



Deliverable D3.1
First Year Report on Work Package 3
Dissemination level: PU
Date: 11 June 2010

1 Overview

Objectives of the Work Package. The key objectives of this work package are to develop a theory for describing and verifying properties of an XML document (or several XML documents) that change in time.

The objectives are split into three tasks

T3.1 Schemas and reasoning tasks for dynamic distributed XML

T3.2 Compile time analysis

T3.3 Run time analysis

Task T3.2 and T3.3 will start only at M19. Task T3.1 started at M6, and therefore only last for six months.

Main results. There were two main results.

The first main result is the work of Serge Abiteboul, Pierre Bourhis and Victor Vianu, described in more detail in Section 2.1. This work lays the groundwork for task T3.1, by comparing the expressive power of various mechanisms that model dynamically changing XML documents. The focus is on the computational complexity of reasoning tasks, thus advancing the stated goal of task T3.1, which was to carry out a “systematic study” of “decidable reasoning tasks” in Active XML.

The second main result is the work Florent Jacquemard and Michael Rusinowitch, described in more detail in Section 2.2 These achievements are on the boundary between tasks T3.1 and T3.2. The contribution of this work is an application of techniques from the term-rewriting community to finding decidable reasoning tasks.

Dissemination. This work package has only been functioning for half a year, so the work is new and there has been little to disseminate. There are some exceptions: the work of Jacquemard and Rusinowitch was started earlier, and therefore the completed paper will be presented at the International ACM SIGPLAN Symposium on Principles and Practice of Declarative Programming (PPDP) conference this year. Also, initial reports on the work of Segoufin and Toruńczyk, a result of Toruńczyk’s visit to Paris, and concerning Task 3.2, was already presented at a workshop on infinite and timed systems.

An important venue for dissemination was the training event for WP3, which was scheduled for April 2010. This event was popular, also with several researchers from outside the project registering. Due to the Iceland volcano, this event has been rescheduled to September 2010.

Collaborations. Even though Tasks 3.2 and 3.3 begin 19 months after the start of the project, we have initiated (French-Polish) collaborations that contributed to these tasks, and should give results in the coming months. These are listed below.

1. Szymon Toruńczyk (Warsaw) visited Paris from October 2009 to February 2010
2. Diego Figueira (Paris) visited Warsaw from October to December 2009
3. Wouter Gelade (Hasselt) visited Warsaw from October to December 2009

Justification of the resources. FoX funding has been used to support research positions in this project at different FoX sites and to support travel to conferences where WP3 research papers have been published and presented.

A total amount of 74 person-month (PM) has been assigned to WP3. This year we have devoted 15.65 PM to WP3 as detailed below. This low number is explained by the fact that most of the efforts on WP3 will start later.

Diego Figueira was appointed by INRIA to work on FoX as part of his Ph.D. He worked 3.1 PM on T3.1. Luc Segoufin and Florent

Jacquemard are also working on T3.1 and T3.2. Altogether INRIA has contributed 6.55 PM to WP3.

Paweł Parys has been appointed by Warsaw (UWAR) in July 2009. For 6 months, he has been working on task T3.1, as well as preparatory research for task T3.2. For the remaining 4 months, he has been working on task T2.3 of WP2. Diego Figueira spent 3 months in Warsaw, 2 of them working on WP3.

Leonid Libkin in UEDIN also contributed 1.1 PM on WP3.

2 Description of the new results

Both those results presented below concern task T3.1.

2.1 Workflows

In the work of Serge Abiteboul, Pierre Bourhis and Victor Vianu, the formalism of Active XML is used to describe several communicating peers, who store their data and send their messages using XML. The goal of this work is to investigate various specification languages that can be used to specify communication protocols, and compare their expressive power and computational complexity. One of the contributions is a more general notion of simulation of specifications languages, which allows to identify otherwise incomparable mechanisms. A slightly more detailed description follows below.

The paper, not yet submitted or published, introduces and compares three natural workflow control mechanisms for document-driven workflows, in the context of Active XML: (i) associating guards as pre-conditions to service calls, (ii) using an automaton with states including data to control transitions, and (iii) restricting transitions using temporal properties over the history of the current run. The results concern the relative expressiveness of the three approaches under two notions of equivalence: a strict notion requiring identical runs, and a more permissive one allowing auxiliary tasks and "invisible" data. The comparison highlights fundamental aspects and limitations of the three approaches. In particular, the results indicate the considerable power of static constraints to simulate apparently much richer workflow control mechanisms.

2.2 Rewrite based updates

Florent Jacquemard and Michael Rusinowitch have studied the following problem. We have a set L of source documents, and a set K of incorrect target documents. We also have a set U of update operations, taken from the W3C XQuery Update Facility, which include operations such as “replace tag name a by tag name b ”, or “add any document conforming to DTD D as the next sibling of a node with tag name b ”. Jacquemard and Rusinowitch have designed an algorithm that inputs L, K, U and decides if it is possible to start with a document from L , apply a sequence of updates from U , and reach a tree from K . The difficulty is that we are interested not in just one update from U , but a *sequence* of arbitrary length. This difficulty is overcome using techniques from term rewriting. The paper, called “Rewrite Based Verification of XML Updates”, will be presented at the 12th International ACM SIGPLAN Symposium on Principles and Practice of Declarative Programming, in July 2010.

References

- [1] F. Jacquemard and M. Rusinowitch. Rewrite based verification of XML updates. In *12th International ACM SIGPLAN Symposium on Principles and Practice of Declarative Programming*, to appear, 2010.