

ERCIM “Alain Bensoussan” Fellowship Scientific Report

Fellow: Sattanathan Subramanian

Visited Location: Gemo Group, INRIA Saclay, France

Duration of Visit: Jan 14 to Oct 13, 2008 (9 months)

I - Scientific activity

During this period, my research focused in the topic of Active XML (AXML, in short). I have identified an approach to optimize Web service calls (*service calls*, in short) of AXML document after analyzing the existing AXML framework. The summarization of optimization approach is follows.

A workflow typically contains a number of service calls that satisfies different business needs. Workflow engines invoke the service calls either remotely or locally in an order depending on the conditions that are given in the respective workflow specifications. Moreover, workflows specifications are *strictly* executed by workflow engines without attempting any optimizations although many possible less expensive workflows could be devised that obtain the same results. Fundamentally, this is because workflow engines consider the control flow but not the dataflow. AXML platform facilitates for *data-oriented workflows*, AXML document is a data-oriented workflow specification. The proposed optimization provides a *relaxed* execution to workflows, in the context of AXML. This is done by doing the following: (i) Group the service calls by relating one with another based on the data source i.e. Web service, (ii) Reuse existing results received from other equivalent (fully or partially) evaluated service calls. This optimization minimizes the following in AXML peer that executes AXML document:

- (i) *number of service calls*, from n to m , where n is the number of service calls in AXML document d , m is the number of service calls in optimized AXML document d' , $m \leq n$,
- (ii) *amount of data transfer*, from dt_n to dt_m , where dt_n is the amount of data transfer that happens during the execution of service calls in d i.e. $dt_n = dt_{sc_1} + dt_{sc_2} + \dots + dt_{sc_n}$, dt_m is the amount of data transfer that happens during the execution of service calls in optimized AXML document d' i.e. $dt_m = dt_{sc_1'} + dt_{sc_2'} + \dots + dt_{sc_m'}$, $dt_m \leq dt_n$.

Also, this optimization minimizes the memory and processor usage in AXML peer that executes AXML document, Web service peer that provides service to AXML document, and Database peer that provides data to Web service.

Theoretical part of this optimization work has been performed. The implementation is on the way to analyze the performance improvement of AXML document execution.

II- Publication(s) during your fellowship

S. Subramanian, S. Abiteboul, I. Manolescu, S. Zoupanos, and A. Ghitescu. “Optimizing Web Service Calls in Active XML Document”. (*In preparation*)

III -Attended Seminars, Workshops, and Conferences

- International Symposium on Applications and the Internet (SAiNT), Turku, Finland, July 28 to Aug 01, 2008. (*Participation*)
- “Enhancing BPEL Engines for Self-healing Composite Web services”, Distributed Systems and Software Engineering Group, University of Groningen, Groningen, Netherlands, May 29, 2008. (*Invited talk*)
- “Optimization of Web service calls in AXML Document”, DocFlow-Meet, May 19-20, 2008, Laboratoire d’Informatique Algorithmique: Fondements et Applications (LIAFA), Paris, France. (*Talk and Participation*)