Progress Management Report
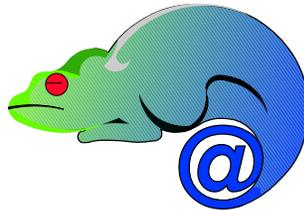
Deliverable Identifier:	PMR1
Delivery Date:	3/21/2003
Classification:	Restricted to the Commission and Appointed Reviewers
Authors:	Ricardo Jiménez-Peris, Marta Patiño-Martínez
Document version:	1.0, 3/20/2003
Contract Start Date:	1 September 2002
Duration:	36 months
Project Coordinator:	Universidad Politécnica de Madrid (Spain)
Partners:	Università di Bologna (Italy), ETH Zürich (Switzerland), McGill University (Canada), Università di Trieste (Italy), University of Newcastle (UK), Arjuna Technologies Ltd.(UK)

Contents

1   Project Objectives

ADAPT will develop the technology and software infrastructure necessary for defining, enacting, and monitoring inter-enterprise business processes that are implemented as composite services with guarantees of availability, scalability and adaptability not only to changing network conditions and user requirements but also to reconfigurations and repairs. ADAPT will also provide middleware support for available, secure and dynamically adaptive basic services that will be used to build higher level composite services.

2   Achievements, Technical Progress, and Project Status

2.1   UPM

The UPM team during the first six months of the project has been working on studying the state of the art of the technology around BSs and CSs, getting familiarized with the tools to be used in the project for BSs and CSs, and designing an initial architecture for the transactional support for both BSs and CSs.

- The study of the state of the art has covered the following topics: standards around J2EE (EJBs, JDBC, RMI, JNDI, JTS/JTA, JSPs), basic web services standards (SOAP, UDDI, WSDL), composite web service standards (WSFL, BPEL4WS, WSCI, BPML), transactional web service standards (BTP, WSCoordination/WSTransaction), advanced transaction models, workflows and transactional workflows, and transaction engines. A summary of the state of the art has been included in deliverable D5.

- The familiarization with the following tools has also been accomplished during this period, application server (JBoss, JBoss clustering), databases (PostgreSQL, HSQLDB), group communication layers (JavaGroups, Spread), SOAP engine (Axis), servlet engine (Tomcat), web server (Apache), JTS transaction engine (JOTM from JoNaS).

- A small e-Learning project was undertaken to summarize the knowledge acquired around the J2EE machinery. This BS provides support for the automatic grading of programming projects. It uses a combination of JSPs, session and entity beans. It allows the electronic submission, correction and grading of programming projects. It additionally provides services for the generation of grade lists. The project will be tested in a real scenario during the second semester to better understand the problems of availability and scalability of the J2EE platform.

- For the familiarization with CSs, we built a simplistic e-travel agency with transactional services using Axis, Tomcat, and an open-source implementation of BTP on top of JOTM, the JoNaS JTS transactional engine, which can be used as s standalone product.

- The UPM has drafted the architecture of the support for transactional persistent state of BSs in the form of a middleware for replicated databases that interfaces with the application server by means of a JDBC driver. The architecture of the middleware is described in detail as part of deliverable D5.

- For transactional CSs, the UPM has outlined the goals to be achieved as well as an initial draft architecture (deliverable D5). Basically, the aim is to provide support for declarative transactions for CSs resembling container managed transactions in the EJB standard. This will be achieved by providing a visual composition tool combined with an intelligent code generator and a flexible CS transactional engine.

Additionally, in its role of coordinator the UPM performed the following activities:

- The representation of the consortium in different meetings such as the cluster of IST projects on service engineering (Bucharest and Brussels), MIDAS IP (Montreux).

- Participating in the elaboration of a coordination activity proposal for FP6 on service engineering as representative of the ADAPT consortium.

- The handling of the negotiation with the PO in all the issues that have been raised to date, such as the industrial partner substitution, changes of budget categories, etc.

- The elaboration of the coordination deliverables of month 6, that is, the dissemination and use plan (DUP), the project presentation, and this report (PMR1).

- The creation and administration of the communication and dissemination infrastructure:

    - The creation and administration of the project web page including the design of the ADAPT logo.
    - The preparation of templates in LaTeX and MS Word for the project reports.
    - The preparation of templates for project presentations in MS PowerPoint.
    - The creation and administration of e-mail lists for the consortium as a whole, the executive board and the different workpackages.
    - The creation and administration of a web based discussion phorum.
    - The creation and administration of an ftp site for storing the interim versions of software and document deliverables.
    - The management of over 500 messages related to coordination.

