

RELI

a project to pilot the development of a licence registry: final report

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1 Executive summary and key recommendations

This report describes the development and testing of a Demonstrator for a Licence Registry service that would interpret library licences for libraries encoded in ONIX-PL in such a way that a user, typically a librarian or an end user, could see at a glance what permissions are granted to the users for, e.g., downloading or redisseminating content. Progress on this project was hampered by the slow adoption of licences in ONIX-PL form by scholarly journal publishers. As a result, only a small number of licences could be demonstrated to a sample of university library staff (including systems librarians) and end users. In a companion project, also funded by JISC, a survey and in depth interviews were carried out to identify what barriers there were to the adoption of this type of service, and what current practices were.

The results showed clearly that there is a strong desire on the part of librarians to have a licence registry service and that the features shown in the demonstrator fulfilled the major user needs in a user-friendly way. They also showed that there are many issues that need to be resolved before a large-scale licence registry service could be implemented. These include issues to do with an overall system architecture for a possible national service, and the need for institutions to use the flexibility of Shibboleth to the fullest possible extent. A number of detailed recommendations are made, including the following:

- Encouragement for implementation and support of ONIX-PL by everyone in the supply chain
- Explicit inclusion of ONIX-PL support in requirements for systems
- Need for a better forum for communication between publishers and libraries about licences. It is clear that the people in publishing with whom librarians typically have contact (i.e., sales people) have little understanding of licences and licensing issues. As ONIX-PL becomes embedded, the shortcomings of publishers' licences from a customer standpoint will become increasingly clear. Licensees will be demanding that licences are clear, unambiguous and comprehensive in their terms. There needs to be more open dialogue (while acknowledging commercial and competition issues) between the parties. Within the UK, the UK Serials Group could provide such a discussion forum.
- The need for publishers and Editeur to think carefully about unambiguous identification of resources and management of repertoire. There is also a need for standards for the identification of licences. We recommend that EDItEUR consider taking this on.
- There is a need for licensees to think about user identification issues raised by RELI and whether the way Shibboleth is being implemented in Institutions is sufficiently fine-grained to satisfy licence requirements.

- We recommend that JISC funds a project to look at the different architecture models for a fully fledged licence registry service.

Our final recommendation is that librarians put pressure on publishers to provide their licences in ONIX-PL format as well as in print. This should be considered by publishers to be an absolutely standard requirement, just as a licence in printed form is today. Only when that occurs is a fully fledged licence registry service likely to emerge.

2 Introduction

This is the final report of the RELI project, a project led by the Loughborough University under Strand I of the Repositories and Preservation Programme. This project, “RELI”,¹ was originally intended to develop a pilot implementation of a digital licence registry. As the report explains, because of the unanticipated slowness of a number of developments external to the project itself, with the agreement of JISC, RELI changed its objective during development to deliver a demonstrator rather than a pilot; this was successfully delivered in June 2009.

This report includes (and fully incorporates) the report of a supplementary project commissioned by JISC towards the end of the RELI project, and carried out in parallel with the final stage of RELI. This project, which was triggered by the difficulties which RELI encountered, examined the barriers to implementation of a licence registry like that being developed by RELI. As well as describing the findings of both projects, the conclusions and recommendations are fully integrated to provide a coherent view of how JISC might most effectively build on the experience of RELI in future.

We wish to acknowledge the assistance and support of many JISC staff, most notably Tom Franklin and James Farnhill. We would also like to thank all those who participated in our focus groups, surveys and interviews, and those who commented on the Demonstrator towards the end of the project. We also wish to thank all those publishers who assisted us, and staff associated with Editeur for their help.

¹ Pronounced “rely”

3 Original project rationale – why establish a licence registry?

The following description of the rationale for the project is drawn from the original proposal; our experience with RELI has underlined the validity of this rationale:

Within the academic community, there is a desire on the part of users of resources² (and of the institutions within which those users work or study) to be compliant with terms established by rightsholders. As the medium for the distribution of resources moves increasingly from physical copies to the network, the need for users to know what permissions attach to the access and use of any particular resource becomes increasingly pressing due to considerable differentiation between licence terms. This is amplified by the increasing diversity of resource providers: organisations and individuals are developing resources that were once the preserve of commercial enterprises, with different objectives and constraints when it comes to making them available. Some resources are available under the terms of a Creative Commons licence; others under stricter commercial terms. It is difficult or impossible for users to discover for themselves the terms that apply to a particular resource.

With licences typically available only on paper (or its digital equivalent), reference to licence terms is labour intensive and slow. Different resource repertoires will have different licence terms for the foreseeable future, and technical support will be needed to facilitate compliance with licence terms without resorting to a “lowest common denominator” approach, i.e., assuming that all licences are as restrictive as the most restrictive licence. A “repertoire” is defined here as the group of resources which is covered by a particular licence.

The solution lies in the establishment of mechanisms by which key elements of licences can be made available so that a user can be provided with the most significant elements of licence information at the point of use – those that relate to permitted access and use. This needs to happen without additional human intervention; those significant licence terms must be machine interpretable. A licence registry (or many licence registries, in a more distributed model) is an essential element in the technical architecture necessary to support such functionality.

² We use the term “resource” in preference to terms such as “content”.

4 Constraining the scope of RELI

4.1 ONIX-PL

Developing a mechanism from scratch for expressing permissions for access and use for interpretation by machines would have been too daunting a proposition for the project to undertake inside two years. Fortunately this was unnecessary, because of substantial work that had already been undertaken by EDItEUR³ in the development of *ONIX for Publications Licenses* (ONIX-PL).

Without this pre-existing development of ONIX-PL, RELI would have had no starting point for its endeavours. Nevertheless, it is important to draw a clear distinction between ONIX-PL and the RELI registry. ONIX-PL is a messaging format for the *communication* of licences; RELI is a database of licence information, informed by the same structures and semantics as ONIX-PL.

