Mobile, Client-Side Discovery of Semantic Services in the Physical World

Mobile and nomadic information needs are typically centered on the user's environment (e.g., finding nearby points-of-interest, or checking reviews of nearby pubs and restaurants). The Semantic Web is an excellent data source for satisfying such needs, for instance via large online sources such as LinkedGeoData[1] and DBPedia[2]. Reflecting this, various mobile application domains already leverage Semantic Web data, such as augmented reality [1], context-aware systems [2, 3] and m-Health applications [4]. Due to recent advances, mobile clients are currently at a point where they can dynamically and autonomously consume the Semantic Web. Firstly, thanks to widespread wireless connectivity, clients can access Semantic Web data at any time and place. Furthermore, powerful mobile hardware allows performing resource-intensive tasks locally, without requiring an external infrastructure; including data interpretation, integration and provisioning. Leveraging these advancements, SCOUT [2] is a mobile, fully client-side framework that provisions semantic information, describing the user's current environment, to mobile apps. To dynamically collect this information from the Semantic Web, SCOUT leverages links between Semantic Web data and the physical world. For instance, tags (e.g., RFID) loaded with online semantic data locations and attached to physical entities, are detected using mobile hardware (e.g., built-in RFID readers), while geocoded semantic data is retrieved based on the user's current location.

Another part of the Semantic Web, namely Semantic Web Services, is ready to be exploited by mobile clients as well. Thanks to the associated semantics, which are based on well-known standards and domain-specific ontologies, descriptions of these services are fully machine-readable and -understandable. Combined with increased mobile device capabilities, these semantics therefore enable service discovery, invocation and orchestration to be performed autonomously on the mobile device. We note that, comparable to their information needs, mobile users often require services related to current surroundings. For instance, this includes services wrapping temperature sensors and actuators (e.g., air-conditioner) in a hotel room; or services supplying schedules and ticket purchasing features in a train station. By likewise providing semantic services with a foothold in the physical world (e.g., via geocoding or tagging), mobile clients can discover semantic services as well.

We propose a system that automatically discovers nearby Semantic Web services, supplying mobile apps with (pull-and push-based) access to the discovered services. In particular, the system converts and adds semantic service descriptions to a query-able Service Model (stored in RDF). We rely on a standards-based, bottom-up semantic service stack, which builds on the W3C Semantic Annotations for WSDL and XML Schema (SAWSDL[3]). WSMO-Lite[4] exploits these SAWSDL mechanisms, and defines a concrete ontology for annotating existing WSDL files. Importantly, by relying on such a bottom-up service stack, we aim to reduce the participation threshold for developers, making it easier for them to semantically enhance their existing services.

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