2.2   UniBo

During the first six months of ADAPT, work at Bologna has concentrated on the design of the Basic Services Architecture and has resulted in the document with the same name. We can subdivide this work in to three different phases. The first phase has been devoted generally to gaining experience with J2EE and evaluating potential J2EE application servers for use within the project. This study has led to the selection of the open-source application server JBoss. In the second phase, JBoss in general, and its clustering facility in particular, have been closely studied and evaluated.**?** We have examined the validity of the solutions and identified some issues regarding the compliance of these solutions with respect to the needs of ADAPT. During this process we have interacted intensively with the JBoss clustering developers, more particularly Sacha Labourey, Bill Burke and Bela Ban. Furthermore, in cooperation with Trieste, a thorough analysis of JBoss integration with the group communication toolkit Javagroups has been performed and the possibility of using other group communication toolkits such as Spread or Jbora have been considered. Finally, in the third phase, different architectural options have been proposed and evaluated, as described in the deliverable dedicated to the basic service architecture.

2.3   ETHZ

In the first 6 months ETHZ has been mainly working on outlining the architecture of Web services as described in the deliverable of the same name.

A significant effort has been made in capturing the state of the art and evaluating its implications for the purposes of ADAPT. A first, very basic composite Web service was implemented combining the Web services of several bookstores worldwide and one search engine (Google). This composite service was demonstrated in the Bologna plenary meeting (Feb, 2003) and was used as the basis for discussions within the consortium regarding the architecture of composite services. There was a 2-day meeting with Newcastle in Zurich to discuss several issues related to the architecture. The results of the meeting were sent to all partners in a report (prepared by Newcastle) as well as presented again and discussed in the plenary meeting in Bologna. The goals and objectives of ADAPT have been presented to industry as part of a course offered in Zurich on Feb, 2003. The material from that course has been made available to all partners as further input to the ongoing discussions on Web service technology.

2.4   McGill

- McGill became familiar with the technology to be used. LAN and WAN performance tests with the group communication system Spread were perfomred. The HP application server (which was initially assumed to be the application server to be used) was installed and tested. An example application based on the TPC-W benchmark was implemented in order to become familiar with the J2EE environment. The JBoss application server was installed and tested and the JBoss clustering (replication) mechanisms was evaluated.

- So far, two very informal internal reports have been written, suggesting, analyzing and comparing several replication strategies for application server architectures. These efforts are currently combined and discussed with the proposals suggested by Univ. di Bologna. Some ideas will be reflected in delivery D1.

- The Postgres-R replication engine has been migrated to the newest version PostgreSQL 7.2. So far, it has been transformed to a master-slave approach. A failover and recovery component has been integrated into the replication tool. The implementation is still in prototype stage but parts of it (basic replication and failureover) are currently tested by several people worldwide (code is published as open-source effort in progress).

- McGill took part in the workshop meetings and in continuous discussions (email and news-board) between the team members, mainly the participants of work package 1.

2.5   Trieste

During the first 6 months of the project, Trieste has been working on various issues related to the support for replication in Basic Services. In addition to studying some of the technologies that will be used for a Basic Service (J2EE, JBoss, JBoss clustering extensions, Axis), Trieste has been using two group communication platforms suitable for the project (JavaGroups, Spread) and has evaluated their behavior under high load, a scenario that is likely to occur in a Basic Service. The results of this evaluation are summarized in Deliverable D1 and will be used as input for building the group communication infrastructure of a Basic Service.

The architectural options for integrating either JavaGroups or Spread in a replication-enabled Basic Service have been analyzed, including options based on the use of JBoss clustering extensions. Such analysis has been discussed at a meeting with Bologna and has been made available to all partners in the form of slides from the meeting. The analysis was the result of numerous on-line discussions and has benefited from the analysis of the internals of JBoss clustering done at Bologna.

The implications of network failures on the replication layer have been analyzed, in particular, with respect to the delivery guarantees offered by the group communication platform. A preliminary proposal that may simplify the implementation of the replication layer in this respect has been presented at a meeting with Bologna and then at the second plenary meeting.