The implementation of RELI depended from the outset entirely on ONIX-PL, and this turned out to create some significant barriers to the successful completion of the project as originally conceived. We had anticipated that, during the lifetime of the project, the implementation of ONIX-PL would move faster considerably faster than in fact proved to be the case. This had two implications for the project itself.

First of all, it became clear that there would be only a very limited number of licences available expressed in ONIX-PL. Although the OPLE tool (developed by EDItEUR with financial support from the JISC and the Publishers Licensing Society) has been published specifically to facilitate the creation of ONIX-PL expressions of licences, the number of licences available to the project was ultimately small. This was partly due to the fact that without a licence registry (or similar systems, like ERMs, that can make use of electronic expressions of licences), there has been little incentive for anyone to create ONIX-PL expressions of licences. At the same time, the expression of licences in XML (even with the support of the OPLE tool) has proved to be quite a complex process, and one which will take time to embed into the workflow around licensing content.

Secondly, ONIX-PL was still in a test and development phase through most of the life of the RELI project. ONIX-PL v1.0 was not finalised and published until January 2009, shortly before the scheduled completion of the project. It seemed pointless to finalise RELI on an obsolete version of ONIX-PL (v0.94), not least as v1.0 represented a significant structural change from earlier versions. However, this also reduced the number of licences available to us, since licences that we needed had to be re-expressed by EDItEUR in ONIX-PL v1.0.

In the light of these challenges, discussions with JISC during 2008 led to a change of focus for the RELI project. It was decided that the registry would continue to be developed, but as a *demonstrator* rather than a *pilot*. We believe that a demonstrator has enabled us to show ‘proof of concept’ and also to facilitate discussion of

³ <http://www.editeur.org/>

enhanced functionality and to further the debate on architecture and implementation decisions. The change from pilot to demonstrator required further discussion among the project team as a number of issues that would be ‘in-scope’ for a pilot implementation were less vital for a demonstrator.

One example is Shibboleth integration. It is clearly important that a licence registry should be able to identify the *role* of a user (academic staff, alumni, student etc), as licence permissions are commonly role-dependent. However, with the change in emphasis from pilot to demonstrator, Shibboleth integration needed to be demonstrated rather than fully implemented; a Shibboleth Identity Provider was included as part of the demonstrator rather than being integrated directly with the UK Access Management Federation. Despite changes such as this, all the functionality required to support the primary use-cases developed during the requirements gathering process was retained. (See Section 6 on technical implementation).

This change in emphasis was approved by the JISC. In addition, additional funding was granted to explore the reason behind the barriers that ONIX-PL had encountered, and whether these were fundamental to the delivery of a RELI-type of service. The results of this project are discussed in Section 8.

4.2 Associating resources and users with licences – the identity challenge

The ability to provide information about the permissions available for a specific resource to a specific user for a specific usage involves the resolution of a three sided identification challenge:

- What is the resource?
- Who is the user (or, at least, in what class in the user)?
- What licence applies for this resource for this user?

The challenge of associating individual resource instances with the specific licences goes substantially beyond that of simply establishing “a licence registry”. It raises considerable issues of resource identity and the management of repertoires – and of user identity.

4.2.1 Repertoire management

A repertoire may be thought of as simply the definition of the set of resources which are covered by a particular set of usage terms. The set may be closed (for example, a single resource could be covered by a licence); or it may be open (“all journal titles published by Publisher XYZ”).

Commonly, repertoires are open and loosely defined. Publishers’ licences are usually time-limited and often refer to resources which do not yet exist – for example, all the papers which *will be published* in a set of named journals in a particular year. Individual resources may be removed from repertoires; complete sets of resources may be transferred from one repertoire to another (for example, a new licence may

supersede an older one; or rightsholders may change); and resources may cease to be licensed.

Most commercial licences do not, of course, cover all *users*; the same resource will belong to many different repertoires, dependent on user context and/or identity. More complex cases also exist, where (because of overlapping licences) the same resource may exist in more than one repertoire for the same user. It is therefore unrealistic to consider implementing a Licence Registry in isolation from careful consideration of repertoire management, the essential (and perhaps more testing) complement to licence management.

Our approach to repertoire management for RELI was necessarily constrained by the requirement for clear identity management of the resources included in the licences that we would use in the demonstrator. The only resources which we could identify which met our requirements were journal articles included in the CrossRef service, where each individual article is identified with a DOI (Digital Object Identifier). No other identity model available to us was capable of providing us with the degree of certainty of identity which is necessary for the management of licensed repertoires.

Nevertheless, even using this approach turned out to be quite challenging, and points to some of the most significant challenges that publishers, intermediaries and libraries will face in automating the process of providing licence data at point of use for the very wide range of resources which libraries provide for their users.

The difficulties which we had with repertoire identification and management include:

1. While publishers may identify their articles with DOIs, they do not always consistently embed those DOIs in metatags in the pages from which those articles are retrieved by users. (The point at which we associated licences with individual resources was the abstract page to which a user is typically taken as an intermediate step in downloading the complete article.). While those publishers who don't use metatags often included them within the HTML, making it possible (theoretically, at least) to use "scraping" techniques to retrieve them, in reality this leads to potential ambiguity or worse. Unambiguous resource identification is a critical part of the process of repertoire resolution.
2. We were able to use the mechanisms provided by the DOI and CrossRef itself to resolve from the DOI of an individual article the journal in which that article is published. However, the identity of journals in the CrossRef data is dependent simply on each journal having a unique name (that is, a unique text string) rather than a unique identifier. This is not a criticism of CrossRef – it has been attempting for a considerable period to persuade its members to issue DOIs for the journals themselves as well as for each article in the journal. CrossRef even offers these "journal level" identifiers to its members without charge. For a reason which we have been unable to ascertain, journal publishers have been reluctant to issue these DOIs. It could be argued that we should be able to rely on the ISSN. Unfortunately, with many issues

around inconsistency of application of ISSN to physical and digital manifestations of the same journal, this also proved uncertain.

