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## **Summary**

The plan for using and disseminating knowledge captures the Provenance partners' views on exploitation and dissemination of the project results. It describes the relevant target groups, it positions the project with respect to the other relevant initiatives, and it documents the exploitation and dissemination strategies and actions designed to reach these target groups in the context of competition. The plan documents knowledge ownership and the initial agreements between the partners to grant access rights to knowledge and associated pre-existing know-how. It is a working document that will be updated as the project progresses.

**Members of the Provenance consortium:**

- IBM United Kingdom Limited United Kingdom
- University of Southampton United Kingdom
- University of Wales, Cardiff United Kingdom
- Deutsches Zentrum für Luft- und Raumfahrt e.V. Germany
- Universitat Politècnica de Catalunya Spain
- Magyar Tudományos Akadémia Számítástechnikai és Automatizálási Kutató Intézet Hungary

## **Foreword**

This document has been compiled by John Ibbotson (IBM) based on input from all project partners.

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# 1 Introduction

In the plan for using and disseminating the knowledge the contractors set out in a detailed and verifiable manner, the terms of use and dissemination of the knowledge arising from the project, which they own, in accordance with their interests. It is an evolving document which is regularly updated to give a cumulative overview of the project's undertaken and planned activities, and submitted at the end of each reporting period.

The final plan for using and disseminating the knowledge, as required at the end of the project, will therefore provide a complete picture of all activities undertaken and most importantly will provide information on the future route to full use (exploitation or use in further research) and dissemination of the knowledge.

This document includes the following three sections:

- Exploitable knowledge and its use
- Dissemination of knowledge
- Publishable results

## 1.1 Background

The concept of *Provenance* is already well understood in the study of fine art where it refers to the trusted, documented history of some work of art. Given that documented history, the object attains an authority that allows scholars to understand and appreciate its importance and context relative to other works of art. Objects that do not have a trusted, proven history may be treated with some scepticism by those that study and view them. This same concept of *Provenance* may also be applied to data and information generated within a computer system; particularly when the information is subject to regulatory control over an extended period of time.

Today's grid architectures suffer from limitations, such as lack of mechanisms to trace results and infrastructures to build up trusted networks. *Provenance* enables users to trace how a particular result has been arrived at by identifying the individual and aggregated services that produced a particular output. The overarching aim of the *Provenance* project is to design, conceive and implement an industrial-strength open provenance architecture for grid systems, and to deploy and evaluate it in complex grid applications, namely aerospace engineering and organ transplant management. This support includes a scalable and secure architecture, an open proposal for standardising the protocols and data structures, a set of tools for configuring and using the provenance architecture, an open source reference implementation, and a deployment and validation in industrial context.

The impact of this project is to provide mechanisms that allow information generated and managed within a grid infrastructure to be proven and trusted. By this we mean that the information's history, including the processes that created and modified it, are documented in a way that can be inspected, validated and reasoned about by authorised users that need to ensure information controls have not been altered, abused or tampered with.

## 1.2 Provenance project objectives

The overarching aim of the Provenance project is:

*To design, conceive and implement an industrial-strength open provenance architecture for Grid computing, and to deploy and evaluate it in complex grid applications (aerospace engineering and organ transplant management).*

Specifically, the objectives of the project are:

1. To specify the contents of provenance in relation to workflow enactment.
2. To design and implement a scalable and secure distributed co-operation protocol to generate provenance data in workflow enactment.
3. To conceive and implement tools to navigate, harvest and reason over provenance data, also in a scalable and secure manner.
4. To design and engineer a scalable and secure software architecture to support provenance generation and reasoning.
5. To deploy and evaluate the provenance system in two different grid applications, namely aerospace engineering and organ transplant management.
6. To propose a draft provenance specification for input to an open standardisation process thereby contributing to the standardisation efforts in this area within the Grid and Web Services architecture domains.

## **2 Exploitable Knowledge and its Use**

### **2.1 *Exploitation Directions***

This section will only present exploitable results, defined as knowledge having a potential for industrial or commercial application in research activities or for developing, creating or marketing a product or process or for creating or providing a service. It should provide an overview of how the knowledge could be exploited or used in further research (if relevant). Both past and planned future activities should be included.

The Provenance results may include:

1. Requirements – User and Software
2. Functional prototypes of the reference architecture
3. Demonstrations
4. Best practice examples
5. Evaluation of Provenance technology
6. Tutorials
7. Framework / architecture
8. Dissemination materials (papers, presentations, film, etc.)
9. Web site
10. Standardisation

The strategies for exploitation will differ with respect to the different nature of these results. Five kinds of exploitation can be categorised:

1. Think tank: Several organisations, including the partners, will make use of the Provenance results as a think tank with a direct influence on their business (strategies, consensus building, standards, etc.).
2. Publishing: For partners from research and academia, publishing scientific results represents their mode of exploitation.
3. New projects: Provenance is expected to give rise to new research projects, and support the preparation of high-quality educational material (courses, text books, etc.).
4. Standardisation: Standardisation organisations such as W3C, OASIS and GGF are suitable organisations for disseminating standards proposals. The aim is to enable interoperability between components using standardised interfaces.
5. Commercialisation: The industrial partners in Provenance will be privileged in respect to the products and standards of Provenance, as they get ownership of IP and influence on and early access to designs and prototypes. It is however expected that industry will generally benefit from those developments. The consortium would encourage the use of some prototypes as the basis for commercial products or product-like open source software, but uniformly achieving this level of quality is not a goal of Provenance.

### **2.2 *Partner Specific Exploitation Plans***

This section contains general statements from partners about their exploitation strategies. Details of specific plans are provided in the [Exploitation Plans](#) section.



## 2.2.1 IBM United Kingdom Limited

IBM is the only commercial partner in the Provenance project consortium. IBM is evaluating the Provenance architecture and proposed interfaces to assess their value for commercial exploitation. IBM does not expect that the reference implementation being developed by the project will become part of a potential commercial product. However, the principles described by the logical architecture together with proposed standardised interfaces may be implemented using IBM's existing portfolio of middleware and application products. IBM is unable to provide any firm exploitation commitments or timescales at this time but undertakes to provide confidential reports to the Provenance Project Officer as and when exploitation activities have taken place.

## 2.2.2 University of Southampton

The University of Southampton is investigating the exploitation of Provenance technology and concepts in the following ways.

In teaching, a new syllabus on Advanced Topics on Web Services was approved on 20/4/2005. This syllabus includes an explicit topic on Provenance. Teaching of this course will begin in October 2005; in a first instance, it will be offered to fourth year Computer Science and Software Engineering MEng students, i.e. a cohort of about 20 students; at a later stage, the course may be offered to third year Computer Science and Computer Engineering students, i.e. a cohort of about 130 students.

In research, the UK funded PASOA project will study opportunities to leverage the outputs of Provenance and feed them into the applications it studies. Specifically, the Southampton PASOA team studies Provenance in the context of a bioinformatics application and of the Large Hadron Collider Atlas experiment.

As part of the e-Science community in the UK and the EU grid activity, we are in contact with a number of e-Science/grid projects; OntoGrid, RealityGrid and Combechem have shown strong interests for Provenance technologies, and we are in the process of building bridges with these projects.

Southampton is also leading the "SOCA - Southampton Chicago Activity", an EPSRC project with Ian Foster's Distributed Systems Lab at Argonne Labs and University of Chicago. In this context, we will study the possibility of software integration with GriPhyN outputs.

