opencyc
[19] http://dbpedia.org/
[20] http://www.opengeospatial.org/standards/gml
[21] http://linkedgeodata.org

```
PREFIX  rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>

SELECT ?entity  ?label WHERE {
       ?entity rdf:type <http://dbpedia.org/ontology/Place>.
       ?entity rdfs:label ?label.
       ?label <bif:contains> '"Guildford"'.
}
```

4.2 Temporal attributes

Temporal attributes in sensor data and their observation and/or measurement data are those describing attributes such as time zone and measurement timestamp. In this context, using common ontologies for temporal specifications enable linked-data consumers to query and access temporal features of data using standard models and interfaces. The important issue is defining temporal concepts according to the existing vocabularies or making the schema description available to the users.

4.3 Thematic attributes

Thematic data provides links between sensor data and the domain knowledge. The attributes such as sensor type, tags, type of observation measurement, features of interest and other more specific attributes such as operational and deployment attributes describe sensors with domain knowledge. We propose using a local ontology to provide more specific sensor descriptions such as those proposed in the SENSEI project [13] and W3C Incubator Group for Semantic Sensor Networks Ontology[22]. Other high level concepts can be associated to the existing data on the Web. For this purpose, we use DBpedia for Sensor Types (general types) and tags (general concepts and applications). It is also worth mentioning that in many applications relying only on general sensor type definitions provided by community-driven vocabularies such as DBpedia will not be sufficient; however, in this example we only demonstrate how linked-sensor-data can benefit from existing resources and at the same time contribute to the extension of linked-data. Similar to location information, for more specific information, local and application/domain specific ontologies can be used to describe detailed attributes more precisely.

4.4 Sensor specific attributes

Sensor data does not only consist of spatial, temporal and thematic features. The sensor as a device and the sensing process have also more specific attributes and features. In addition to providing links between sensor attributes and other resources, there are approaches to annotate and link sensor observation services

[22] http://www.w3.org/2005/Incubator/ssn/wiki/

and also describe device dependent and process specific features of sensor data. In this context, Janowicz *et al.* [14] describe a semantic enablement layer on top of the OGC SWE standards. Henson *et al.* [15] discuss construction of a Semantic Sensor Observation Service based on the SWE standards. There are several approaches that provide ontology based description for more specific sensor data, for example [2], [3], [16]. There are also other important issues such as registry, search and discovery of sensor descriptions and updates that are not in the scope of this paper. The SENSEI white-paper provides a review on some of these issues and discusses some possible solutions [17].

4.5 Re-visiting linked-data principles to publish linked-sensor-data

The four main principle rules proposed by Berners-Lee [8] are not mandatory guidelines to publish linked-data; however, following these principles makes the linked-data easily and efficiently accessible to consumers on the Web of data. In this section we revisit the guidelines and discuss them for publishing linked-sensor-data.

URIs and Naming: Assigning URIs for sensor descriptions; each sensor has a unique URI that refers to its descriptions. The naming of sensors can follow similar conventions that are used for HTML pages or other resources on the current Web. The SENSEI project proposes a more specific guideline to define a Universal Resource Name (URN) for sensors. In SENSEI, the unique resource identifier includes administrative domains as the first part after the namespace identifier and then adds resource identifiers to the URN [17]. The following phrase shows a sample URN using the SENSEI naming convention.

```
urn:sensei:surrey.ac.uk:TeloSBSensorTS1:
   Temperature:SampleRate:3223a-86bca-0123-e123
```

All resources in SENSEI are identified by a domain and the unique resource identifier is constructed using the domain name, sensor type and an internal unique identifier. We propose a similar approach for defining sensor identifiers; with a difference that in our linked-sensor-data the identifiers are defined as URIs.