The above preliminary proposal has been implemented on top of Spread and has been used as communication infrastructure for a preliminary implementation of replicated web server. This early prototype has allowed Trieste to familiarize with Tomcat, that will constitute a Basic Service entry point, and to experiment with a possible replication strategy for such entry point. Details about such implementation have been made available in the form of a technical report.

2.6   UNEW

During the first six months of the ADAPT project, Newcastle has been working defining parts of the Composite Service Architecture. This has involved collaborating with Arjuna Technologies and ETH Zürich to produce a task model and specification language for Composite Services (Deliverable D7 and D9). The language allows the designer to specify which services are used to compose a Composite Service and place restrictions on the execution order of these services. The language is expressive enough

to allow the specification of arbitrarily complex services. The major design issues involved with the composition language were ensuring that it is scalable, reconfigurable and extensible.

We have also begun work on a distributed Service Enactment Coordinator to orchestrate the execution of Composite Services. To complement this we have been investigating adaptability issues such as semantically equivalent services and a service offering multiple levels of Quality of Service. We hope to integrate these ideas into the SEC which we will develop in the future.

2.7   Arjuna

During the first six months of the ADAPT project, the work at Arjuna Technologies has primarily focused on the Evaluation Plan (Deliverable D15), in addition to some work on the Composite Service Composition Language and the Middleware for Basic Services.

In order to produce an Evaluation Plan we have analysed existing and proposed standards and technologies to identify the technical capabilities and attributes, which are relevant to the goals of the ADAPT project. These goals have been identified as: Availability, scalability, performance, service description, composability, configuration, adaptation, process definition, replication, security, transaction models.

The set of selected existing and proposed standards and technologies that have been identified are: Java 2 Platform, Enterprise Edition (J2EE), Business Transaction Protocol (BTP), Web Services (WS-Transaction) and Web Services (WS-Coordination), Business Process Execution Language for Web Service (BPEL4WS), Web Service Choreography Interface (WSCI), Web Service Flow Language (WSFL), Microsofts XLANG, Web Service Conversation Language (WSCL), Web Service Description Language (WSDL), WS-Security (WSSec), Universal Description, Discovery and Integration (UDDI), OMG Interface Definition Language (OMG IDL), CORBA Interface Repository (CORBA IR).

The evaluation plan will address the functional capabilities and attributes of each of these technologies and derive a set of questions that can be used to evaluate the functionality of ADAPT.

With regard to specifying a Composite Service Composition Language, we have collaborated with Newcastle University and ETH Zurich. The language allows composite services to be specified as a sequence of basic(/composite) service invocations - this sequence of invocations honours constraints imposed by the service providers.

In order to undertake our work on the provision of Middleware for Basic Services we have familiarised ourselves with JBoss, Axis and Postgres, and provided an example web service application utilising JBoss and Axis to the other partners.

3   Adherence to Workplan

The workplan proceeds according to schedule.

3.1   Resource Usage

- UPM. 11 person-months for technical work, plus 5 person-months for coordination.

- UniBo. 8 person-months of additional personnel effort (scheduled effort 12 person-months), plus 8 person-months of permanent staff effort to the project.

  There was a 4-month delay in the start date of the second scientist (Jaksa Vuckovic) due to administrative delays in the hiring process. This shortage has been partially compensated by increased effort by the permanent staff during the period 1/9/2002 - 31/12/2002. There has been no modification to the scheduled workplan or the delivery dates.

- ETHZ. 9 person/month.

- McGill. Hired staff: 7.4 person-months, permanent staff: 0.6 person-months.

- Trieste. 3.45 person-months of additional personnel effort plus 3 person-months of permanent staff effort.

  There was a 3-month delay in the hiring of Milan Prica due to the intricacies of local rules for the hiring process of foreign people. This delay has been partially compensated by increased effort by the permanent staff and by a short-term contract to Etienne Antoniutti (that has recently become a PhD student, currently working on the project but without a contractual link).

- UNEW. 3 person-months of additional effort plus 6 person-months of permanent staff effort.

- Arjuna. 3 person/month (scheduled effort 6 person/month).

  ATL has faced significant administration difficulties over the first 6 months of this project as we have negotiated an amendment to the contract with HP and the Commission to become a contractor on ADAPT (in place of HP). We have therefore continued to carry out our obligations under the contract without being sure in the knowledge that this amendment would be signed. The majority of our effort therefore has started from 1 Jan.