3. In each of the licences which we have used for the demonstrator, we have therefore collated an “A to Z” list of journal titles which are covered by the licence, following the journal title conventions used by CrossRef; the link is initially made from DOI to CrossRef journal title, and then (by string matching) from CrossRef title to applicable licence – which also, of course, involves “the system” knowing who is the User is, or at least what their affiliation and role is. We do not believe that a system which depends on somewhat arbitrary methods for matching resources into repertoires is ultimately scalable.

The challenges for applying a licence registry to resources which do have a good identity model, and unique identifiers that can readily be resolved to a repertoire are self evident. While this does not necessarily invalidate the concept of maintaining consistently encoded licences for such resources in a licence registry of the type demonstrated by RELI, it does inevitably restrict the functionality of such a registry.

It is also worth noting that the continuous changes to the repertoire covered by a licence (for example, when a journal ceases publication or changes publisher) are already recognised as something of a challenge. The flow of information about repertoire in the supply chain will clearly have to improve substantially if licence registries are to achieve their full potential.

4.2.2 User Identification

We have already touched on the limited Shibboleth implementation undertaken within RELI (see Section 4.1 above). It is worth exploring this issue in slightly greater depth.

The types of usage permitted to an individual user under a licence are frequently defined by the role that the user is playing. So, a student may have different usage rights from a member of academic staff; and both may have different rights from a member of library staff – or from an alumnus or a walk-in user. This is all perfectly familiar territory.

In our original project plan, we had assumed that we would be able integrate with the broader implementation of Shibboleth within the UK HE community.

However, in a not dissimilar story to that about ONIX-PL, we found that Shibboleth implementation was not moving forward with the speed which we had anticipated. Furthermore, most HEIs appear not to be implementing Shibboleth with the degree of granularity of user typing which will ultimately be necessary to support providing the correct information to users about their specific usage rights under licence at the point of use. The same may be true with respect to the consistency of implementation between different HEIs.

Clearly, a detailed exploration of the implications of a consistent and comprehensive implementation of Shibboleth-based identity management within the UK HE and FE

communities is substantially beyond the scope of RELI. However, the significance of user identity cannot be overlooked.

4.2.3 Licence management

There is little to be said about the unique identification of licences, since so little has been done in this area. So far as we are aware, the only substantial work done on the development of a licence identifier was undertaken in the music industry, in the development of the Musical Works Licence Identifier (MWLI) as part of the “MI3P” project (which led to the establishment of the DDEX standards organisation). So far as we are aware, the MWLI has not been widely implemented.

There is no standard mechanism for the identification of licences within the publishing-library supply chain; with the lack of any option, RELI imposed its own simple and arbitrary identification system on the licences included in the demonstrator.

Again, this is not a scalable solution in the long term, and licence identity is an issue that will require further work in due course. All the normal challenges of creating unique references will apply – including, for example, giving identities to “template” licences (e.g. NESLI-2) and to individual instances of that licence as implemented for a particular repertoire between a particular publisher and an HEI for a given year.

5 User requirement definition

A set of interviews and two in-depth focus group discussions with key stakeholders were conducted to identify issues relating to the management of licences in HE/FE and the benefits that a registry of electronic licences may bring. The major outcome of this process was a set of user requirements for a registry of electronic licences. These requirements were subsequently used to develop a set of use-cases that the registry would support along with a business case. The requirements also formed the basis for the architecture of the registry and its functionality.

Based on prior developments with ERM systems, the following assumptions were made prior to beginning the requirements gathering process:

- **Licence ingest format and display format:** The licence ingest format would be ONIX-PL. “Out of the box” ONIX-PL may not have the necessary semantics to express all licences, and ultimately terms from other sources – Creative Commons, Creative Archive etc – may require mapping into ONIX-PL for inclusion.
- **Licence and resource types:** A limited range of licence and resource types would be used as exemplars within the Registry. However, these should cover a wide range of types of resource and, if possible, a range of commercial and non-commercial licences.
- **Licence registry instantiation:** The most appropriate architecture for the disposition of licence registries [centralised/federated; held by licensors/licensees/third parties] was not clear at the start of the project. The RELI project would therefore begin to explore the advantages and disadvantages of different architectures.

Stakeholders were identified to feed into the requirements gathering process. Table 1 shows the stakeholders that were identified. Representatives from all groups were invited to participate in the process.

Table 1 Stakeholders contributing to the Requirements Process

Stakeholder	Interest / stake
Rightsholder	A Registry should improve clarity of understanding of users in what they may or may not do with particular content. It would reduce requirement for staff to answer questions and assist compliance. The Registry should also help rightsholders provide better user service. If desired, the Registry might also make it possible for rightsholders to compare their standard terms with those offered by others.
Librarians	Librarians already have to deal with a wide range of digital content, and many different licences and sets of licence terms. This complexity will grow. The Registry should provide an information resource to support compliance and reduce the

Stakeholder	Interest / stake
	need for human intervention in enquiries. If desired it may be possible to enable different licences to be compared.
JISC Information Environment	The Registry should play a pivotal role in the overall functionality of the JISC Information Environment.
End-users	Academics, teachers, students should be better able to understand accurately what they can do with content they have discovered.
JISC Content Company and other content aggregators	Aggregators may have very different content types and rules governing their use. The Registry should make it easier to manage and easier to obtain compliance.
Subscription agents	The key benefits for information aggregators should be increased simplicity and clarity. This should reduce requirement for staff to answer questions and assist compliance.
Information & library systems suppliers	Systems suppliers should be able to offer richer services through connecting library management systems to the Licence Registry.

Interview schedules appropriate to the stakeholder groups were drawn up and interviews were conducted with publishers, aggregators and institutions. The interviews were conducted in Summer 2007.