Providing HTTP access: The linked-sensor-data can be made available through HTTP access by simply publishing descriptions as Web documents or in a more efficient way, as linked-data suggests, by providing SPARQL endpoints to query and access the data. Sensor observation and measurement data can also be made available through HTTP interfaces via sensor observation services. SWE *Sensor Observation Service (SOS)* [4] defines a standard Web service interface for requesting, filtering, and retrieving observations and sensor system information. In [18] a service oriented middleware architecture for providing HTTP access to sensor observation and measurement data is also discussed. In this paper our main focus is providing HTTP access to sensor description data. We publish sensor descriptions as RDF data and provide SPARQL endpoints and standard interfaces to query and access this data. We also allow users to publish other RDF description associated to the sensors (i.e. sensor description according to other ontologies) and link it to the current descriptions. Details of publishing RDF sensor data are described in Section 5.

Providing meaningful descriptions: Sensor data can include RDF descriptions according to ontologies designed to represent sensor features and attributes. We propose a two layer sensor data annotation to provide sensor data annotations to link them to other resources. An RDF description captures basic attributes of a sensor (i.e. spatial and thematic data) and uses publicly available linked-data to create the links to other resources. The basic RDF representation of linked-sensor-data is discussed in more detail in Section 5.

Linking to other URI's: To describe sensor data using the basic sensor ontology, the terminology (wherever it is applicable) can be chosen from publicly available linked-data. This enables construction of sensor descriptions that are already linked to other resources based on different features. We also propose using local ontologies and vocabularies to provide more specific descriptions and also allow users to add and associate existing RDF data, according to other ontologies, to the current sensor descriptions. Including all this data and publishing it as linked RDF data creates a set of resources that some of their attributes are already described using other Web resources. This allows browsing and accessing more information by referring to different attributes. It also establishes a link between other RDF descriptions of the sensor data and the high-level concepts that are defined as their property values.

5 Linked-sensor-data Platform

Sense2Web provides a platform to publish linked-sensor-data according to the four main principles discussed in the previous section. It enables users to publish their sensor description data as RDF triples, associate any other existing RDF sensor description data, link to the existing resources on publicly available linked-data repositories and make it available for linked-data consumers through SPARQL endpoints.

Figure 2 shows the user interface to publish a new sensor description. We use Jena API [19] to query DBpedia and other resources to obtain values for location, type and descriptive properties. We query the linked-data resources and serialise the results using AJAX technology [20] directly to the page; so user can type a keyword and obtain relevant suggestion from on-line repositories. Figure 3 shows suggestions from DBpedia for a sample query, "'Guildford"' as a place.

