

**ADAPT**  
**IST-2001-37126**

*Middleware Technologies for Adaptive and  
Composable Distributed Components*

**Demonstrator Specification**



**Deliverable Identifier:** D17  
**Delivery Date:** 21<sup>st</sup> March 2004  
**Classification:** Public Circulation  
**Authors:** Stuart Wheater  
**Document version:** 1.0 12<sup>th</sup> March 2004

**Contract Start Date:** 1<sup>st</sup> September 2002  
**Duration:** 36 months  
**Project coordinator:** Universidad Politécnica de Madrid (Spain)  
**Partners:** Università di Bologna (Italy), ETH Zürich (Switzerland), McGill University (Canada), Università degli Studi di Trieste (Italy), University of Newcastle (UK), Arjuna Technologies Ltd (UK)

**Project funded by the  
European Commission under the  
Information Society Technologies  
Programme of the 5<sup>th</sup> Framework  
(1998-2002)**



## Table of Contents

1	Introduction .....	3
1.1	Theme of the Demonstrator .....	3
1.2	Overall Structure of the Demonstrator .....	4
1.2.1	RosettaNet .....	4
1.2.2	WS-I Sample Application.....	6
2	ADAPT Tool Set .....	7
3	Demonstration Items.....	8
3.1	Demonstration of Basic Services Support.....	8
3.2	Demonstration of Composite Services Support.....	9
3.3	Demonstration of Basic and Composite Services Support.....	9
4	References .....	11

# 1 Introduction

The purpose of this demonstrator specification is to set down the scope and intent of the demonstrator which will be constructed by the ADAPT project partners. The demonstrator specification is also intended to act as a document that will communicate expectations between partners, along with indicating to the project offices and reviewers of the project our plans.

The ADAPT project's demonstrator will showcase the projects results; in particular it will show:

1. How composite services can be composed and orchestrated.
2. How legacy applications can be exposed as web services and constructed into composite services
3. How an ADAPT enhanced middleware platform (J2EE) can support available services.

This document focuses mainly on the overall structure of the demonstrator and specific use cases of the ADAPT middleware and tools, which are to be demonstrated. How the demonstrator will be used to provide input to the evaluation of the ADAPT project is detailed in the "Evaluation Plan".

## 1.1 Theme of the Demonstrator

The original intent of the ADAPT project was to have as the theme of the demonstrator an "E-Services Based Holiday Planner", but this theme, although popular as an example in papers, on examination, does not have the characteristics that would make a convincing demonstrator. There are no existing, publicly available, real, "E-Services Based Holiday Planner" designs that can be used to ensure the reality and completeness of any demonstrator constructed. As a result we have chosen to change the theme of the demonstrator to the related one of "Supply Chain Management", which can be argued, is a generalization of the "E-Services Based Holiday Planner" theme.

The theme of Supply Chain Management has the advantage that there exist a number of relevant standards and application designs, which can be used to ensure the reality and completeness of any demonstrator constructed.

The terms *supply chain* and *supply chain management* are defined by [1] as:

- The *supply chain* encompasses all activities associated with the flow and transformation of goods from the raw materials stage (extraction), through to the end user, as well as the associated information flows. Material and information flow both up and down the supply chain.
- *Supply chain management* (SCM) is the integration of these activities through improved supply chain relationships, to achieve a sustainable competitive advantage.

These definitions show that supply chain management involves the coordination of distributed activities and information flows across a number of participants within the

supply chain, and hence is a promising theme for an ADAPT demonstrator. It also contains numerous use cases for the ADAPT middleware and tools, which are to be demonstrated.

## 1.2 Overall Structure of the Demonstrator

One of the challenges with specifying the ADAPT demonstrator, is that one of the aims of the ADAPT project is focused on supporting the construction of composite services. So basing the demonstrator on a single uniform design would not show composition, as a single design would have been designed to be "composable". Hence the ADAPT demonstrator will be based on composing two different designs of a Supply Chain Management system: WS-I's (Web Services Interoperability) Sample Application Specification [2][3] and the RosettaNet's Order Management (Cluster 3) Standards [4][5]. We will also be monitoring the XML Common Business Library (xCBL) [8] to see if that standard can play a part in the ADAPT demonstrator. We intend to show that existing (legacy) applications can be "wrapped" as web services that can be composed with other services.

WS-I's Sample Application Specification and RosettaNet's Order Management Standards [6] are sufficiently different in their design that composition is challenging, but possible for some interactions. Also the implementation of the relevant service that makes up the systems is possible as an ADAPT Basic Service. Hence, combining a WS-I and RosettaNet looks a good approach to providing a demonstrator for the ADAPT project.