Two substantial focus groups were also undertaken in June 2007 with representatives of all stakeholder groups. During the focus groups, stakeholders discussed a range of issues relating to licence management in Higher Education. Not all of the issues could be considered as 'requirements' for a licence registry, however, all the issues raised were of interest in that they outlined the problems of managing licences and the participants' perceptions of the ways in which licences are used. These issues have been categorised into a number of themes including problems with licences, interpreting licences, repertoire management, multiple licences, repositories & VLEs, perceptions of end-users, scope of a licence registry, creation & maintenance of electronic licences, dissemination of electronic licences, integration issues, searching licences and publishers' perspectives. The main points raised under these themes can be found in Appendix 1 and form the basis for the following paper:

Bide, M., Dhiensa, R., Look, H., Oppenheim, C. and Proberts, S.G.,
 "Requirements for a registry of electronic licences", *The Electronic Library*,
 27(1), February 2009, 43-57, ISSN: 0264-0473.

The findings can be summarised as followed:

- The requirements process clearly illustrated that making licence terms available to end-users is important and that there is a requirement for a registry of electronic licences to manage this process.

- There was consensus that some form of symbolic representation should be displayed to users to show them clearly what is permitted and what is forbidden, but that only key usage terms need to be displayed to users.
- It was clear that librarians find that interpreting licences presents many problems, particularly if the meaning of clauses is obscure. In these cases most librarians tend to err on the side of caution and do not allow users to make any use of a resource if they are not completely clear about its legitimacy.
- Librarians can find it difficult to present the clauses within the licence in a meaningful way without expert unpicking of the “legal jargon”. Librarians want publishers to make electronic versions of licences available at an institutional level so they can be interpreted and the interpretation attached to resources.
- Librarians indicated that integrating a licence registry with existing library management systems would be desirable, but that it should function without relying on other library management systems.
- Publishers would like to be able to offer one broad general licence, but this was not possible due to differing conditions on the sale of journals. Publishers, however, did indicate that they would be willing to create machine-readable licences when it can be shown that there is a demand for them.

Given these findings, it was clear that there were real stakeholder requirements for a licence registry. Qualitative data from these activities was then analysed to produce a set of use-cases and an outline of the business requirements. The business requirements are presented in Appendix 3. The use-cases illustrated the functional requirements that the registry should support and represented the core functionality that was required from potential users of the registry. Four use-cases were developed (full details of these can be found in Appendix 2):

- *Use Case 1: End user provided with licence information at point of access*
- *Use Case 2: Specialist Users provided with machine readable version of standard licence expression to download*
- *Use Case 3: Specialist Users (administrators) provided with a licence ingest capability*
- *Use Case 4: Specialist Users (administrators) provided with repertoire management capability*

The use cases were then used to develop a technical architecture for the Licence Registry.

6 Technical Implementation of the RELI Demonstrator

6.1 Introduction

This section describes the technical architecture of the RELI Demonstrator application, including use case analysis, key technical areas that were investigated, the resulting technical architecture and the instantiation of that architecture using the chosen software stack.

6.2 Technical requirements analysis and areas for investigation

The use cases summarised in Section 5 and presented in detail in Appendix 2 defined the starting point of the technical requirements exercise.

Analysis of these use cases highlighted a number of areas requiring further technical investigation; these are summarised below.

Issue	Description
1. Mechanism for presentation of licence information at point-of-use	The point-of-use will be a journal article abstract/splash page. Various technical mechanisms exist for integrating a RELI presentation of licence information, including modifications to the publisher's page, or client-side code running in the user's browser (e.g. a plug-in or extension).
2. Resource identification at point of use	Following on from (1), an identifier for the resource will need passing to RELI. This will to some degree be based on the outcome of (1)
3. User identification at point of use	The RELI system needs to know the user's institution and role within (affiliation to) the institution in order to present the correct licence terms.
4. Repertoire management and identity resolution	The RELI demonstrator licences, derived from the NESLi2 model licence, will in general specify licences at the journal title level. Each individual resource will be identified at the journal article level. Mechanisms are therefore required to relate these together; and an appropriate form of journal title identifier needs to be determined

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Issue	Description
5. Format of licence information at point-of-use (i.e., layout)	A simple, easily-understood visual presentation of licence usage conditions is required
6. Access control	Various aspects of system functionality will require protection from unauthorised access. Different levels of user access need to be specified.
7. Indexing	Key elements of licence metadata must be indexed to provide licence search/discovery services. Similarly the licence full-text document needs to be indexed. Search services need to be flexible, including and/or combinations and wildcards.

6.2.1 Constraints

The following items were considered out-of-scope for the RELI demonstrator.

Item	Benefit	Reason for exclusion
Validation of OnixPL	Prevents invalid (and therefore un-processable) licences being included in the registry.	It is assumed that the current licence authoring tool (OPLE) performs validation; therefore little benefit to the project in return for the effort required.
Licence consistency checking	Prevents inconsistent, and therefore un-interpretable, licences being stored in the registry.	Insufficient project resources (high effort)
Dealing with licence conflicts	Allows overlapping and contradictory licences to be evaluated to give an overall view of permitted usages	Requirements undefined, insufficient project resources (high effort). However basic functionality to identify where more than one licence covers a resource was implemented

Item	Benefit	Reason for exclusion
Versioning and audit trail	Ability to view the history of modifications to licences	Little benefit for the project resource required. The base software platform includes automatic versioning and an audit trail, so proof-of-concept of this functionality can be illustrated in any case.
Integration with the UK Access Management Federation	The RELI demonstrator works with real-world Shibboleth attributes	Little benefit for project resource required. Anticipated that this would require static IP addresses, registering a domain, and would limit the ability to perform what-if experiments with different attribute values.
Provide the RELI demonstrator as a hosted service	Enables multiple simultaneous accesses to the demonstrator; allows demonstration to a wider community.	A hosted solution would require both budget for the hosting, and budget for ongoing support; it was felt that project resources would best be spent on other areas
Include different types of licences (other than OnixPL)	Demonstrates potential wider use of a RELI-type services	Insufficient project resources to generate different licences.
Include licences covering different types of resources (other than journal articles)	Demonstrates potential wider use of a RELI-type services	Insufficient project resources
Integrate directly with publisher's systems	Demonstrates a real-world application of a RELI-type service; no requirement to install a Firefox plug-in	Insufficient project timescales and resourcing