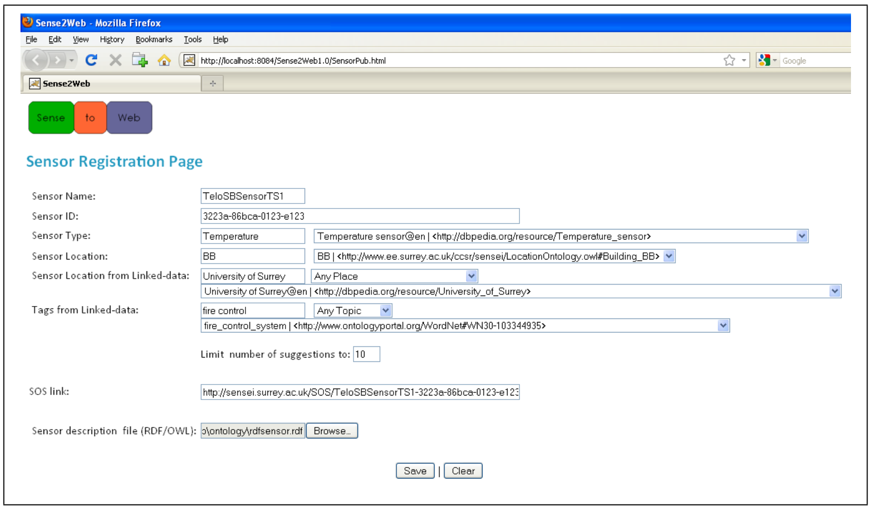

Fig. 2. Sensor data publication interface

The submitted variables are stored in XML format and Extensible Stylesheet Language Transformations (XSLT)[23] is used to transform the submitted data to RDF form. This makes generation of RDF data flexible and independent. We construct the RDF data according to a basic RDF structure that captures main properties of sensor data and link it to other RDF files that provide more specific properties according to common sensor ontologies. However, by using a different stylesheet data can be transformed to another format or other namespaces based on different applications and requirements.
It should be noted that the properties identified in main Sense2Web RDF descriptions are neither complete nor fixed. The system includes primary attributes to demonstrate the feasibility of publishing linked-sensor-data and it can be extended to include more specific attributes to describe sensor data. The following shows a fragment of an XSL stylesheet designed for constructing the RDF data.

```
<?xml version='1.0'?>
<xsl:stylesheet version="1.0"
xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
    <xsl:template match="/">
  <rdf:RDF
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    ...
    xmlns:dbpedia="http://dbpedia.org/property/">
<rdf:Description>
            <xsl:attribute name="rdf:about">
http://ee.surrey.ac.uk/ccsr/sensei/simplesensor#
```

[23] http://www.w3.org/TR/xslt20/

```
                <xsl:value-of select="sensors/sensor/id"/>
            </xsl:attribute>
            <rdfs:label>
                <xsl:value-of select="sensors/sensor/id"/>
            </rdfs:label>
            <simplesensor:hasDBPediaLocation>
                <xsl:value-of select="sensors/sensor
/locationList"/>
            </simplesensor:hasDBPediaLocation>
...
</rdf:Description>
</rdf:RDF>
 </xsl:template>
</xsl:stylesheet>
```

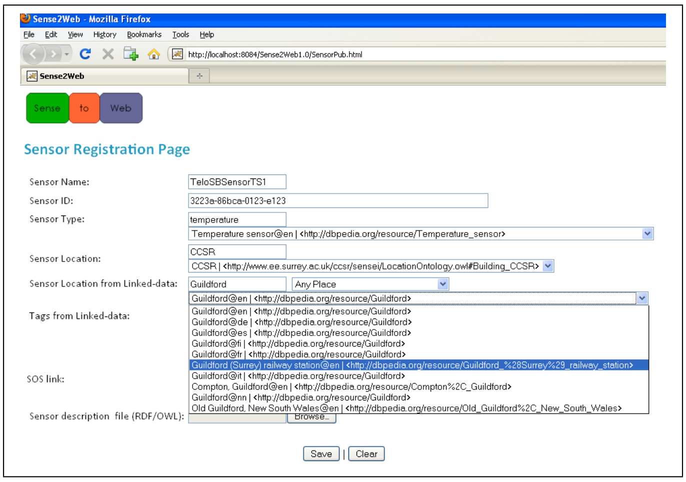

Fig. 3. Resource suggestions from DBpedia for a sample keyword

The following demonstrates a fragment of an RDF instance that is constructed from user submitted data using the XSL stylesheet.

```
<?xml version="1.0" encoding="UTF-8"?>
   <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
   xmlns:dbpedia="http://dbpedia.org/property/"
   ...
   <rdf:Description rdf:about=
   "http://ee.surrey.ac.uk/ccsr/sensei/simplesensor#3223a-86bca-0123-e123">
   <rdfs:label>3223a-86bca-0123-e123</rdfs:label>
```

```
  ...
  </rdf:Description>
</rdf:RDF>
```