### 1.2.1 RosettaNet

The RosettaNet organization is a self-funded, non-profit making, consortium of major Information Technology, Electronic Components, Semiconductor Manufacturing, Telecommunications and Logistics companies working to create and implement industry-wide, open e-business process standards. These standards form a common e-business language, which allows the interpretability of processes between supply chain partners.

These standards have been split into seven *Clusters*, or groups of core business processes, that represent the backbone of the trading network. The Clusters that have been specified by the RosettaNet organization are detailed in the following table.

Cluster	Description
0: RosettaNet Support	Provides administrative functionality.
1: Partner Product and Service Review	Allows information collection, maintenance and distribution for the development of trading-partner profiles and product-information subscriptions.
2: Product Information	Enables distribution and periodic update of product and detailed design information, including product change notices and product technical specifications.
3: Order Management	Supports full order management business area from price and delivery quoting

	through purchase order initiation, status reporting, and management. Order invoicing, payment and discrepancy notification also managed using this Cluster of processes.
4: Inventory Management	Enables inventory management, including collaboration, replenishment, price protection, reporting and allocation of constrained product.
5: Marketing Information Management	Enables communication of marketing information, including campaign plans, lead information and design registration.
6: Service and Support	Provides post-sales technical support, service warranty and asset management capabilities.
7: Manufacturing	Enables the exchange of design, configuration, process, quality and other manufacturing floor information to support the "Virtual Manufacturing" environment.

Each RosettaNet *Cluster* is broken down into *Segments* - cross-enterprise processes involving more than one type of trading partner. The Cluster 3 is the most relevant to the ADAPT demonstrator, as it deals with *Order Management*. The Segments within Cluster 3 are listed within the table below.

<b>Segments</b>	<b>Description</b>
3A: Quote and Order Entry	Allows partners to exchange price and availability information, quotes, purchase orders and order status, and enables partners to send requested orders, or shopping carts, to other partners.
3B: Transportation and Distribution	Enables communication of shipping- and delivery-related information with the ability to make changes and handle exceptions and claims.
3C: Returns and Finance	Provides for issuance of billing, payment and reconciliation of debits, credits and invoices between partners as well as supports product return and its financial impact.
3D: Product Configuration	Enables development of custom configurations to feed the order management process and supports the effort for engineering changes by providing supply-chain communications for implementation.

Each Segment contains Partner Interface Processes (PIPs), which define business processes between trading partners. PIPs are specialized system-to-system XML-based

dialogs. Each PIP specification includes a business document with the vocabulary, and a business process with the choreography of the message dialog.

For the purposes of the ADAPT demonstrator we will concentrate on the PIPs within the 3A segment, as they are at present the most complete specification. The PIPs of the 3A segment are listed below.

<b>PIPs</b>	<b>Description</b>
3A1	Request Quote
3A2	Request Price and Availability
3A3	Request Shopping Cart Transfer
3A4	Request Purchase Order
3A5	Query Order Status
3A6	Distribute Order Status
3A7	Notify of Purchase Order Update
3A8	Request Purchase Order Change
3A9	Request Purchase Order Cancellation
3A10	Notify of Quote Acknowledgment
3A11	Notify of Authorization to Build
3A12	Notify of Authorization to Ship
3A13	Notify of Purchase Order Information
3A14	Distribute Planned Order

One of the challenges with using the RosettaNet PIPs is that no Web Services Definition Language (WSDL) specifications are provided. All that is standardized is the XML schemes for messages, but not their SOAP bindings. This means that we will have to construct our own WSDL definitions of the services involved in a PIP. This will allow us to choose between synchronous and asynchronous interaction styles for requests and their responses, this could allow us to demonstrate features that otherwise could not be shown.

### **1.2.2 WS-I Sample Application**

The Web Services Interoperability (WS-I) Organization is a group chartered with promoting Web Services interoperability across platforms, applications, and programming languages. The organization brings together a diverse community of Web services companies to provide guidance, recommended practices, and supporting resources for developing interoperable Web services. As a part of these efforts the WS-I Organization has specified a sample application specification, which is intended to allow companies to demonstrate their conformance to the WS-I's Basic Profile[6], which contains WS-I's Web service implementation guidelines. This sample application specification was developed by 10 of WS-I's member companies, and model a simplified supply chain management scenario.

The sample application design consists of three systems: a retail system, a manufacturing system and a demo system. The retail system consists for three service types: a retail service, a warehouse service and a warehouse callback service. The manufacturing system consists of a single service, a manufacturer service. The demo system consists of two services: a configurator service and a logging service. Each these services are specified in detail, and include their WSDL interface and their semantics.