3.2   Deliverable Schedule Update

The deliverable schedule has not been changed. One of the month 6 deliverables, "D5 Advanced Transaction Model" has changed its goal. The justification is that after the study of the state of the art of advanced transaction models it became clear that no new transaction model was needed and that no single advanced transaction model can suit any arbitrary CS. The decision has been to provide flexible support for a wide range of advanced transaction models. Therefore, we decided to extend the scope of the deliverable to cover: the state of the art of transactional support for BSs and CSs (including advanced transaction models), standards for transaction support, and architecture outline of transactional support for BSs and CSs.

4   Cooperation in the Project

4.1   First plenary workshop. Madrid, 23-24th Sept. 2002

The first plenary meeting was devoted to plan the first stages of the project. During the first day of the meeting the partners made presentations on their respective backgrounds related to the project. The partners also pointed out which could be their contributions to the project.

During the second half of the day, two issues were dealt with. The first discussed issue was how to proceed with the industrial partner substitution. Three possibilities were considered: to continue with a different lab of HP, to substitute HP by a new company formed out of the staff of the HP Arjuna Lab, and to search for another partner. The option considered more plausible was to substitute HP by the new company funded by the staff of the former HP Arjuna Labs. This option was the less disruptive as it meant to continue with the same team of people.

The rest of the day and the next half day were devoted to set up a detailed workplan and to assign responsibilities regarding the month 6 deliverables. Additionally, the main pieces of software to base the work of the consortium were decided: JBoss as application server, Tomcat as servlet engine and Axis as SOAP engine.

Talks and schedule available at: http://adapt.ls.fi.upm.es/madrid-sep-2002-meeting.htm

4.2   Second plenary workshop. Bologna, 13-14th Feb. 2003

This second plenary workshop was mainly devoted to come out with a common and integrated vision of the project, as well as to discuss the main architectural decisions taken during the first six months of the project. The meeting was extremely fruitful and helped to solve issues that could not be solved by e-mail.

During the first day, it was discussed the architecture of the basic services (BSs), especially the main issues regarding the interface between the different components. During the first half of the second day, the architecture of the composite services was considered. One of the main issues discussed whether to pursue a centralized or decentralized (workflow) engine for supporting CSs. The decision was to continue, at least initially, with both approaches to see which one was more promising. During the second half of the second day, it was discussed how to integrate the BSs with the CSs, in particular, whether it made sense to export statistics about the behavior of the BSs that could be used by the CSs. Finally, it was decided to not to include this support, since the advantages of the approach were not clear.

Talks and schedule available at: http://adapt.ls.fi.upm.es/bologna-feb-2003-meeting.htm

4.3   WP2 Meeting, Zurich, January 2003

The meeting was devoted to discuss the possible alternatives for the architecture of the CS services. The results of this meeting were taken as input for the deliverable "D9 CS Middleware Architecture".

4.4   WP1 Meeting, Bologna, 28 January 2003

The technical program of the meeting consisted of two parts: discussion of J2EE and JBoss, and of group communication infrastructures in general.

But the main issues discussed at the meeting were strategic: specifically, how to structure WP1 so that all partners can work together and individually as developers and researchers. Madrid's work on database middleware is cleanly separable, thanks to J2EE's database interface. But Bologna, Trieste and McGill need to find a way to work together. The majority opinion at this meeting was that we should collaborate on a complete replacement for JBoss's replication mechanism. But we did not propose a specific plan at this meeting.

5   Coordination with other Projects/Programmes

Different coordination activities with other projects have been undertaken up to the end of the period:

- Free/Open Source Software Projects Concertation Meeting, Brussels, 24th June 2002. A representative of the coordinator, prof. Marta Patiño-Martínez, attended the meeting and made a presentation of the ADAPT project and established contacts with some industry representatives interested in the potential results of the project.

- IST Cluster Meeting for Service Engineering Functionality, Bucharest, Oct. 11th 2002 in conjunction with the "Information Society Technologies for Broadband Europe". The coordinator, prof. Ricardo Jiménez-Peris attended the meeting and made a presentation of the ADAPT project.

- IST Cluster Meeting for Service Engineering Functionality, Brussels, 17th February 2003. The coordinator, prof. Ricardo Jiménez-Peris, attended the meeting. This meeting followed up the one held in Bucharest. The meeting resulted in the agreement of preparing a proposal for a coordinating activity for the first call of FP6. This proposal will study the different perspectives of the concept of a service and how services are engineered in different contexts. The partners of ADAPT will participate in the proposal.