6.3 Abstract architecture.

An initial architecture was developed for the proposal. The key elements of this are illustrated by the following two diagrams:

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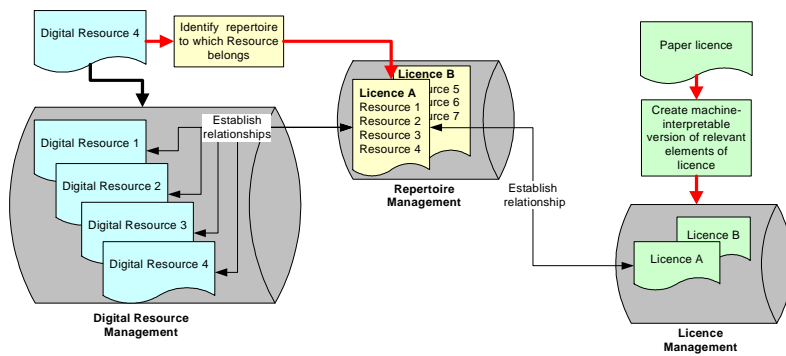


Figure 1: Establishing the relationships between licences and resource. Depending on the approach that is taken, repertoire and licence management may be distributed to the level of the individual licensing organisation; or may be managed more centrally. The issues of user and/or user class identity become more of an issue in a centrally managed approach. Note that this diagram is not intended to suggest any particular technical architecture.

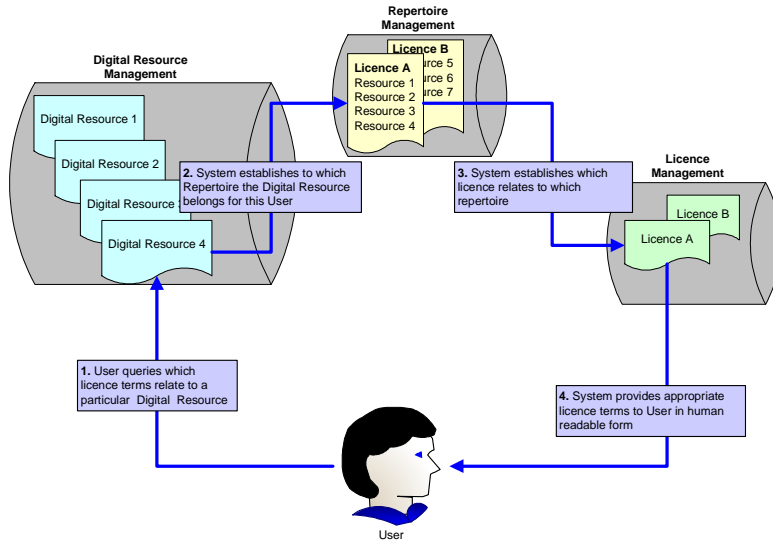


Figure 2 The basic functionality required to test a Licence Registry; note that the complete licence could be made available to the User if this desirable [perhaps on a “click here to see the complete licence” basis].

Analysis of the use cases was carried out to validate and refine the abstract architecture, and validate the candidate software components to be used during development of RELI.

This led to identification of the main functional modules that would be required in RELI, as follows:

Main Functional Modules	Responsibilities	Implementation Note
RELI Repository	Retaining all artefacts in a managed environment for the functioning of the registry	Fedora has been selected as a framework technology for the repository function.

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Main Functional Modules	Responsibilities	Implementation Note
RELI Metadata Index	Relates indexed metadata of repository objects together. The index will be queried using metadata categories as parameters, supporting licence retrieval functionality.	Fedora Generic Search (GSearch) is a plug-in module to Fedora that allows fast and flexible index generation.
RELI Free Text Index of full licence	Supports discovery functionality of licences, based on partial strings, wildcard matches and regular expressions.	Fedora GSearch includes free-text indexing capabilities, including of PDF documents
RELI Licence Expression Module	Ensuring a mapping between expressions of a licence and the underlying objects representing it. For the pilot system, two sorts of expression are under consideration: a textual format using ONIX-PL terms, and a more simplified visual format.	An XML parser will be constructed for licence metadata extraction and indexing. ONIX-PL Licence expressions will not be constructed, simply located and retrieved. Simplified visual expressions will be constructed by the system.
RELI Presentation Module	Constructs the appropriate display items based on objects located within the repository.	Orbeon's Xforms, which uses DHTML running within standard web browsers, is the current implementation choice; however, the issues around display of licence information within applications running remotely will need to be investigated.
RELI Access Control Module	Deals with the different sorts of permissions that the different categories of actor have with the RELI system. Attributes of a particular user are passed through from Identity Management, Authentication and Authorisation services external to RELI, in this case Shibboleth.	The attributes of the user are used in both controlling access to resources and customising the user interface and functionality where appropriate.

The software stack proposed for the implementation of these components was as follows:

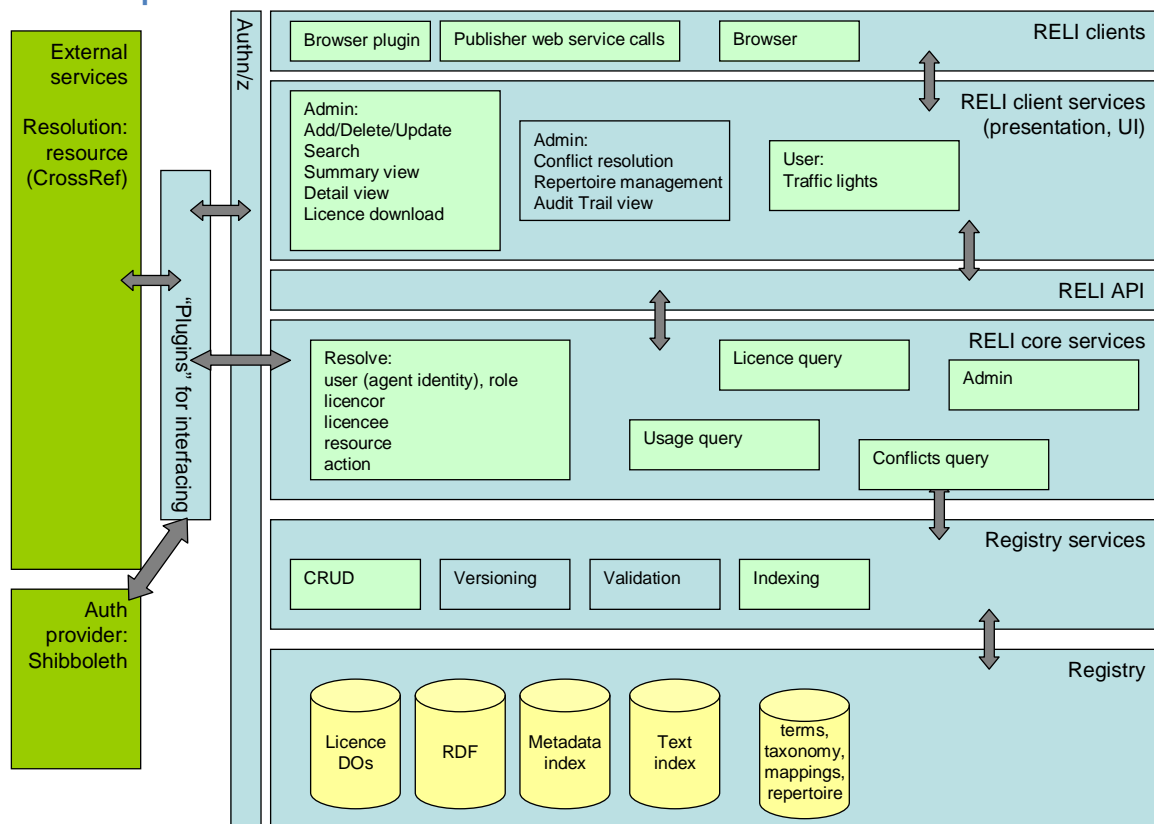
- Base operating system: Centos 5 (Red Hat Enterprise Linux clone)
- Operating environment: Java 1.5
- J2EE Web application deployment environment: Tomcat 5.5.27
- Repository functionality: Fedora 3.1
- Repository metadata and free-text indexing functionality: Fedora GSearch

- Repository and application services: XPL pipeline processing implemented using OrbeonForms
- RELI User interface: XForms implemented using OrbeonForms

6.4 Implementation Architecture

Following the validation of the abstract architecture and proposed software stack, a concrete architecture was developed to support the various functional elements identified by the use cases in conjunction with the results of further technical analysis.

6.4.1 Implementation Architecture overview



6.4.2 Software components

In addition to the software components identified at the Abstract Architecture phase, the technical investigations (see below) resulted in additional software components summarised as follows:

- A Shibboleth Service Provider, implemented using the native shibd Linux daemon, and the Apache mod_shib module.
- Apache for hosting Tomcat, using AJP for communications, ensuring all requests to RELI are handled first by Apache and forwarded to the Shibboleth daemon for authentication before reaching the J2EE web applications

- A Shibboleth Identity Provider, running as a J2EE application within Tomcat. This was configured to use a MySQL database to store the necessary user eduPerson Shibboleth attributes.
- Fedora GSearch to provide metadata and free-text indexing of artefacts in the Fedora Repository, to provide enhanced discovery functionality
- Pellet, an OWL reasoner, whose primary use case is for a licence checking service (to check whether the licence “makes sense”, in terms of some simple constraints expressed in OWL); in the demonstrator it is also used to identify data relevant for traffic lights via queries implemented in a separate server module
- JiB, a popular, high-performance, open-source XML binding library for the Java programming language, is used to process the two ONIX-PL XML Schema documents (Schema and Code List files), license templates, and license instance documents themselves into Java classes and objects. JiBX was chosen due to the complexity of ONIX-PL. The native XML languages, XPath and XSL, were found to be too unwieldy to be practical for anything other than ad-hoc usage of ONIX-PL, for instance for reformatting a stand-alone license document for display. Access of the data from within Java provides flexibility through use of various Java libraries, data structures, etc.

6.4.3 Implementation architecture components

6.4.3.1 Registry

Description

The RELI Registry is responsible for registering and persisting the artefacts necessary for operation of the RELI service, and for persisting metadata describing these artefacts.

The main artefacts persisted by RELI are:

- Licences, including
 - the original licence document
 - the OnixPL XML expression
 - Metadata describing the licence
- Additional artefacts relating to RELI’s use of ONIX-PL as a structured data source, including
 - The original ONIX-PL XML Schema documents
 - A converted version of the ONIX-PL Schema that serves to separate structural constraints from (anonymous) atomic type definitions present within the original ONIX-PL XML Schema structure. This is done to allow for subsequent data access using methods other than XPath, which is closely tied to the formatting details of the licence rather than the terms in which the underlying data is expressed. The

resultant schema consists of a set of atomic types consistently referred to irrespective of the location of a referring element within the ONIX-PL format structure, and in addition requires fewer terms and explicit atomic types. The structural constraints represented by the format are retained to provide for license checking at design-time.

Additionally, the Registry maintains index data relating to the persisted artefacts, to enable efficient discovery and management of these artefacts, including

- A Metadata index of the licence metadata
- A free-text index of the original licence document

In addition to providing persistent storage for RELI's artefacts, the registry is also responsible for minting persistent unique identifiers for those artefacts so that they can be reliably referenced in the future.

Implementation

The Registry, together with the Registry Services, is implemented as a Fedora digital object repository. A Fedora Digital Object is created for each licence, with separate data streams holding the original licence document, the OnixPL licence expression and the licence metadata. Fedora's plug-in search engine, GSearch, is used to implement both the metadata index and the full-text index of the licences; GSearch utilises Lucene as the indexing back-end.