Because the purpose of the sample application specification is to demonstrate interoperability, the style of service interface used, and interaction patterns specified are intentionally varied, including synchronous request/response, call backs and one-way interactions. This gives us an opportunity to demonstrate that Basic Services can maintain the required semantics of the underlying services, even given varied style of service use.

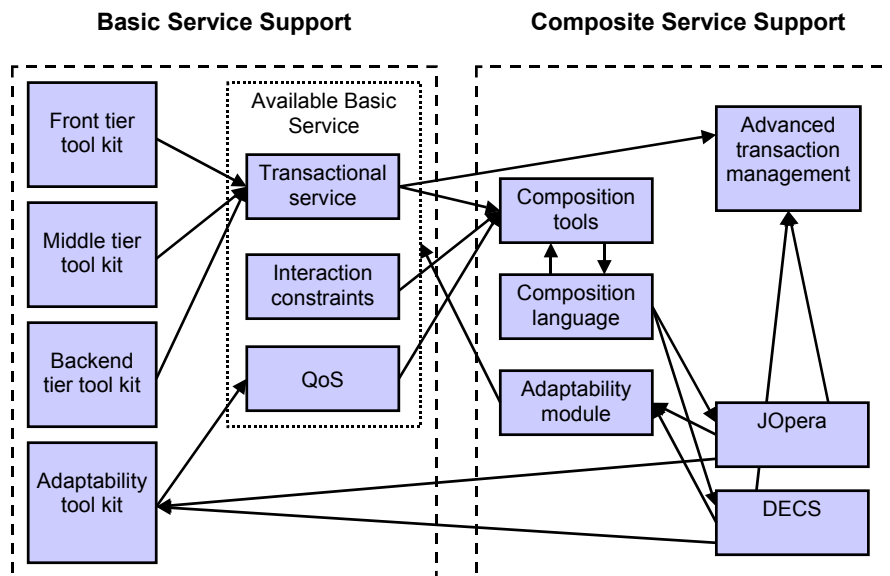
The WS-I's sample application specification has also specified 8 specific use cases, which specify scenarios for the use of the retail, manufacturing and demo systems. These use case are:

- Purchase goods
- Source goods
- Replenish stock
- Supply finished goods
- Manufacture finished goods
- Configure and run demo
- Log events
- View events

These give us the opportunity to demonstrate that some of these use cases can be deployed as Composite Service.

## 2 ADAPT Tool Set

The middleware and tools provided by the ADAPT project are intended to provide a comprehensive suite of tools to support the construction of reliable, adaptable and composite services. The relationships between the different aspect of the ADAPT platform are shown in the figure below.



It can be seen that three replication/availability tools kits have been developed to support available basic services. For service composition and orchestration, we provide a composition engine (JOpera or DECS), adaptability module, compositions tool and advanced transaction management. . Some of the highlights are:

- The transactional semantics of services can be ensured by the basic service support for replication of servlets, EJBs and databases.
- The transactional semantics, interaction constraints and performance properties of services can be used by the analysis and composition tools for validation and construction of composite specification, respectively.
- The advanced transaction manager will support the transactional semantics required by services.
- The composite service execution support (JOpera or DECS) can enact a composite specification, described using the composition language.
- The composite service execution support can interact with the advanced transaction manager, to ensure the transactional semantics of composite services.
- The composite service execution support can interact with the basic service adaptability support, to adapt basic services.
- The basic service adaptability support can enables adapt the performance properties.

In the following section, specific use cases detailing how the demonstrator will show support for Basic Services and Composite Services will be given. Use cases which involve both Basic and Composite Services have also been identified. It should be noted that the use cases are a mixture of design time and run-time scenarios.

### **3 Demonstration Items**

#### **3.1 Demonstration of Basic Services Support**

The following is a list of use cases, for ADAPT's Basic Services support, that will be demonstrated.

- Description of the services within the retail system, manufacturing system and demo system of the WS-I Sample Application with the ADAPT's service specification language, in particular their transactional semantics and their interaction constraints.
- Description of the RosettaNet Segment 3A PIPs interactions with the ADAPT's service specification language, in particular their transactional semantics and their interaction constraints.
- Demonstration that the RosettaNet Segment 3A and the WS-I Sample Application services, constructed using the ADAPT platform meet the required transactional semantics, despite failures.
- Demonstration that RosettaNet Segment 3A and the WS-I Sample Application services, constructed using the ADAPT platform, can be made adaptable (e.g. load balanced), despite failures.