## 2.2.3 University of Wales, Cardiff

The University of Wales, Cardiff (UWC) is currently investigating the use of Provenance in the GridOneD project -- based on the Triana workflow engine. GridOneD is a UK funded project exploring the analysis of Gravitational Wave data from laser interferometers. A very large quantity of data can be generated, and looking through this for a particular template signal can require significant computational power. The Provenance issues being investigated include understanding the effect of using different analysis services in the overall process of detecting such template signals. As a repeat of a particular computation can be expensive, understanding why or how a particular result has been generated can help in the planning of future experiments. The data generated at the end of the analysis process is very much dependent on the accuracy of intermediate results. Therefore recording a trace of execution provides useful insight to a physicist in understanding whether the result that has been produced is likely to be of value.

A related project is FAEHIM (Federated Environment for Heterogeneous Intelligent Mining), which allows composition of Web Services to support distributed data analysis. The toolkit is currently being evaluated by the Earth Sciences community at Cardiff, to support the analysis of data from oil and gas reservoirs. A presentation has also been made to the coordinator of the EU DataMining Grid project,

and it is expected that some collaboration with this project on Provenance issues will be forthcoming. The key Provenance issues in this context relate to attributing intellectual property rights, based on how a particular result has been arrived at.

The Grid Enabled Numerical and Symbolic Services (GENSS), in which UWC is also involved, has already provided requirements as part of the User Requirements capture process.

## **2.2.4 Deutsches Zentrum für Luft- und Raumfahrt e.V.**

DLR is evaluating the opportunities for exploiting Provenance technology with their TENT system for distributed simulation of aerospace components.

Currently, various data sources are queried to gather information on the current state of a simulation or computation. The data is handled in various ways depending on the source (e.g. logging data, session file generation, and data management service). A Provenance service would present a single and central interface for information collection and retrieval. It would be developed as a separate instance handling the collection of data and the queries on this data. It would be designed using the standards for Grid Services making it as flexible as possible and provide the full security of Grid Services to the user.

Additionally, DLR would provide an interface or export feature to the persistent data management system DataFinder. This would give a complete integration for all data involved within scientific computational processes handled via the simulation environment TENT.

This open, flexible, and integrated approach is the key feature for use in our DLR internal and external deployments. A Provenance service would give a homogeneous view on all available data within complex simulation workflows.

## **2.2.5 Universitat Politècnica de Catalunya**

Provenance results exploitation for UPC focuses on two main tracks: 1) the medical domain of organ transplants - this is a long term program but with high rewards and 2) application in other UPC Grid related projects - medium term but more research rather than business outcomes.

For the first of these two tracks, as described in the SWOT analysis, UPC sees potential in the development of the Provenance enabled OTM application demonstrations to lead to real deployed systems in the medium and long term. During discussions with professionals in the domain it has become clear that the types of capabilities offered by the planned demonstrator are both A) highly desirable (leading to higher auditability of medical processes) and B) not available with current systems. In order to pursue this opportunity UPC works with Hospital St. Pau, the Catalan Organ Transplant authority and specifically the CARREL FIS project. The main starting point for any post-project exploitation / development is the demonstration to be carried out by the CARREL FIS to OCATT and others in autumn 2006. The Provenance enabled OTM systems developed in the Provenance projects will form part of this demonstration and will hence receive exposure to the OCATT and hospital audiences. The timeline for preparation of this exploitation corresponds to actions UPC-E-1 to UPC-E-6.

For the second track, the Provenance group at UPC has initiated discussions with Barcelona Super Computing (BSC) research group at UPC lead by Mateo Valero. This group runs and is involved in a number of large scale Grid research projects. The objective of the interaction is to enable Provenance technical results to be integrated into some of these activities over time. The timeline for preparation of this exploitation corresponds to actions UPC-E-7 to UPC-E-9.

## 2.2.6 SZTAKI

SZTAKI has identified two target groups for exploitation; the eScience community and healthcare applications.

The eScience community consists mainly of the academic users of the generic grid infrastructure of the Hungarian academic network. These users have developed several grid applications without using provenance services. The aim here is to show the advantages of applying provenance by deploying provenance services and applying it to a set of deployed grid applications. The currently planned exploitation actions in this target group are STA-E-1 and STA-E-2.

The healthcare applications target group consists of the users of electronic healthcare record (EHCR) systems. Healthcare applications often need to collect the full EHCR of patients; however there are no established informatics methods to do this. Provenance technology can provide the means to support this. The exploitation actions in the healthcare application target group will be based on the methods and EHCR software components developed in the OTM application of the Provenance project. The currently planned exploitation action in this target group is STA-E-3.

## 3 Dissemination of Knowledge

### 3.1 Overview

Dissemination and exploitation of results is key to raising the Provenance project visibility. This effort includes publishing results, making presentations and providing code and demonstrations. Dissemination actions will address Europe and beyond and contribute to the positioning of the project results within society and the marketplace.

The promotion strategy as stated later in this document will be applied. Broad support and commitment from the stakeholders about Provenance is required. Therefore Provenance concepts have to be clarified and the benefits of the proposed architecture have to be explained. This could for instance be achieved by the following means and strategies:

- *Public web site:* Web pages are available from the project public web site <http://www.gridprovenance.org/> to ensure timely access to the project published results, including public deliverables, and to enable the interested communities to provide early feedback and to raise public debate on Provenance progress and prospects;
- *Promotion material:* The Provenance consortium will design promotion material on printed media as well as on new interactive products and services. This material will continue to be broadly distributed, in particular at dissemination events that the Partners attend or on demand;
- *Dissemination events:* Provenance Partners will submit papers to major conferences and journals, and give demonstrations and speeches at international fairs, open house and commercial events, whenever possible. Upon achievement of major results, reports and press releases will be issued, and dedicated dissemination events will be organised;
- *Lectures:* selected project partners, who have qualification tasks at Universities and Research Centres, will perform lectures and research transfer. They will transfer know-how on methodology, technology and business evaluation to their students.
- *Networking activities:* the project has established co-operation links with other initiatives interested in the research and application of a Provenance architecture;
- *Workshops and visits:* Organising workshops and giving presentations are valuable tools in the promotion of Provenance, but might attract only those that already are convinced of the application of Provenance. Hence, also personal high-level visits to those people that still have to be convinced are the most effective way to achieve support and commitment. A visit plan has to be developed;
- *Knowledge base:* The construction, population and maintenance of a comprehensive knowledge base are pivotal to sustaining the off-line and on-line activities of Provenance. It will provide consortium partners, as well as external interested parties, with added value access to information, contacts and activities. This knowledge base will ensure excellence by having links to the most up-to-date information available concerning Provenance management. It will contain the findings of Provenance, in the technical, legal, social and economic field. It can be used to keep all stakeholders informed and to convince them about the relevance and importance of Provenance.

Success resulting from the Provenance dissemination actions could be scored according to the aggregate number of visits to the project web site, the requests received for information on project

results and prospects, the aggregate participation in the Provenance events such as workshops, presentations, lectures, and demonstrations – whether initiated by the project or from invitation by external organisations. Later in the project, the numbers of users downloading and using the reference Provenance implementation and tool set.

## **3.2 Publishable Results**

This section lists global results from the Provenance project. Each result is briefly described in terms of its main purpose, its content, its benefits, and its potential use.

### **1. Requirements – User and Software**

*Purpose and content:* Being developed as workpackage 2, the requirements guide the project throughout its lifetime and deliver valuable information for exploitation. They capture the User requirements and a derived set of Software requirements.

*Benefits and use:* This material is designed for everybody interested in Provenance. The requirements provide a reference from which other Provenance deliverables such as architecture and reference implementation can be evaluated.

*Availability:* This result is available in the form of two deliverables, referenced D2.1.1 (User Requirements) and D2.2.1 (Software Requirements). They are public documents and will be accessible from the public web site.

### **2. Functional prototypes of the reference architecture**

*Purpose and content:* Functional prototypes of the reference architecture will be developed and tested by the application partners as part of the Provenance project. The final version of the functional prototype is meant to demonstrate the results of Provenance at the end of the project. Application prototypes will be developed in the context of selected application scenarios and will be subjected to small-scale, supervised trials with partners. The prototypes are not public materials but will be publicly demonstrated.

