Implementation of OpenGIS Sensor Observation Service (SOS)

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Introduction

The applications of sensors have increased tremendously over time and there is an augmented demand for making sensor data and services available on the web. Web enabled sensors have potential for application in wide ranging areas of science, environmental monitoring, transportation management, public safety, disaster management, utilities' SCADA (Supervisory Control and Data Acquisition), industrial controls, and facilities management needs.

There have been advancements made in many fields of Information and Communication Technology (ICT) such as embedded operating systems and the advent of low-cost satellite links, GPRS mobile technology as well as sensor technology. These technologies can be combined together for various sensor based applications for gathering valuable data from remote locations. Recently, the Open Geospatial Consortium (OGC), a non-profit, international, voluntary consensus standards organization that is leading the development of standards for geospatial and location based services, has released a sensor related implementation specification. Named the Sensor Observation Service (SOS) Implementation Specification, it provides access to observations from sensors and sensor systems in a standard way that is consistent for all sensor systems including remote, in-situ, fixed and mobile sensors. It defines an application programming interface (API) for managing deployed sensors and retrieving sensor data. The Open Geospatial Consortium approved of the SOS specification on September 1, 2006.

Brief Description of Sensor Observation Service

Sensor Observation Service (SOS) has three mandatory "core" operations: ***GetObservation, DescribeSensor***, and ***GetCapabilities***. The ***GetObservation*** operation provides access to sensor observations and measurement data via a spatio-temporal query that can be filtered by phenomena. The ***DescribeSensor*** operation retrieves detailed information about the sensors making those measurements and the platforms that carry the sensors. The ***GetCapabilities*** operation provides the means to access SOS service metadata. Several optional, nonmandatory operations have also been defined. There are two operations to support transactions, RegisterSensor and InsertObservation, and six enhanced operations, including GetResult, GetFeatureOfInterest, GetFeatureOfInterestTime, DescribeFeatureOfInterest, DescribeObservationType, and DescribeResultModel. Used in conjunction with other OGC specifications, the SOS provides a broad range of interoperable capability for discovering, binding to and interrogating individual sensors, sensor platforms, or networked constellations of sensors in real-time, archived or simulated environments. The SOS aspires to make sensor data available on the web for easy access to users in a standardized format.

Need for Sensor Observation Service

Although there are a wide ranging variety of sensors available for measuring parameters of many different physical phenomena, the actual task of going to the study areas and fields to make these observations and readings are time-consuming as well as expensive. The large distance between study areas and the laboratories, where the data is to be finally analyzed demands a communication medium through which sensor data can easily be obtained. Various modes of connection to the Internet such as a satellite link, GPRS modems and ADSL devices are options which can be used.

At the same time, there is also a need for an independent unit in the field which can operate on its own, and connectable to the laboratory as and when required. The implementation Sensor Observation Service (SOS) in the remote field can fulfill this exact need. With the implementation of SOS, sensor data can not only be obtained in a standardized format, sensors can also be controlled remotely. The systems would be interoperable with approved specification.

The purpose of implementing SOS in the remote field is to push the sensor functionalities as closer to the field as possible, so that independent and standardized sensor units ready for communication can be deployed.

Optimization of SOS System

The SOS system to be deployed in remote fields need to be optimized. The optimization will be done both in the hardware setup and software implementation. Various hardware setups and architectures will be tested various scenarios with or without AC power, with or without satellite link, with or without mobile phone coverage, with or without Linux box to determine which would be best optimized implementation in each scenario.

On the other hand, the system resources required to run SOS also will be optimized. A practical way of achieving this is to implement SOS without the use of JAVA SDK and Apache Tomcat servlet container. This would greatly reduce the demand on memory and storage requirements. A method of implementing this optimized SOS is to use the SOS support available in Minnesota Mapserver. However, no clients are available through Minnesota Mapserver. A Common Gateway Interface (CGI) will have to be implemented in the C programming language to achieve this purpose. This optimized SOS will however, will only provide the core functionalities.

References

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