- MIDAS Workshop on "Middleware for Composable and adaptable Services", Montreux, 14-15 November 2002. The workshop was attended by three partners of the ADAPT consortium (prof. Santosh Shrivastava from UNEW, prof. Ricardo Jiménez-Peris from UPM, prof. Gustavo Alonso from ETHZ). The MIDAS consortium is led by prof. Santosh Shrivastava what guarantees a fluent communication between the two projects. The invited ADAPT partners participated actively in the meeting. More concretely, prof. Gustavo Alonso presented an invited talk and all the ADAPT partners participated in the working groups organized as part of the meeting.

- DeFINE Workshop on Dependability Foundations for Information infrastructures - Network of Excellence, Pisa 25-27 November 2002 and Paris 24th of February 2003. Three partners of ADAPT were invited to the meeting (UNEW, UPM, ETHZ) and were finally selected to be part of the membership of a NoE proposal for the first call of FP6 on the dependability objective. If the NoE is accepted, the partners of ADAPT will be able to disseminate the results of ADAPT within the NoE.

6   Promotion/Information Dissemination

The project publications are the following:

- G. Alonso. Myths around Web Services. Bulletin of the Technical Committee on Data Engineering. IEEE Computer Society. pp. 3-9. Dec. 2002.

- R. Jiménez-Peris, M. Patiño-Martínez, G. Alonso. An Algorithm for Non-Intrusive, Parallel Recovery of Replicated Data and its Correctness. 21st IEEE Int. Conf. on Reliable Distributed Systems (SRDS 2002), pp. 150-159. Oct. 2002, Osaka, Japan. Number of attendants: around 75.

Some related publications are:

- W. Bausch, C. Pautasso, G. Alonso: Programming for Dependability in a Service-based Grid. The 3rd IEEE/ACM International Symposium on Cluster Computing and the Grid (CCGrid 2003). May 12-15, 2003, Tokyo, JAPAN

Other dissemination activities include:

- The project was also presented to industry in a two day course imparted in Zurich by ETHZ (10-11 February, 2003) with 41 participants from diverse industrial sectors.

- Publish the project in the LEARN web page, part of an accompanying measure in the IST programme to inform people about European research into information technology and to encourage young people to consider science and technology careers.

7   Conclusion

The project is progressing according the workplan. The software tools that will be used in the project have been selected. At this point the architecture of the BSs and CSs is clear and has been documented in the corresponding deliverables. It is also clear how to integrate transactional semantics into both BSs and CSs. The different meetings that have been hold among the partners have resulted very fruitful and have helped to clarify some difficult issues.

8   Appendices

8.1   Updated Consortium's Relevant Persons Working and/or Associated to the Project

After the contract amendment the industrial partner, HP, was substituted by Arjuna Technologies Ltd.

- UPM. The permanent staff participating in the project are: Prof. R. Jiménez-Peris, Prof. M. Patiño-Martínez.

  The currently hired staff includes: Mr. David Cadena and Mr. Alberto Erice.

  Additionally, there is a PhD student, Mr. Francisco Perez, working in the project although currently without a contractual link.

- UniBo. The permanent staff participating in the project is: Prof. Ozalp Babaoglu, Dr. Alberto Montresor, Dr. Davide Rossi.

  The hired staff is: Dr. Vance Maverick, Dr. Jaksa Vuckovic.

- ETHZ. The permanent staff participating in the project is: Prof. Gustavo Alonso.

  The currently hired staff for the project is: Mr. Daniel Joensson and Mr. Bioern Bioernstad

- McGill. The permanent staff participating in the project is: Prof. Bettina Kemme.

  The currently hired staff for the project is: Mr. Huaigu Wu and Mr. Mabrouk Chouk.

- Trieste. The permanent staff participating in the project is: Prof. Alberto Bartoli.

  The currently hired staff for the project is: Mr. Milan Prica, Mr. Etienne Antoniutti Di Muro.

- UNEW. Permanent staff: Prof. Santosh Shrivastava, Dr. Graham Morgan.

  Hired Staff: Mr. Simon Woodman

- Arjuna. The staff working in the project are: Dr. Stuart Wheater, Dr. Dave Ingham, Dr. Mark Little, Dr. Jim Webber.