*Benefits and use:* The prototypes show the functionality of the Provenance architecture. They aim to validate the project results and provide evidence that these results are suitable for exploitation from a legal, usability, technical and commercial point of view.

*Availability:* The functional prototypes are available from month 12 of the project and are subject to a revision every six months. The pre-prototype (D9.1.1) and first functional prototype releases are restricted to partners only. These are available in months 6 and 12 respectively. Later versions at months 18 and 24 (D9.3.1 and D9.3.2) are available to the wider community on an open source license.

### **3. Demonstrations**

*Purpose and content:* The demonstrations are designed to provide intuitive and informative education in the use of the Provenance architecture. They may also illustrate the conceptual models used to develop the Provenance architecture and its deployment. The demonstrations are not public material as such but can be used by project partners for presentation purposes.

*Benefits and use:* The demonstrations form a basis for illustrating the Provenance architecture and implementation.

*Availability:* Demonstration material is not scheduled within the project plan but will be available on an as-is basis.

### **4. Best Practice Examples**

*Purpose and content:* Best practice examples will be produced to show how the Provenance architecture can be deployed in either newly designed or existing systems.

*Benefits and use:* The guidelines are developed and tested by the use of the demonstrations.

*Availability:* This result is as part of the final project documentation (D1.2.1). The guidelines will be publicly accessible at the public web site.

## **5. Evaluation of Provenance Technology**

*Purpose and content:* The evaluation reports the assessment of Provenance technology at different levels of prototype and test application maturity. The evaluation is performed from the legal, social, economic and user viewpoints. It is based on the requirements gathered in workpackage 2.

*Benefits and use:* Steady evaluation is necessary in the iterative process of design and implementation to improve the concepts and prototypes and to ensure the compliance with the requirements. Additionally it serves as a trust-building method, especially as the material on evaluation is public.

*Availability:* This result is available as a restricted deliverable from each of the two test application workpackages (D7.2.1 and D8.2.1). Its access is restricted to the project partners and the European Commission.

## **6. Tutorials**

*Purpose and content:* The tutorial materials will be designed to help the users of the prototypes to understand the concept of Provenance, as well as to build a common knowledge base among all partners in Provenance and beyond. To achieve this, the tutorials will contain material from all the different disciplines represented by the Provenance partners.

*Benefits and use:* There will be tutorials for different target groups, especially for end-users, for developers, for service providers and for application designers. The material aims at increasing awareness for the problems which privacy-enhancing IDM tries to solve and educates the target groups in concepts and solutions. The material may be used for academic teaching.

*Availability:* Tutorials have not been scheduled as explicit deliverables from the Provenance project. They will however, form part of the Collaboration workpackage 10.

## **7. Framework / Architecture**

*Purpose and content:* The Provenance architecture aims to establish the basis for the widespread deployment by providing a detailed “map” of Provenance management. The Provenance Architecture is part of the framework and specifically focuses on how to organise the relationships and the interactions between the various mechanisms so that they work in synergy and achieve the desired results.

*Benefits and use:* The first internal strawman of the architecture will be on the public web site. Like the requirements materials the architecture points out the context and the principles of Provenance management. The Provenance Architecture is expected to serve as a reference for positioning existing and future market offerings.

*Availability:* The contracted architecture deliverable (D3.1.1) is not scheduled until month 18. The project will however, make earlier drafts available on the public web site.

**8. Dissemination Materials (Papers / Presentations etc.)**

*Purpose and content:* This result is intended to raise the visibility of the project and facilitate dissemination and exploitation. Promotion material includes documents – press releases, newsletters, brochures, posters, articles, and presentations and demonstrations of general interest – that introduce the problem area addressed by the Provenance project, and that describe from various angles the project vision, goals, approach, expected results and benefits, status, and membership of the Provenance consortium. Promotion material also includes mock-ups, demonstrations, and video clips.

*Benefits and use:* This material is designed for non-specialists. Eligible for broad distribution in the context of dissemination of the project results, they prepare and facilitate the exploitation of results.

*Availability:* These will be provided on an as-is basis as part of the collaboration workpackage 10.

**9. Web Site**

*Purpose and content:* The Provenance public web site represents a major vehicle for raising broad and timely visibility of the project vision, goals, approach, expected results, and the membership of the Provenance consortium. It provides a means to immediately inform interested audiences on progress achieved as well as events and links related to the project, to establish contacts with interested parties, and to publish project key results.

*Benefits and use:* The Provenance web site serves as a library of Provenance public information – including deliverables, public reports, press releases, newsletters, papers, lectures, and presentations –, accessible by interested parties.

*Availability:* The web site is available at [www.gridprovenance.org](http://www.gridprovenance.org).

**10. Standardisation**

*Purpose and content:* Open standards are important for interoperability with other systems. Therefore Provenance will monitor relevant standardisation activities. The project will produce a standardisation proposal (D3.2.1) at month 24 that may be taken to a suitable standards organisation

*Benefits and use:* Provenance partners who are members of standardisation bodies can use the generated documents to put forward the standardisation supporting Provenance and its objectives.

*Availability:* A standardisation proposal will be prepared as a deliverable at the end of the project.

## **4 Project Promotion Strategy**

### **4.1 Overview**

Since the project start, a number of individual dissemination actions have taken place based on the Partners' experience in previous projects and the various promotion opportunities that emerged. While all these actions contributed to raising visibility of the project, they stemmed more from intuition than from an explicit and reasoned promotion strategy. A promotion strategy is required that guides selection of the most appropriate dissemination actions for raising project visibility and preparing exploitation of the project end results.

This document responds to this need by defining a common view on the motivations and goals pursued in promoting the project, on the target audiences to reach, on the material to disseminate, and on the dissemination opportunities that the consortium considers important to promote the project. It also outlines an initial plan for scheduling selected dissemination actions.

The first section states the motivations of the consortium in promoting the project results and the goals that any dissemination action should support. The second section identifies the target audiences that should be addressed accordingly. The third section captures the types of promotion material and their intended target audiences. The fourth section reviews the set of possible dissemination channels that the project can use, including those offered by the media, the conference and exhibition organisers, the standardisation committees, the Provenance Partners, and the European Commission. The exploitation plan is contained in the [Exploitation Plans](#) section.

### **4.2 Motivation and Goals**

Provenance is becoming a necessary component in the Grid community as distributed collaboration between research groups becomes a natural way of working. The management of experimental and computational results becomes important as the data and generated information are shared between partners and disseminated to other stakeholders. In industry, the need for compliance and regulation also drives the need for a Provenance solution. Highly regulated industries such as healthcare, life sciences and finance require systems that can ensure legally defined processes are complied with. The potential impact of the technology being delivered by the Provenance project will have a major impact in these application areas.

For the project visibility to increase among various target groups it is necessary to perform outreach actions to exploit the Provenance results. Its goal is to raise awareness about the goals, methodology and results of the project. It seeks synergies with other initiatives and to establish co-operation links with them.

The goal of Provenance in providing real-world solutions requires information exchange with all stakeholders and the participation in standardisation processes.



### 4.3 *Target Audiences*

The ultimate success of the Provenance project as measured by its objectives and beyond will primarily rely on the capacity of its participating partners to establish credibility, to interact and exchange information about the vision of Provenance, its approach, progress and results. In order to support these objectives, the identification of the key actors and the creation of a wider permanent community of stakeholders is crucial.