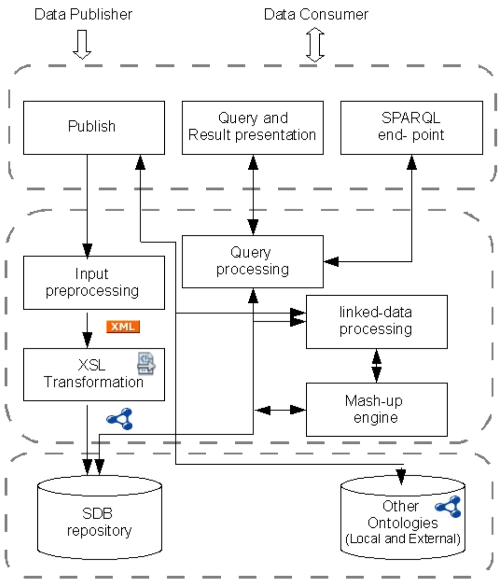

Fig. 4. Main components in Sense2Web

We use SDB[24] a SPARQL database for Jena to store the triples. To provide SPARQL endpoints we use an open source SPARQL server for Jena called Joseki[25]. We have also implemented interfaces that enable users to obtain the query results in a different format such as XML, RDF and SPARQL protocol format[26]. The following demonstrates a fragment of results of a sample published resource in SPARQL protocol format.

```
<sparql>
  <head>
    <variable name="property"/>
<variable name="value"/>
</head>
<results>
  <result>
  <binding name="property">
```

[24] http://openjena.org/SDB/
[25] http://joseki.sourceforge.net/
[26] http://www.w3.org/TR/rdf-sparql-protocol/

```
  <uri>http://www.w3.org/2000/01/rdf-schema#label</uri>
</binding>
<binding name="value">
  <literal>3223a-86bca-0123-e123</literal>
</binding>
</result>
<result>
 ...
</sparql>
```

Figure 4 shows the main components of Sense2Web platform and the interfaces to access the system.

dbpedia-owl:country	▪ dbpedia:Surrey
dbpedia-owl:district	▪ dbpedia:Guildford_(borough)
dbpedia-owl:populationTotal	▪ 66773 (xsd:integer)
dbpedia-owl:thumbnail	▪ http://upload.wikimedia.org/wikipedia/commons/thumb/f/f8/Guildford_castle_1.jpg/200px-Guildford_castle_1.jpg
dbpprop:constituencyWestminster	▪ dbpedia:Guildford_(UK_Parliament_constituency)
dbpprop:country	▪ England
dbpprop:dialCode	▪ 1483 (xsd:integer)
dbpprop:hasPhotoCollection	▪ http://www4.wiwiss.fu-berlin.de/flickrwrappr/photos/Guildford
dbpprop:latitude	▪ 51.235400 (xsd:double)
dbpprop:longitude	▪ -0.574600 (xsd:double)
dbpprop:officialName	▪ Guildford
dbpprop:osGridReference	▪ SU9949
dbpprop:population	▪ 66773 (xsd:integer)
dbpprop:postTown	▪ GUILDFORD
dbpprop:postcodeArea	▪ GU
dbpprop:postcodeDistrict	▪ GU1-4
dbpprop:reference	▪ http://wikitravel.org/en/Guildford ▪ http://www.guildford.gov.uk/ ▪ http://www.thetimechamber.co.uk/Sites/deepshelter/Foxenden/Foxenden.php ▪ http://www.guildfordeye.com/ ▪ http://www.guildford.gov.uk/GuildfordWeb/Leisure/Guildhall/ ▪ http://www.arthurlloyd.co.uk/GuildfordTheatres.htm ▪ http://www.heureka.clara.net/surrey-hants/gu-ford.htm
dbpprop:region	▪ South East England
dbpprop:shireCounty	▪ dbpedia:Surrey
dbpprop:shireDistrict	▪ dbpedia:Guildford_(borough)
dbpprop:staticImage	▪ dbpedia:Guildford_high_street_1.jpg
dbpprop:wikiPageUsesTemplate	▪ dbpedia:Template:Infobox_UK_place
dbpprop:wordnet_type	▪ http://www.w3.org/2006/03/wn/wn20/instances/synset-location-noun-1
georss:point	▪ 51.2354 -0.5746