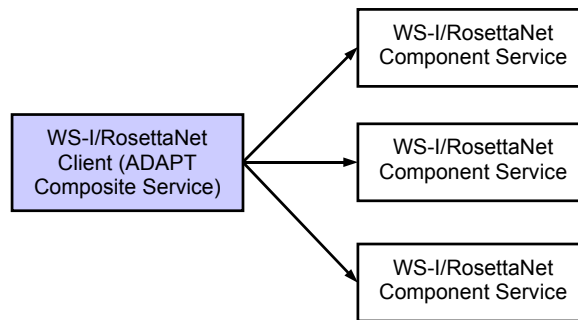


- Monitor the Performance Properties of the RosettaNet Segment 3A and the WS-I Sample Application services using ADAPT's Basic Service support.

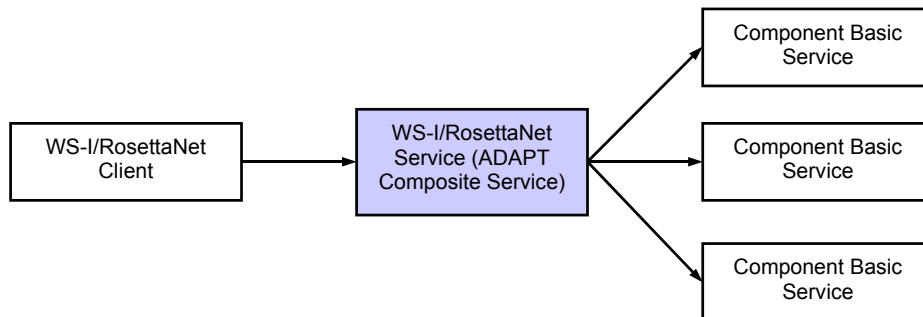
### 3.2 Demonstration of Composite Services Support

The following is a list of use cases, for ADAPT's Composite Services support, that will be demonstrated.

- Model the RosettaNet Segment 3A PIPs with the ADAPT composition language.
- Model WS-I's Sample Application use cases with ADAPT's composition language.
- Provide some of the RosettaNet Segment 3A PIPs and the WS-I Sample Application use cases as composite services using ADAPT's Composite Service support.



- Demonstrate the adaptation of a composite service that provides RosettaNet Segment 3A PIPs and the WS-I Sample Application use cases.
- Providing composite services that are composed out of RosettaNet Segment 3A and the WS-I Sample Application composite services.



- Provide the service specified WS-I Basic manufacturing service as a composite Service. This will show that the composite services maintain the original semantics.

### 3.3 Demonstration of Basic and Composite Services Support

The following is a list of use cases, for both ADAPT's Basic and Composite Services support, that will be demonstrated.

- Demonstrate the selection of a set of services based on their service specifications, and then these service being composed into a new service, and it being analysed.
- Demonstrate that the RosettaNet Segment 3A PIPs and the WS-I Sample Application use cases that are provided as composite services, can honour the required transactional semantics, despite failures.

- Demonstrate that the RosettaNet Segment 3A PIPs and the WS-I Sample Application use cases that are provided as composite services, honor the interaction constraints placed on the constituent services.
- Demonstrate advanced transactions support, because neither the WS-I Sample Application use cases or the RosettaNet Segment 3A PIPs deal with advanced transactions

## 4 References

- [1] “Introduction to Supply Chain Management”, Robert B. Handfield and Ernest L. Nichols Jr., Prentice Hall, 1999.
- [2] “Supply Chain Management Sample Application Architecture”, WS-I, Version 1.0, December 2003  
(<http://www.ws-i.org/SampleApplications/SupplyChainManagement/2003-12/SCMArchitecture1.01.pdf>).
- [3] “Supply Chain Management Use Case Model”, WS-I, Version 1.0, December 2003  
(<http://www.ws-i.org/SampleApplications/SupplyChainManagement/2003-12/SCMUseCases1.0.pdf>).
- [4] “RosettaNet Standards”, RosettaNet(<http://www.rosettanet.org/standards>).
- [5] “RosettaNet Pips”, RosettaNet  
(<http://www.rosettanet.org/pipdirectory>).
- [6] “RosettaNet Cluster 3: Order Management”, RosettaNet  
(<http://www.rosettanet.org/Cluster3>).
- [7] “WS-I Basic Profile Version 1.0a”, WS-I  
(<http://www.ws-i.org/Profiles/Basic/2003-08/BasicProfile-1.0a.html>).
- [8] “XML Common Business Library”, xCBL.org  
(<http://www.xcbl.org/>).