The following initial list of stakeholders can be identified. This list is not exhaustive:

1. *Individuals* that are impacted by the regulation of industries such as healthcare and financial services. Provenance technology may provide a framework for additional protection for users of these industry services.
2. *User and consumer associations* on national and European level whose role is to protect and support groups of individual users of industry services.
3. *Policy makers and parliamentarians*, nationally and on a European level. They are representatives of the citizens as potential users and data subjects and should protect the regulatory interests and rights of them. They also have the possibility to promote Provenance-based solutions by for example creating legal rules for industrial regulatory frameworks that may be verified for compliance using Provenance technology.
4. *Research communities* (governmental and commercial) dealing with regulatory compliance issues, technology assessment organisations on national and European level, like European Parliamentary Technology Assessment Association (EPTA), departments and faculties of universities that focus on collaborative research issues. They should be stimulated to cooperate with Provenance partners in a scientific discussion and research on data and information lifecycle management solutions.
5. *Standardisation organisations* on national and on international level like the Global Grid Forum (GGF), European Committee for Standardization (CEN), World Wide Web Consortium (W3C), and the Organization for the Advancement of Structured Information Standards (OASIS). Their co-operation will be important for the transfer of Provenance results into standardisation to ensure interoperability with existing systems and concepts.
6. *System developers, system designers, suppliers of ICT products and services* should be motivated to see Provenance as a business enabler and to integrate its concepts and solutions into their systems and products.
7. *Regulatory authorities* at national and international level. Their representatives should participate in discussions with Provenance partners and advise them about regulatory issues and the use of Provenance technology in the administration of these regulations.

### 4.4 *Promotional Material*

Promotional material concerns what type of content should reach the target audiences. Because all of these audiences need initial understanding of Provenance, the promotional material must consist of a basic set that can be accessible to any of the target audiences. This basic set should present Provenance in terms of its vision, paradigm, objectives, results (both expected and achieved) and benefits, as well as details of the consortium members. It must be written to inform the target group in non-technical terms.

However, while this basic set can draw attention to the project, it is insufficient for further interaction with the target audiences. A more advanced, more specific set must be available

for distribution to the interested parties. This advanced set conveys the actual results obtained by the project, including:

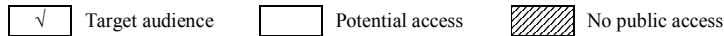
1. Requirements (legal, social, economics and prototypes)
2. Application prototypes
3. Assurance methods
4. HCI guidance
5. Evaluation of Provenance technology
6. Tutorials
7. Architecture and Methodology.

The advanced set consists of mock-ups, demonstrations, public deliverables, technical papers, presentations and standardisation efforts.

The elements of promotion material needed are listed in the following table, together with an indication of their intended audience and available access to these audiences. Most of this material is already available or planned to become available over the project lifetime. It includes the public web pages (they must point to all public documents available), the project brochure and flyer, the newsletter, the press releases, papers and presentations, and public and internal deliverables released according to the project work plan.

**Table 1 - Reaching Target Audiences through Promotional Material**

Promotion material		Target audiences												
		Potential users and customers	Organisations and Third Parties	Media	Standardisation committees	Research community	Provenance Partners	European Commission						
<b>Basic set</b>	Public web pages	All target audiences												
	Project flyer													
	Newsletter issues													
	Press releases													
	Press interviews													
	Slide shows													
	Posters													
<b>Advanced set</b>	Mock-ups													
	CD-ROMs													
	Demonstrations													
	Public deliverables								√	√	√			
	Technical papers and presentations								√	√	√			
	Contributions to standardisation								√	√	√			
	Internal deliverables							√						



## 4.5 *Communication channels*

### 4.5.1 Reaching the target audiences

The target audiences can be reached through a number of channels, either permanent channels like the media, public events and technical publications, or Provenance specific channels like public and internal web sites, the events organised by the consortium or those with limited access proposed by the Provenance consortium and the European Commission.

#### Permanent channels

These channels have significant power for raising awareness of the project and (for several of them) collecting first-hand reactions on the project direction and results.

- The *media*: whether on-line or traditional, they represent major channels that can reach all audiences, including the media themselves. However, these channels are mostly event-driven and unidirectional. Almost no feedback is returned; as a result, it is difficult to estimate the impact on the target audiences. The media should be used to draw attention to information of broad interest;
- *Public events*: they include conferences, workshops, lectures, fairs, and exhibitions. They have more limited coverage than the media although they can also reach all audiences. The advantage of public events over the media lies in their capacity to support bi-directional communications (for collecting feedback), and to convey complex technical information;
- *The Consortium Partners' own channels*: the partners have privileged contacts with the media, their customers, suppliers, business and research partners, and obviously with their employees. These contacts occur through:
  - The partners' public and (most often) internal web site. These sites may be complemented by a press communications department for announcing specific events to the external world;
  - The internal and external publications that maintain links with their employees and customers, respectively;
  - In-house events, like customer briefings, internal seminars and workshops;
  - Briefing and demonstration centres where customers and business/research partners are kept informed on the latest market offerings and developments;
- *Technical publications*: they comprise technical journals and books. These mainly reach the research and development community, including the Provenance partners and the European Commission. They are mostly unidirectional channels.

**Table 2 - Reaching audiences through communications channels**

Communication channels		Target audiences						
		Potential users and customers	Organisation / Third parties	Media	Standardisation committees	Research community	Provenance Partners	European Commission
Permanent	Media	√	√	√	√	√	√	√
	Public events	√	√	√		√	√	√
	Partners' own channels	√	√	√	√	√	√	
	Technical publications					√	√	√
Provenance - specific	Public web site	√	√	√	√	√	√	√
	Networking activities					√		
	Provenance -specific events	√	√	√		√	√	√
	Internal web site						√	

Likely                       Possible                       Not applicable

**Provenance project-specific channels**

Except for the Provenance internal Twiki at the University of Southampton, reserved for the project use, Provenance project-specific channels have high potential to directly reach any target audience, but on a limited scope. However, the efficiency of these channels depends on the permanent channels previously mentioned. The availability of the Provenance project-specific channels must be advertised through the permanent channels:

- The *Provenance public web site* (<http://www.gridprovenance.org>): provides access to any type of public information on the project with the possibility to collect feedback, and to establish direct contact between the project and its audiences;
- *Networking activities*: they represent an opportunity for interchange, mainly technical, with other Provenance -related initiatives and research centres. They take the form of cluster meetings, seminars and workshops, and visiting scientists. They essentially reach the research and development community;
- *Provenance -specific events*: they should be designed to reach and collect feedback from all audiences, primarily focusing on a Provenance target group. Announcement of Provenance -specific events should reach the members of the Provenance interest group, the media, and the European Commission; and,
- The *Provenance internal Twiki site* at Southampton University: primarily designed for the needs of the project, it represents a major channel to disseminate all types of (technical and non-technical) information within the Partners' organisation, to collect feedback, and to motivate the Partners to pursue their efforts on exploitation of the project results. Each Partner should ensure appropriate Provenance publicity within their organisation, especially in the marketing and development departments.

## 4.5.2 Conveying promotion material

Some specific channels are more suitable or optimal for conveying certain types of promotion material, as illustrated by Table 3 of this section, and discussed below:

1. The *media*: can distribute press releases, conduct interviews, report on demonstrations, or reference the public web site and promotion material.
2. Public events and Provenance -specific events: project team members who participate to such events or activities must distribute promotion elements of the basic set, for example the project brochure, the latest press release as appropriate. Other public material from the advanced set may also be distributed or referenced (in particular the Internet address of the public web site). When possible, the latest version of the mock-ups, etc. should be shown. Slide and video shows, demonstrations and posters will have to be designed for fairs, exhibitions, in-house events or any appropriate meeting with potential users and customers.
3. The public web site must provide access to all public project information as soon as it becomes available. Authors of the elements of promotion material (papers, presentations, slide show, video show, mock-up, etc.), once agreed by the consortium for publication, must send their material without delay to the web site administrator for publication on the project public web site.
4. The Partners' own channels, both internal and external, should be used as much as possible to distribute the promotion material to and collect feedback from the interested parties, their customers and business/research partners:
  - The Partners' internal and external web sites should link the Provenance public web site;
  - The Partners should distribute the public material available, both internally and externally: the project brochure, the newsletter issues, the press releases, the press interviews, CD-ROMs, and papers as appropriate.
  - The Partners are encouraged to write articles on the project and publish them in their internal and external publications.
  - The Partners that have representation in standardisation committees should be invited to submit contributions to the standardisation work items relevant to Provenance and co-ordinate them with Provenance own efforts.
  - The Partners that have demonstration facilities should display the project posters, and run slide shows, video shows, mock-ups and demonstrations as these become available.