Fig. 5. Related data for a sample resource (i.e. "'Guildford"') from DBpedia

5.1 Mash-up Application

To demonstrate the linked-data usage and integration of data from different sources we have created a mash-up application using Google Maps API[27]. For this application we use the location attribute and retrieve geographical coordinates of the resources from linked-data. The application then retrieves other related properties of the resources from the linked-sensor-data interface and lists available sensors and their properties through a Google Maps application. In the current demo, we only retrieve published properties and show them in a

[27] http://code.google.com/apis/maps/

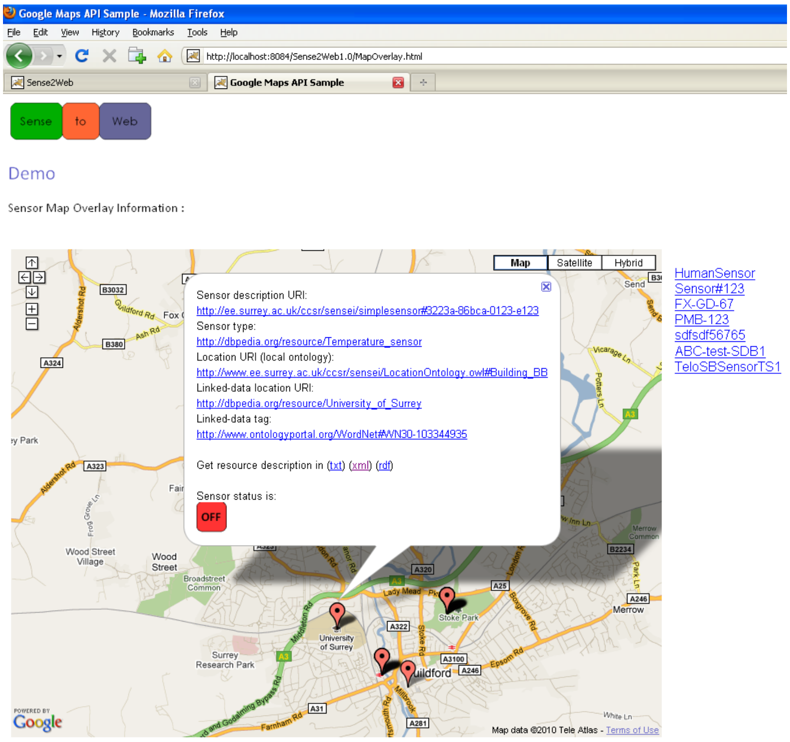

Fig. 6. A sample mash-up application

map overlay. This can be extended to discovering other related resources such as nearby locations, districts and other related information available through browsing different links. Figure 5 shows some of the related data available for our sample query ("'Guildford"') from DBpedia.

Figure 6 demonstrates the application and shows available information for a sample published sensor. In our sample, we create links between high-level description of sensor data, type and keyword descriptions. In fact, if more public semantic data is available, then more properties of sensor description can be linked to other resources. This will require more common ontologies to describe sensor types, sensor platforms, sensor measurement attributes, sensor devices, etc.

6 Conclusions and Future Work

This paper discusses creating linked data from sensor data and in particular providing sensor descriptions and associating their attributes to resources on the Web. We describe our platform and discuss how existing linked data resources are used to create linked sensor data. The underlying sensor descriptions are constructed using XML data from user annotations. We use stylesheets to transform the annotation data to different designated sensor description formats such as W3C SSN ontology or SENSEI ontology representations. The paper describes our ongoing work and the implemented prototype demonstrates the idea of using semantic Web technologies and link data principles to connect sensor data to other existing resources on the Web of Data. An example access and exploitation scenario for the constructed linked sensor data platform is also described using a mash-up application. The future work will focus on adding and testing different sensor platforms to the system, including observation and measurement data, providing sensor and service discovery mechanisms and evaluating scalability of the platform.

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