6.4.3.2 Registry Services

Description

RELI's registry services layer is responsible for providing services to manage the artefacts stored in the RELI registry. These services include

- Providing secure access to RELI artefacts
- Creating, updating and deleting RELI artefacts
- Maintaining a history of changes to RELI artefacts, including management of versions of those artefacts
- Validation of RELI artefacts
- Indexing these artefacts and providing discovery services using this index

Implementation

The Registry Services are implemented along with the Registry as a Fedora digital object repository. Out of the box, Fedora provides all of these registry services, with the exception of indexing services; for which the Fedora GSearch plug-in module is use.

Although Fedora includes version management services, and internally keeps a history of all versions and changes to digital objects (in this case RELI licences), access to this information was not provided as part of the RELI demonstrator's services (however this information is visible through Fedora's own administrative tools).

Fedora includes a comprehensive access control layer for controlling access to its resources. However for the purposes of implementing the RELI demonstrator, this was not used. Access control was only implemented at the application layer (RELI Core Services, RELI client services) as this was sufficient for demonstration purposes.

6.4.3.3 RELI Core Services

Description

RELI core services are RELI-specific services implemented for use and management of the licence registry, that is a generic set of cores services that may be used in constructing applications which use RELI services and data. Analysis of the RELI use cases leads to a number of common core services which can then be made use of by RELI applications (in this case implemented as RELI client services).

RELI core services include

- Adding, updating, disabling and deleting RELI licences
- Discovery services for searching for RELI licences based on both licence metadata and free-text searching of the original licence document
- Licence view services, including presentation of the OnixPL expression as a number of views ranging from raw XML to fully-formatted summary presentations
- Licence metadata view services
- Original licence text view services
- Download of original licence document and OnixPL licence expression
- Services for querying and resolving OnixPL licence data

Implementation

OrbeonForms is used to implement the RELI core services. OrbeonForms is a J2EE application framework for XML-centric implementations, which, in the demonstrator, runs in a Tomcat application server. OrbeonForms enables the implementation of XML-centric web services, with XML document processing being handled by OrbeonForms' XML pipelining engine.

RELI's core services are implemented with a simple REST-based web service interface, with parameters being passed either as URL parameters, or XML documents being POST-ed to the REST service URLs, and the results of calls being returned as XML documents to the caller.

6.4.3.4 RELI API

Description

The RELI API consists of the interface layer between RELI core services and the rest of the RELI application layer (RELI client services in the demonstrator).

Implementation

Implementation of the RELI API is integrated with the RELI core services, with OrbeonForms' page flow definition mechanism used to define the URLs associated with services and how data is passed to and from those services.

6.4.3.5 RELI client services

Description

The RELI client services layer consists of the RELI application seen by both end users and by administrative users. In a full RELI implementation this layer could also provide web services to external systems that wanted to make use of RELI's data and services.

The RELI client services layer implements

- an Administrative interface, consisting of web pages allowing a user to
 - Upload new licences to RELI
 - Upload new versions of licences to RELI
 - Disable and delete licences
 - Search for licences
 - View licences in a variety of formats
 - View licence metadata
 - Download licences, both original licence documents and OnixPL expressions
- an End User interface, consisting of
 - A "traffic lights" display giving a simple visual presentation of the usages for a single resource.

RELI client services in turn make use of RELI core services in delivering this user interface.

Implementation

The OrbeonForms application framework is used to implement the RELI client services layer. As well as providing a powerful XML document processing through its XML pipelining engine, OrbeonForms also provides an XForms implementation which is used in the Demonstrator to provide a user interface. Although the definition of the user interface is implemented in XForms, the OrbeonForms XForms engine renders this as standards-compliant HTML to the user's browser.

6.4.3.6 RELI Clients

Description

The RELI Clients layer consists of the components used by a user of RELI to access RELI services. For the RELI demonstrator, the RELI clients are:

- A web browser, for accessing the administrative interface. Firefox version 3 was used for the RELI demonstrator. Although OrbeonForms is compatible

with most modern web browsers, including Internet Explorer; only Firefox was tested comprehensively for the Demonstrator.

- A Firefox plug-in. The purpose of the plug-in is to detect when an end-user is viewing a journal article abstract/splash page. It then extracts the identifier of the journal article, make a call to the RELI traffic lights service and displays the results of that call to the user, embedded within the page they are viewing. Simple clickable icons are provided for the user to "open" and "close" the RELI display of licence conditions.

Implementation

The Firefox plug-in is implemented using the Firefox GreaseMonkey plug-in. This provides a framework for quick and easy development of plug-in scripts.

The GreaseMonkey script examines every HTML page for "META" tags, and then determines if any of these tags contain a DOI. If so, the DOI is extracted and then used to generate a web service call to the RELI client services layer, which returns the traffic lights HTML presentation of usage conditions for the particular resource.

6.4.3.7 Authentication and Authorisation

Description

- Authentication is required to determine a user's identity, particularly the user's institution, and the users affiliation (or role) to the institution
- Authorisation is required to protect access to RELI services and resources to users permitted to access those resources

The Authentication and Authorisation layer can potentially be used by various layers of the RELI application.

Implementation

Shibboleth is used to provide both authentication and authorisation services.

The RELI demonstrator includes a Shibboleth Identity Provider, which is configured with a set of demonstration user credentials and Shibboleth attributes for those users; following the standards used for UK Federation identity providers, specifically provision of the eduPersonScopedAffiliation and eduPersonEntitlement attributes.

A RELI-specific Identity Provider was implemented for two main reasons

- Full control over Shibboleth attributes, allowing various scenarios to be tested, without having to modify attributes in a "live" UK Federation Identity Provider
- No requirement to interface directly with the UK Federation, which would have used RELI project resources that could be better spent elsewhere on the project

The RELI demonstrator is implemented as a standard Shibboleth 2 Service Provider, which includes the following components:

- The Shibboleth daemon, configured to use RELI's Shibboleth Identity Provider
- The Apache web server, running Mod_Shib
- Tomcat configured to be proxied behind Apache, with Apache effectively marshalling all communications between consumers of RELI services and the Tomcat web applications using AJP

When a user first accesses any RELI service or user interface component, they are first redirected to log in to the Shibboleth Identity Provider (in a UK Federation implementation they would first be passed through a "WAYF" service to determine the identity provider to use). Once logged in, the user is redirected back to the original URL, and the Shibboleth Service Provider then has access to the user's attributes (as controlled by the Identity Provider's attribute release policy).