**Table 3 — Promotion material conveyed by the communication channels**

Promotion material		Communication channels							
		Permanent				Provenance -specific			
		Media	Public events	Partners' own channels	Technical publications	Public web site	Networking activities	Provenance E-specific events	Internal web site
<b>Basic set</b>	Public web pages	√		√	√	√			√
	Project flyer	▨	√	√	▨	√	√	√	√
	Newsletter issues		√	√	▨	√	√	√	√
	Press releases	√	√	√		√	√	√	√
	Press interviews	√		√		√	√	√	√
	Slide shows	▨	√	√	▨	√	√	√	√
	Posters / Exhibition material	▨	√	√	▨	√	√	√	√
<b>Advanced set</b>	Mock-ups	▨	√	√	▨	√	√	√	√
	CD-ROMs	▨	√	√	▨	▨	√	√	√
	Demonstrations	√	√	√	▨	▨	√	√	√
	Public deliverables	▨		√	▨	√			√
	Technical papers and presentations	▨	√	√	√	√	√	√	√
	Contributions to standardisation	▨		√	▨	√	√		√
	Internal deliverables	▨	▨	▨	▨	▨	▨	▨	√
	Prototypes	▨	▨	▨	▨	▨	▨	▨	√



Desirable



Possible



Not applicable

## 5 Market Analysis

In the Provenance Technical Annexe the project partners identified market analysis as part of the project exploitation plan. In particular, this would include:

1. A definition of the *Provenance* end product or result
2. A preliminary market analysis
3. Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis

The first six months of the Provenance project has concentrated on technical requirements and specification of architecture. It is expected that the architecture will be defined and frozen by month 12 of the project. With this architectural definition, it becomes possible to perform the kinds of market analysis described in the technical annexe.

At the project face to face meeting held in June 2005, the partners discussed what marketable products could be defined from the project deliverables. Note that a complete marketing and business plan would require an enterprise to be created to market the product once the project has completed in September 2006. The partners have no plans to create such an enterprise.

### 5.1 The Provenance Products

The partners identified a number of products that could be generated from the Provenance project deliverables. These were:

1. A set of open standards that describe the interfaces and operations of a Provenance service. The standards to be ratified by a suitable open standards organisation.
2. A set of software applications enabled to use the Provenance architecture. The Organ Transplant and Aerospace applications from the Provenance project would be exemplars.
3. A Provenance methodology that describes how software developers would make existing and new applications and systems Provenance aware.
4. A reference implementation of the Provenance architecture.
5. A set of tools for analysing the contents of a Provenance store.
6. A managed implementation of a trusted Provenance store provided by a service provider for use by third parties.

These six products were then subjected to a SWOT analysis where their internal strengths and weaknesses and external opportunities and threats were identified. These are described in the following sections.

#### 5.1.1 Provenance Standards

**Table 4 Provenance Open Standards**

<b>Strengths</b>	<b>Weaknesses</b>
Compatible with Service Oriented Architecture	Does not cover Provenance for Databases
Sound theoretical grounding	Value and concept is not easy to explain
Well scoped problem	Limited time horizon/resources to promote standard
Credibility of consortium partners (industry/research)	

Backed up with reference implementation	
<b>Opportunities</b>	<b>Threats</b>
Market acceptance of need	Existing partial solutions
No known competitive standards	Proprietary non-standard solution
Consortium global visibility	Competing standard activities
	Changing "centre of gravity" for Grid standards (moving from GGF to OASIS)

Proposing an open standard for Provenance raises several issues:

1. The landscape for open standards creation and ratification is fragmented and likely to remain so for the foreseeable future. There is a change in emphasis from early creation organisations such as GGF to industry based organisations such as OASIS. The Web and Grid Services portfolio of standards is divided between several organisations; in particular the W3C, OASIS and GGF with the associated difficulties in coordination and producing a coherent set of standards.
2. Provenance standards may be divided into two parts.
  - a. A generic interface to a set of operations for a Provenance store. The Provenance project should concentrate on this part whilst ensuring that schema definitions for p-assertions are flexible enough to allow part b.
  - b. Industry specific schemas for Provenance p-assertions.
3. Provenance is not an identifiable architectural component as far as software industry analysts and other stakeholders are concerned. The concept and value of Provenance is not easy to explain to potential users of the architecture and methodology. Education of the marketplace is required before the need for a standard will be accepted.
4. Creating an open standard is a time consuming activity. The Provenance project ends at the end of August 2006 with the draft standards proposal being a final project deliverable. No funding is provided to take that draft proposal through to a final ratified standard. This process may take 2 to 3 years.

## 5.1.2 Provenance Applications

**Table 5 Provenance OTM Application**

<b>Strengths</b>	<b>Weaknesses</b>
Detailed models of the Catalan / Spanish OTM processes, extensive prior and ongoing work with medical staff	Prototype implementation (not full industrial strength) - would require a subsequent significant build for a fully deployable version.
Integration with Spanish national medical research project (CARREL FIS )	No current commercial backing for subsequent maintenance and commercial development of the system. (None of the current consortium members is in a position to provide the kind of grade of service guarantees necessary for real deployment)
Robust, secure solution using modern technologies for distributed applications	
Distributed solution mapping directly to the organisational structure of the medical authorities in Catalunya / Spain. A good fit with current off-line processes.	
Strong contacts to relevant authorities in	



Catalunya, Spain and at European level	
Provenance provides querying features and data tracking not previously available (to the consortium's knowledge nowhere in Europe.)	
using realistic data models and protocols provided by the medical partners [not mock ups]	
Opportunities	Threats
Currently processes are paper, fax, and phone driven with isolated databases in different institutions. The system would present a very significant step forward in automation.	Real deployment would be subject to a wide range of regulations, rules, laws, certification processes - a long haul to acceptance.
Currently no competitors at the Catalan level.	commercial products such as IBM's patient care record management system cover part of the space - these vendors may extend offerings to the OTM space (however the step is large)
Consortium well aware of regulation, legal and other complexities: representing a significant barrier to entry to new entrants in the market.	Other transplant authorities throughout Europe are experimenting with IT systems - generally less sophisticated - however this may cause fragmentation of the market and resistance to the system developed here (due to an installed base of other ad-hoc solutions).
There are no standard protocols or data models currently in use - providing an opportunity to lead the field and define a standard.	As well as providing an opportunity, the current lack of standards creates a risk that a de-facto solution from another vendor may quickly dominate the market.

The applications used to test Provenance as part of the project highlight the following issues:

1. Provenance is applicable to many different industrial and application domains. Domain expertise in those areas is required to make a successful software application business. The focus of the Provenance project should not be on the applications, but to provide a reusable architecture and methodology that different application domains can use. This architecture will be reflected through standardised interfaces and operations.
2. Provenance supports distributed applications that have high priority requirements for regulation and compliance. These regulations are generally imposed by some external legal authority such as in the healthcare, pharmaceutical, financial or aviation industries. A marketing strategy that focuses on the providers of software applications will not be as successful as one that focuses on the regulators as industry influencers and imposers of regulation. The attractions of Provenance in supporting regulatory compliance should first be directed to the governmental organisations that create the regulatory frameworks under which industries operate.
3. As an addition to issue 2 above, the European Commission can play a part in promoting the Provenance technology agenda throughout Europe.

