PIRE 2009 Project Proposal

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Project Title:
Mobile Web Services using Globus

Problem Statement:
The Globus Toolkit 4 provides support for grid computing through web services. The standard implemented by GT4 is called the Web Services Resource Framework (WSRF).

During the course of the PIRE program contributions to the development of the WSRF-ME framework were made.

The WSRF-ME framework's goal is to enable the use of web services on mobile devices based on the Web Services Resource Framework while adhering to the method in which web services invocations are utilized in JSR-172 (which is the standard API for accessing web services from a J2ME enabled mobile phone).

One of the future developments suggested by previous PIRE participants involves the solution of issues regarding cross-manufacturer interoperability. Considering today's market and mobile device pool

heterogeneity a real implementation of grid computing should prioritize the solution of such manufacturer inherent issues.

Motivation and Impact:
This project proposes the continuation of the development of the WSRF-ME framework, which implements mobile devices as members of grid computing clusters. It has already been demonstrated that it is possible to enable mobiles to behave as members of a grid computing environment. A generalization of the WSRF-ME framework is proposed, applied to other mobile manufacturers, specifically those who implement Android.

Selected because of their low cost, these two platforms should help asses the expansion capability of the current framework and point to a particular modification that could lead to a successful cross-platform implementation. This generalization could suggest the WSRF-ME framework as a plausible candidate for commercial deployment and provide guidelines for the implementation of grid web services oriented specifically towards mobile devices.

Additionally, the WSRF-ME framework has never been tested on an implementation with true applicability. The effectiveness of the framework in a real scenario should be proven by leveraging the experience and already existing grid computing solutions of the partner institution. This will provide further proof of the advantages of the developed framework.

Current Status:

The initial implementation of the WSRF-ME framework has already been accomplished by previous PIRE contributors.

The Java ME based JSR-172 specification provides the basic functionalities required to use web services in restricted environments and defines two API which provide support for XML processing and parsing, and the enabling to web services of XML based Remote Procedure Calls (RPC).The WSRF-ME framework addressed issues encountered in the JSR-172 which limit its effectiveness mainly: the APIs lack of built-in support for the Web Services Resource, no standardized support for WS-Addressing, the impossibility of the parser for the accommodation of the extensions and changes made by WSRF in the client stub generation and the poor support of complex data types.

Another Java ME implementation is called kSOAP 2 but it also suffers from some of the same limitations encountered by JSR-172. The “wsrf4j2me” solution attempted to address some of the limitations encountered by kSOAP 2 during the communication with WSRF-enabled web services, but it was never completed.

Within the Android development, little attention has been paid to the implementation of web services. The generalization of the JSR-172 for it may or may not be possible during the development of this project and a clean implementation from scratch may be required that could satisfy the requirements of both platforms (S60 and Android).

Research Roadmap:

The activities related to this research are the following:

1. Background/learning phase:
    a. Tutorials on Java
    b. Tutorials on Android and S60 development
    c. Tutorials on Globus

    d. Research on related projects like wsrf4j2me.
2. Handover of the original WRSF-ME framework code and documentation.
3. Analysis of code
4. Exploration of evolution strategies
5. Redesign tasks: proposed solution.
6. Environment setup (possible upgrade to latest software versions)
7. Implementation and testing:
    a. Research on the grid computing solutions that Tsinghua University specializes in and selection of the application that will serve as proof of concept.
    b. Test scenario selection and implementation.
    c. Testing
8. Result gathering and final conclusions which should point towards guidelines for the implementation of grid web services for mobile devices (possible paper).

Relation to PIRE Core Research Projects:

Within PIRE's core research projects this proposal fits into the CI Integration Layer. This layer provides services that can be reused by other applications in the targeted domains. Particularly it fits as a solution to the call for Transparent Grid enablement by providing a general tool for implementing grid computing in specific mobile environments.