Mobile Computing and Sensor Web Services for Coastal Buoys

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Abstract-

A new generation of mobile device users is coming of age in the next decade. These users can explore the mobile internet with its new features compatible mobile phones, new services, and applications. Recently, an application platform like the Google's Android mobile platform, which incorporates the recommendations of the mobile middleware research, has revolutionized open applications development for the mobile platform. As increasing numbers of companies expose their services as web services, enabling flexible mobile access to distributed web resources, advanced personalization and localization features is a very relevant challenge. However, the current web is a collection of human readable pages that are unintelligible to computer programs. Semantic Web and Web Services have the potential of overcoming this limitation. Semantic interoperability is crucial for web services. Semantic web technology and the advent of universal and mobile access to internet services, provides additional features like knowledge-based, location or context aware information, provides languages and ontologies to reason about service descriptions, message content, business rules and relations between these ontologies, resulting in a service named Semantic Web Service.

A Semantic Web Service is a web service whose description is in a language that has well-defined semantics. It is computer interpretable, and facilitates maximal automation and dynamism in Web service discovery, selection, composition, negotiation, invocation, monitoring, management, recovery, and compensation. For this we employ a standard ontology called Ontology Web Language for Services (OWL-S), consisting of a set of basic classes and properties, for declaring and describing services. OWL-S attempts to close the gap between the Semantic Web and the Web services infrastructure. The vision is to automatically discover services like Sensor Web Service, Geospatial Information Service, etc from mobile.

In this work, we apply the above methods to the Coastal Sensor Web. The Sensor Web links a remote end user's awareness with the observed environment. The coastal buoys collecting information are described using an interoperable framework OGC SensorML, which provides standard models and an XML encoding for describing any process, including the process of measurement by sensors and instructions for deriving higher-level information from observations. The information collected from the buoys can be queried by the user using Sensor Observation Services (SOS). The Sensor web enables the use of real or near real time data derived from coastal sensor networks and dynamic selection and aggregation of multiple sensor systems, meteorological and oceanographic simulations, and other decision support systems in a web services-based environment. A service description for this application is created using the above mentioned methods and is published in a UDDI registry to participate in discovery process. UDDI is a web wide registry of web services, it lacks an explicit capability

representation of service and it is a syntax based search producing coarse results. To avoid this we integrated UDDI with OWL-S forming an OWL-S/UDDI matchmaker, which provides a capability-based description mechanism to describe the web service making it possible to express the functionality of web service in terms of inputs, outputs, preconditions, and effects. Once the services are registered in the registry, the user can place a request for the web service. When the user places a request from a mobile client developed using Google's Android platform, OWL-S descriptions of the appropriate service satisfying the user's requirements is returned, by matching the query with the registered web services using the OWL-S/UDDI matchmaker. Through mobile, the execution of the discovered web service is done. Also other OGC services like WMS, WFS can be queried from the mobile client.