### 5.1.3 Provenance Methodology

**Table 6 Provenance Methodology**

Strengths	Weaknesses
Compatible with Service Oriented Architecture (SOA)	Relies on concepts not easy to explain

Credibility of consortium partners (industry/research)	Is not an extension of an existing methodology
Focused methodology	difficulty to claim generality from a small number of applications
Based on Real world experience (derived from ICE/OTM, used by OTM/Aero/ICE/BDW, evaluated by OTM/aero)	
Step by Step guide: easy to use	
<b>Opportunities</b>	<b>Threats</b>
No competitor (even in DB community)	Failure to deliver a viable technical solution to the Provenance problem
Answers users' need "how do we go about it?"	Not a predefined deliverable, hence not on project critical path
Reaches a new community (SE)	Market rejecting SOA model
Gives credibility to a consultancy business	

A Provenance methodology is not a deliverable under the terms of the project contract, but it has been identified as a potential outcome from the project. It raises the following comments:

1. A methodology may be defined as “A system of principles, practices, and procedures applied to a specific branch of knowledge”. The purpose of a Provenance methodology would be to provide a step by step process to allow business analysts and software designers to enable their applications to use Provenance.
2. The delivery of a Provenance methodology “product” would be by several channels including:
  - a. Published literature including articles and books
  - b. Education through lectures, tutorials and hands-on workshops.
  - c. Software services and business consultancy engagements.
3. Such a product could be provided by Universities concentrating on the literature and education channels or existing consultancy companies providing customer service engagements.
4. The Provenance project does not expect to promote the methodology product under the terms of this contract.

### 5.1.4 Provenance Implementation and Tools

An implementation of the Provenance architecture and an associated set of tools are considered together.

**Table 7 Provenance Implementation**

<b>Strengths</b>	<b>Weaknesses</b>
Experience in delivering integrated project	No security
Close contact with creators of related standards	No scalability
Close contact with teams implementing related resources	No plug-points for additional external features
<b>Opportunities</b>	<b>Threats</b>
Deliver initial offering to support Provenance Standard	Delivery time not met
Apply WS standards	Reduced depth of feature implementation

**Table 8 Provenance Tools**

<b>Strengths</b>	<b>Weaknesses</b>
Generic assertion checking mechanism.	User needs to know JESS or specialist language

	for specifying assertions.
Atomic assertions that evaluate to True or False -- thereby providing a quick response time.	No support for confidence intervals (fuzzy) assertion checking.
Provision of a "relationship" class that can be extended	
Use of a Navigation Tool that can allow a variety of different visualisation mechanisms	
<b>Opportunities</b>	<b>Threats</b>
Assertion checking mechanism used with WS-Policy.	Delivery time not met.
Integration with existing workflow tools (e.g. Triana)	Lack of information from Application Users.
	Lack of suitable capability for Application Users.

The following comments refer to a Provenance implementation and tools product:

1. A business strategy for a “product” based on an Open Source reference implementation is difficult to justify. An implementation of the Provenance store architecture by a software vendor would be based on an existing set of distributed middleware products based on the open interfaces specified by the Provenance project.
2. A business strategy for a set of Provenance tools is a separate issue. Whilst examples of tools will be demonstrated as part of the project, tools and their associated services constitute value added components to the basic architecture. Niche application domains may require specific tools that interact with a Provenance store through its interfaces. A business plan based on these niche tool sets may be sustainable but will not be pursued by the current project.
3. The Provenance project does not expect to establish an enterprise to exploit the reference implementation and tools. Commercial partners are expected to exploit the standardised interfaces and logical architecture.

### 5.1.5 Provenance Service

**Table 9 Provenance Managed Service**

Strengths	Weaknesses
A managed service infrastructure removing management costs from clients	High setup infrastructure costs
Suitable for use by Small Medium Enterprise (SME) community	Service supplier will have to support high (and costly) Quality of Service
Single store for distributed "consortium" Provenance information	Currently no identified market for Provenance
Centralised high level of security management	Reluctance by customers to outsource sensitive information
Opportunities	Threats
"Certification" by regulatory authorities as a unique selling point	Offshoring by low cost service suppliers
Data lifecycle management as well as Provenance	

The following comments refer to providing a Provenance managed service:

1. Many SMEs do not have the resources to deploy and manage a trusted Provenance store with the levels of security that regulatory authorities may demand. Provision of such a managed service may be an attractive business proposition for a third party service provider. Such a

- service provider may already be a player within a particular industry so that the addition of a Provenance service would not incur as high infrastructure setup and management costs as a new business entry.
2. Provision of a managed service for Provenance could be included as an additional service to a wider data lifecycle management portfolio.
  3. The Provenance project has no intention of providing such a managed service for third party clients.

## **5.2 Provenance Market Actions**

The following actions have been identified:

1. Identify suitable open standards organisations for a Provenance draft standard. These may include a combination of generic and industry specific organisations.
2. Identify industry partners to support a draft standards submission.
3. The marketplace has to be educated in Provenance technology. Identify and engage with key stakeholders including:
  - a. Market Analyst organisations.
  - b. Potential collaborators in an open standards initiative.
  - c. Industry and governmental regulatory authorities
  - d. Software vendors
4. Identify a funding strategy for taking the draft Provenance standards proposal through to a final recommendation status.
5. Identify a strategy for disseminating the Provenance methodology and technology for regulatory compliance through the European Commission.

## 6 Exploitation Plans

This section identifies specific actions to be taken by the Provenance project to promote, disseminate and exploit the project results. These actions will be tracked by the project and will form the basis of future exploitation reports to the Commission.

Each action is given an identifier for tracking purposes.

### 6.1 Dissemination

This section details actions for disseminating Provenance project results through publication and direct exploitation channels.

#### 6.1.1 Publications

This section identifies a set of target conferences, publications and collaborative meetings for dissemination of project results. In most cases, the target date represents the submission date for a particular conference or journal.

**Target Audience:** Research communities, system developers, system designers, suppliers of ICT products and services

ID	Description	Conference	Target Date	Owner
UWC-D-1	Provenance session at EU CoreGrid meeting	EU CoreGrid mtg	30/12/2006	UWC
UWC-D-2	Talk at the "The Second Workshop on Scientific Data Mining, Integration and Visualization" at the National eScience Center (Edinburgh).	SDMIV2	31/12/2005	UWC
IBM-D-1	Briefings with IT industry analysts. Next briefing 06/02/2006	1:1 meetings	31/03/2006 and 30/06/2006	IBM
IBM-D-2	Article written for IBM DeveloperWorks site	Web publication	30/06/2006	IBM
DLR-D-1	Conference paper	ECCOMAS CFD 2006	15/01/2006	DLR
DLR-D-2	Conference paper, International Provenance and Annotation Workshop	IPAW'06	10/02/2006	DLR
DLR-D-3	Dissemination of Grid Provenance to target groups in day-to-day business and Internal project meetings. IMENS+ (space reentry simulation)	Project meetings	30/08/2006	DLR
DLR-D-4	Dissemination to German C3-Grid project (climate data community),	Project meetings	30/02/2006	DLR
DLR-D-5	Dissemination to German DGI project (basic Grid infrastructure	Project meetings	Ongoing	DLR

