Extending Semantic Sensor Networks with QueryML

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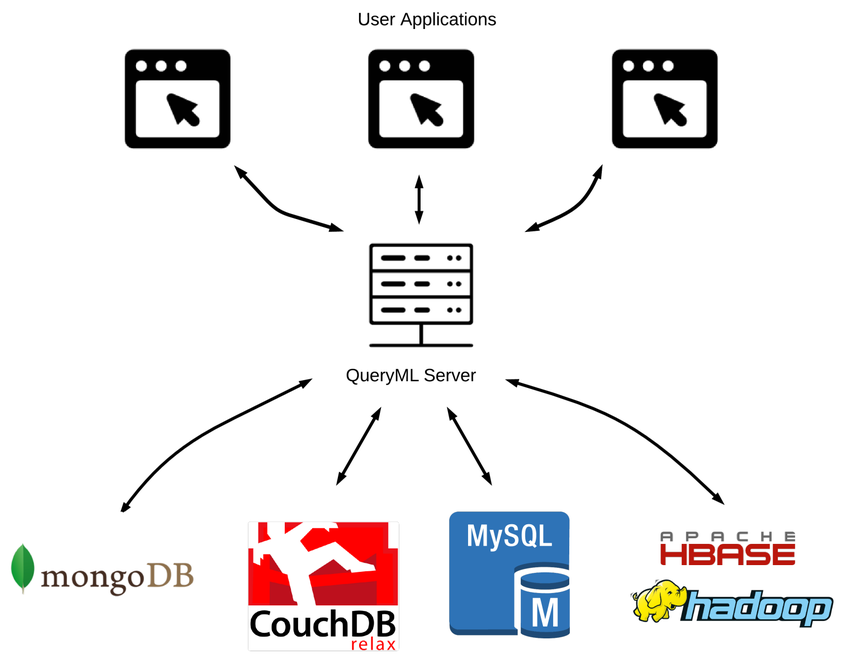
Introduction

Different sensor networks have different application scales, manufacturers, communication protocols, and application architectures. As a result, sensor data can normally only be processed and consumed by their own custom applications. Some attempts have been made to address the problem, namely, Semantic Sensor Network (SSN)(1) and Sensor Web Enablement (SWE)(2). However, they cannot solve the problem where querying historical data is needed. We proposed a new markup language, QueryML, in addition to the existing semantic sensor web, to solve the problem.



QueryML Structure

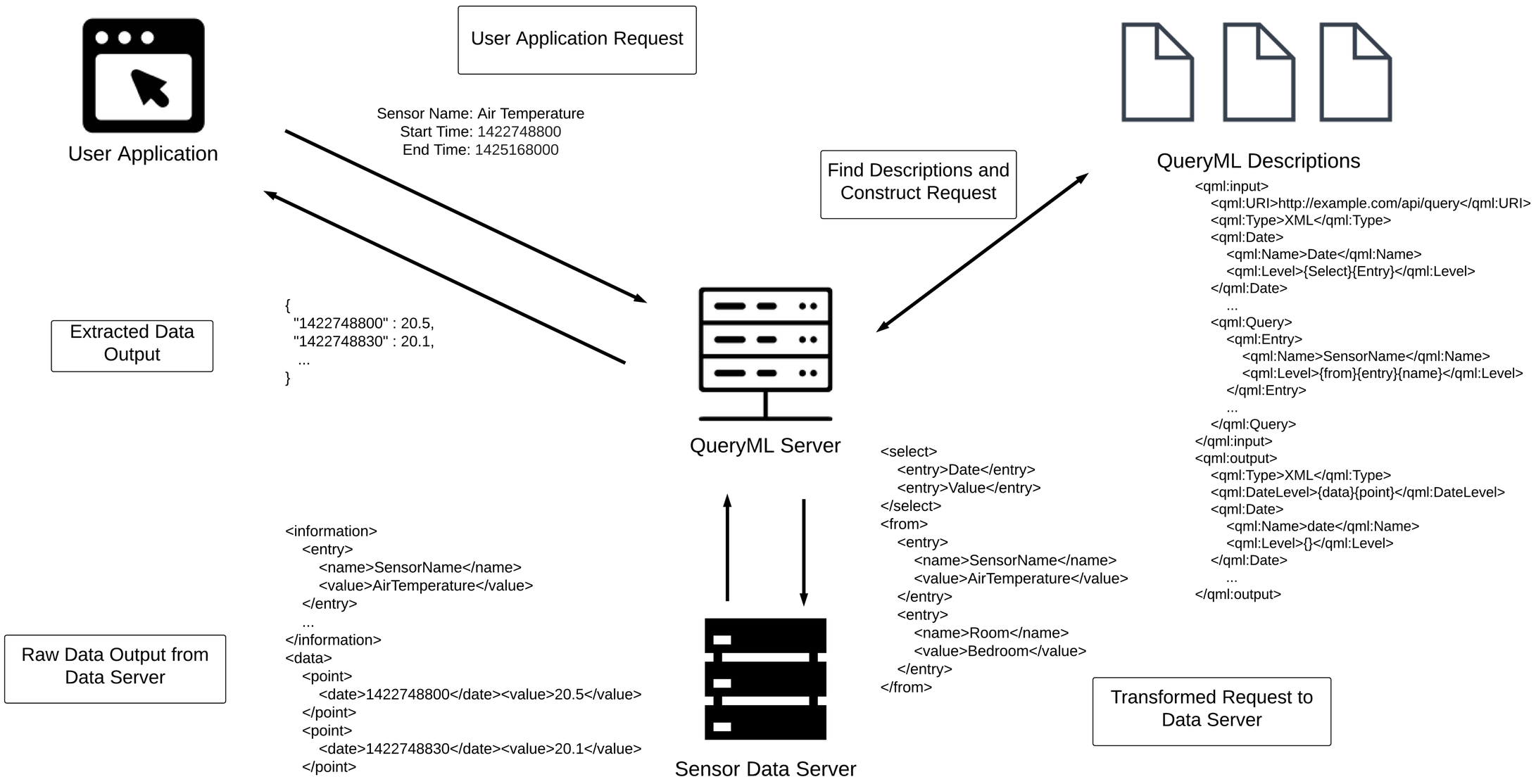
QueryML is a semantic description language based on XML. It can be easily transformed into SNN or SWE. It is designed for sensor networks where historical sensor data can be acquired through a RESTful web interface. Each QueryML description for a single sensor node has three components: data source web interface, input data transformation, and output data extraction. By integrating into either the SNN or SensorML, we can extend the core semantic features of either framework with cross platform historical query capabilities(3).

Input Transformation

Different sensor networks accept different query request formats. In order to hide the query details from user applications, an input data transformation is defined by a regular expression. Necessary information for the query, such as the timespan and sensor identifier, is defined by the sensor in it's QueryML description. An application can then construct a valid query using the QueryML description to format the specific request details.

Output Data Extraction

As with the database inputs, the outputs are also highly varied in existing sensor systems. Thus, a standard transformation is necessary to operate on the outputs to normalize the results from different sensor networks. We use the QueryML output description to define the extraction of time series data from the raw XML or JSON results provided by the RESTful interface.



Future Work

We proposed QueryML to define the structure of a query in the same way SensorML defines the structure of a sensor, so that applications can query historical data from different sensor networks in a general way. This is a work in progress; we are improving the schema so that it will support more database web interfaces. This summer we plan to implement a live server and adopt a new QueryML parser.

References

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