	for Germany)			
STA-D-1	First International Workshop on Privacy and Security in Agent-based Collaborative Environments. Joint paper with UPC.	PSACE 2006	15/01/2006	STA
STA-D-2	International Provenance and Annotation Workshop	IPAW'06	10/02/2006	STA
UOS-D-1	Communications of the ACM	Journal	Structure: 15/03/2006 Draft: 15/04/2006 Submission: 15/05/2006	UOS
UOS-D-2	Paper on Provenance Methodology. Conference to be defined by 01/06/2006	To be defined	Structure: 1/9/2006 Draft: 1/10/2006 Submission: 1/11/2006	UOS
UOS-D-3	Paper on Client side library and programming model. Conference to be defined by 01/04/2006	To be defined	Structure: 1/05/2006 Draft: 1/06/2006 Submission: 1/07/2006	UOS
UOS-D-4	Paper on Software Practice and Experience	To be defined	Structure: 1/09/2006 Draft: 1/10/2006 Submission: 1/11/2006	UOS
UOS-D-5	Articles for research newsletters	CoreGrid, ERCIM, AgentLink, etc	Ongoing to 30/08/2006	UOS
UOS-D-6	Articles in popular journals to promote Project visibility	New Scientist, Economist	Ongoing to 30/08/2006	UOS
UPC-D-1	Conference paper for HealthGrid'06, Valencia, Spain, June 7-9 2006, deadline January 13, 2006	HealthGrid'06	13/01/2006	UPC
UPC-D-2	Conference paper or poster at 4th International Conference on Service-Oriented Computing ICSOC'07, December 2006 deadline not published yet, potentially June 2006.	ICSOC'07	30/06/2006	UPC
UPC-D-3	Conference paper or poster, 4th IEEE Conference on Enterprise Computing, E-Commerce and E-Services (EEE'07), April 2007 deadline November 2006.	EEE'07	30/11/2006	UPC

UPC-D-4	Position paper: European Transplant Coordinators Organisation, 2006 Annual Conference (ETCO 06), Wroclaw, Poland, 9-10 June 2006	ETCO 06	Abstract: 31/12/2005 Submission: 20/02/2006	UPC
UPC-D-5	Journal publication in Multiagents and Grid Systems (MAGS), IOS Press. Paper on Provenance for Agent-based Grid systems.	MAGS	31/07/2006	UPC
UPC-D-6	Journal publication in Artificial Intelligence and Medicine, Elsevier. Paper on OTM application, agentified through Grid.	Elsevier	31/10/2006	UPC

## 6.2 Exploitation

This section identifies actions to be taken by consortium partners to exploit tangible deliverables from the project other than publications. These deliverables include software, demonstration applications and experience gained through the project.

**Target Audience:** Research communities, system developers, system designers, suppliers of ICT products and services

ID	Description	Target Date	Owner
UWC-E-1	Evaluate link between Provenance tools suite and Triana workflow engine to allow exploitation by the BioSciences, BioDiversity and AstroPhysics (Gravitational Wave) community.	30/03/2006	UWC
UWC-E-2	Subject to UWC-E-1, implementation for community	30/06/2005	UWC
UWC-E-3	Access to tools portal framework will be provided through a guest account for those wishing to interact with Provenance Tools. A sample Provenance Store may be set up at Cardiff to support this. This capability will be advertised through mailing lists.	28/02/2006	UWC
UWC-E-4	Evaluate the use of Provenance alongside the Pro-Active Middleware	30/04/2006	UWC
UWC-E-5	Subject to UWC-E-4, implementation for Pro-Active	30/08/2006	UWC
IBM-E-1	IBM to provide regular confidential feedback to Commission on their exploitation of Provenance technology	30/08/2006	IBM
DLR-E-1	Use of Provenance implementation in the final deployment of the SikMa project. This is outside the scope of the Provenance project and is due to be deployed in the autumn of 2006.	31/12/2006	DLR
DLR-E-2	Include Provenance technology into software developed during the recently started SESIS project. This software provides an extensible distributed integration and	28/02/2006 to 30/05/2008	DLR

	simulation system for pre-design studies of ships. The developments for SESIS are undertaken for the German ship building industry. For liability reasons and order analysis Provenance recording may become valuable.		
STA-E-1	The lessons learnt in the EHCR part of the OTM application of the Provenance project are planned to be utilized and the K4Care project currently under contract negotiation. The main objective of the K4CARE project is to improve the capabilities of the new EU society to manage and respond to the needs of the increasing number of senior population requiring a personalized healthcare assistance. The project will capture and integrate the information, skills, expertise, and experiences of specialised centres and professionals of several old and new EU countries, and will incorporate them in an intelligent web platform in order to provide e-services to health professionals, patients, and citizens in general. One of the specific objectives of the K4Care project is to define a solution for Electronic Health Record (EHR) incorporating lessons learned in past experiences (e.g. I4C/TripleC, PROREC and Provenance projects), and exploiting the knowledge of the consortium about standards within this field. The defined EHR will be implemented and used to store information about healthcare. This EHR will integrate different data types (e.g. text, numerical values, and multimedia parts) and documents coming from different sources (e.g. hospital services, laboratories, consultations, specialists, relatives and patients at home).	30/08/2006	STA
UPC-E-1	Initial demonstrations to Hospital St. Pau medical staff of public demonstrators, preliminary discussion with all potential actors who may take part in further development.	30/06/2006	UPC
UPC-E-2	Demonstrations for OCATT and Hospital St. Pau.	30/09/2006	UPC
UPC-E-3	Evaluation of prototype by Hospital St. Pau staff.	Ongoing 31/07/2006 to 30/09/2006	UPC
UPC-E-4	Development of a concrete continuation plan on the basis of the demonstrator in conjunction with Hospital St. Pau, OCATT and (potentially) third party medical informatics companies.	30/09/2006	UPC
UPC-E-5	Applications for follow on funding on the basis of the prototype from Spanish National or European sources.	Autumn 2006	UPC
UPC-E-6	Publications targeting the May 2007 Spanish National Organ transplant conference (XXII Reunion Nacional de Coordinadores de Transplantes) which detail the system and its potential. This event gathers together major stakeholders and decision makers in OTM technology at the Spanish level.	30/05/2007	UPC
UPC-E-7	Preliminary meetings introducing Provenance to the	31/10/2005	UPC



	Barcelona Super Computing (BSC) research group and generating comments / feedback.. Already completed.		
UPC-E-8	Planned meeting to identify candidate projects which may in the future take up Provenance results.	31/01/2006	UPC
UPC-E-9	Development of a detailed usage plan for candidate projects once Provenance project technical components are public.	30/06/2006	UPC

### 6.3 Events

This section identifies specific events to be organised by consortium members to promote the Provenance and project knowledge.

**Target Audience:** Research communities, system developers, system designers, suppliers of ICT products and services

International Provenance and Annotation Workshop (IPAW'06), Chicago, Illinois, USA  
May 3-5, 2006, [www.ipaw.info/ipaw06](http://www.ipaw.info/ipaw06)

This workshop is a follow-up to workshops in Chicago in October 2002 (<http://www-fp.mcs.anl.gov/~foster/provenance/>) and in Edinburgh in December 2003 (<http://www.nesc.ac.uk/esi/events/304/>). It will further investigate the issues of data provenance, process documentation, data derivation, and data annotation.

### 6.4 Teaching and Tutorials

This section identifies teaching and other educational materials to be developed by the consortium. These materials may be used within a University teaching context or for presentation to a wider industrial or research audience.

**Target Audience:** All target audiences

The Provenance project will prepare teaching and tutorial material for presentation within their institutions and at external events. The material will also be available for download from the project website. The project will investigate the copyright and licensing requirements for this published material. The material would include:

1. A non-technical overview (1 hour duration)
2. A technical presentation including architecture and methodology with hands on use of software (1 day duration)
3. A set of 1 hour tutorial presentations on aspects of the project

The target audience for these presentations will be

1. Non-technical people who require a basic understanding of Provenance
2. Technical people who are enabling and deploying Provenance based systems

<b>Id</b>	<b>Description</b>	<b>Target Date</b>	<b>Owner</b>
UOS-T-1	First tutorial for SOCA and OntoGrid	06/12/2005	UOS
UOS-T-2	First lecture	13/12/2005	UOS
UOS-T-3	Investigate copyright and licensing for downloadable material	28/02/2006	UOS
UPC-T-1	Tutorial presentation on OTM application	30/04/2006	UPC

STA-T-1	Tutorial presentation on EHCR application	30/04/2006	STA
IBM-T-1	Tutorial presentation on implementation	30/04/2006	IBM
DLR-T-1	Tutorial presentation on aerospace application	30/04/2006	DLR
UWC-T-1	Tutorial presentation on Provenance tools	30/04/2006	UWC
UOS-T-4	Tutorial collocated with IPAW'06	05/05/2006	UOS
UOS-T-5	WhiteRose grid access grid tutorial	28/02/2006	UOS
UOS-T-6	CoreGRID summer school	30/09/2006	UOS
UOS-T-7	GGF International Grid Summer School	31/07/2006	UOS

## 6.5 Promotional Material

Promotional material will be used to advertise the project knowledge at external events including workshops and conferences. It will also be used by individual partners to advertise their participation in the project.

The material will promote a Provenance brand through a common graphical layout across all case studies and brochure documents. Through this we expect to create a brand identity for the project. A proposed mission statement/strap line to support this branding is:

*EU Provenance provides a complete set of techniques and technologies to let you know what happened in your business processes*

### 6.5.1 Case Studies

**Target Audience:** All target audiences

The project will create a set of Case Studies to be distributed at the IPAW'06 workshop. These will include:

1. A One page flyer (2 per partner?);
2. A 4-page case study (1 per partner?)

<b>Id</b>	<b>Description</b>	<b>Target Date</b>	<b>Owner</b>
UOS-C-1	Identify case studies	30/03/2006	UOS
UOS-C-2	Partners to complete case studies	30/04/2006	All
UOS-C-3	Distribute flyers	05/05/2006	UOS

### 6.5.2 Brochure Material

**Target Audience:** All target audiences

The project will produce brochure material to distribute at events. This will include:

- 1 page project description
- 1 page on each application
- Case studies
- Standardisation white paper
- Software to download
- Overview (CACM-like) paper
- Feedback form

The brochure contents will change as further project material becomes available

<b>Id</b>	<b>Description</b>	<b>Target</b>	<b>Owner</b>
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		<b>Date</b>	
IBM-B-1	Project Description	30/04/2006	IBM
DLR-B-1	Aerospace application description	30/04/2006	DLR
UPC-B-1	OTM application description	30/04/2006	UPC
UOS-B-1	Include case studies	30/04/2006	UOS
UOS-B-2	Include standardisation white paper	30/04/2006	UOS
UOS-B-3	Include overview	30/04/2006	UOS
UOS-B-3	Include feedback form	30/04/2006	UOS
IBM-B-2	Software CD	30/04/2006	IBM

## 6.6 Standardisation

A draft standard for Provenance is a key deliverable for the project. This section details a roadmap for disseminating the draft standards proposal.

**Target Audience:** Standardisation organisations, Research community, Suppliers of ICT products and services

<b>Document Track</b>			
<b>Id</b>	<b>Description</b>	<b>Target Date</b>	<b>Owner</b>
UOS-S-1	Standardisation white paper: presenting aspects of standardisation of Provenance	28/02/2006	UOS
UOS-S-2	Documented Provenance Data model	27/04/2006	UOS
UOS-S-3	Functional specification of Provenance store	30/06/2006	UOS
UOS-S-4	Specification for Provenance	29/09/2006	UOS
<b>Technology Mapping Schedule</b>			
UOS-S-5	Internal milestone: Identify relevant standards against which we believe we should make a decision	31/03/2006	UOS
UOS-S-6	Internal milestone: Choice of technology stack, and positioning against existing standards	31/05/2006	UOS
<b>GGF Track</b>			
UOS-S-7	Discuss Provenance white paper with relevant members of OGSA standardisation committee (e.g., Dave Snelling, Ian Foster, Dave Berry) and Dave De Roure as a GGF area chair	31/03/2006	UOS
UOS-S-7	Investigate support in the community for a GGF event on provenance (e.g. workshop, BOF session, OGSA presentation, etc)	31/04/2006	UOS
UOS-S-8	Submit proposal to GGF steering group before GGF17	TBA	UOS
UOS-S-9	Provenance Event to be held at GGF18	TBA	UOS
<b>Industrial Track</b>			
IBM-S-1	Obtain support from IBM for standardisation	28/02/2006	IBM

IBM-S-2	Identify supporting IT companies	31/03/2006	IBM
IBM-S-3	Identify target standards body	31/03/2006	IBM
IBM-S-4	Identify supporting organisations e.g., financial (banks, local government.), accounting, health care, AE, food, libraries	31/04/2006	IBM
IBM-S-5	Promote standardisation effort through contacts with IT industry analysts. Meetings to be organised when required.	31/08/2006	IBM

GGF timetable for 2006:

GGF16: February 13-16, 2006, Athens, Greece

GGF17: 9-12 May in Tokyo, Japan (in conjunction with Grid World Japan)

GGF18: Washington DC (tentative) – TBA

## 6.7 Additional Resources

This section identifies additional actions the project will take to develop further material to promote the project and its technology. These actions are outside the scope of the technical deliverables contained within the project contract.

**Target Audience:** Research community

The project will investigate additional resources to promote the project. In particular this will include the use of summer students to develop additional material for the project.

<b>Id</b>	<b>Description</b>	<b>Target Date</b>	<b>Owner</b>
UOS-S-1	Assess budget	01/02/2006	UOS
UOS-S-2	If budget allows, advertise appointments	15/02/2006	UOS
UOS-S-3	Deadline for application	01/04/2006	UOS
UOS-S-4	Short listing and appointment	01/05/2006	UOS
UOS-S-5	Develop mini-project specifications.	15/05/2006	UOS

Mini-projects currently being considered include:

### **Provenance Store Database back end**

The student would implement an XML / SQL database backend to the Provenance interfaces. This would involve implementing the Record Java API and either the Query API (for databases supporting XQuery directly) or Retrieval API (for other databases).

### **P2P Database back end**

Same as above, but with a P2P database, with high availability and reliance.

See <http://research.microsoft.com/research/pubs/view.aspx?type=Technical%20Report&id=1035>

### **Translation / Curation Tool**

Process documentation is useful only as long as it can be interpreted by the querying actors. If data is in a format for which there is no longer adequate tool support, that data is useless.

The student would implement a tool that automatically trawls provenance stores for data in obsolete formats and converts that data to novel formats. The translation process would be documented in a

provenance store, ensuring that the querying actor can get from the translated data to the original data (and its provenance).

As an extension to this, we may consider management of data signed with certificates that have expired or are about to expire.

**Provenance and Difference Report Generator**

The student would implement a processing service that produced a nice, readable report from the provenance trace of experiment results. Additionally, it would be useful to have a report highlighting the relevant differences between two provenance traces.

**Automated Indexing Tool**

The student would implement a mechanism for producing an index of interactions/views/p-assertions. This index could be used where view or object links have not been recorded in process documentation, or just for fast look-up.

The mechanism would query provenance stores for all contents (presumably in chunks). The mechanism would get the locations of provenance stores either from registries or from the object and view links contained in already trawled provenance stores.

**OWL Reasoning**

To be specified.

## **6.8     *Management of the Exploitation Plan***

The Provenance project has identified an exploitation manager at the University of Southampton. The role of the exploitation manager is to track all project dissemination and exploitation deliverables. This is achieved by the Exploitation manager contacting project partners at appropriate times to check with the people responsible for deliverables that progress is being made and that deadlines will be met.