Subsequent access to RELI services is effectively "SSO" (single sign-on), as the user is already authenticated with the Shibboleth Identity Provider – so the user will not be asked to log in again.

The chosen implementation allows two layers of authentication and authorisation. At a basic level, certain URL patterns can be protected to allow access only by authenticated users with specific attributes defined in the Apache Mod_Shib configuration.

Apache and Mod_Shib are also configured to populate the HTTP Headers of the request with the user's Shibboleth attributes.

These can then be retrieved by the Tomcat web applications (OrbeonForms, and theoretically Fedora) to determine a user's identity and attributes, and further restrict access or modify application behaviour based on these attributes.

6.4.3.8 Plug-ins

Description

RELI requires access to certain external services to provide its functionality. For the RELI demonstrator these services are

- CrossRef, for resolving journal article DOIs to journal titles
- Shibboleth for determining user attributes

Sound system design stipulates that the RELI software is not tightly-coupled with these external services, to allow re-use of the RELI software with different resolution and identity provider services in the future.

Implementation

Specific program modules were written in OrbeonForms to interface with the two external services; all other RELI application components then use these modules rather than interfacing with external services directly.

6.4.4 Results of technical investigations

The results of the technical investigations together with the implications on the RELI demonstrator implementation are presented below.

6.4.4.1 Mechanism for presentation of licence information at point-of-use

Potential mechanisms for presentation of licence information to the end user fall broadly into two categories:

- Code included in the publisher's web page for the resource.
- Client-side functionality implemented as a web-browser extension or plug-in component

The first category in general requires publishers (or their agents) to make modifications to how they generate the journal article abstract/splash pages. In principle, this is feasible, and already happens for bookmarking services such as Del.icio.us, CiteULike, Digg, Technorati etc⁴. There are a number of potential ways of implementing the RELI usage display functionality in this category, ranging from simple links through to a RELI HTML service to embedded graphics, Flash objects etc.

The second category relies on code effectively installed on the user's PC as part of their browser implementation. Such code would then examine web pages, determine when a web page is for a journal article abstract page, and then make appropriate calls to RELI services.

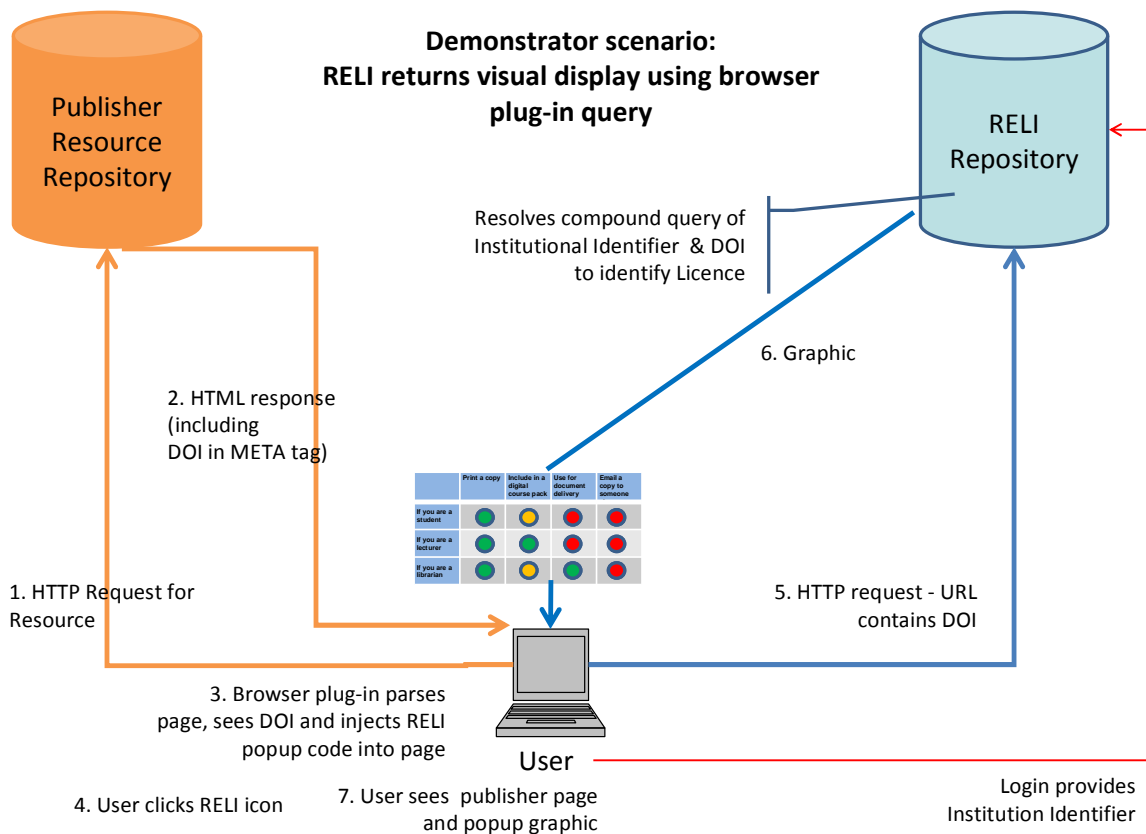
The second category relies on end users downloading and installing software on their machine, whereas the first category is essentially seamless to the end user, and therefore preferable in the longer term.

However, given the project timescales, and the anticipated time that it may take (and maybe their willingness) for publishers to implement changes to their systems, a project-level decision was taken that for the purposes of a RELI demonstrator it would be more pragmatic to concentrate on the second.

Drawbacks of this approach were noted, particularly ongoing maintenance of the browser plug-in code, the need to supply browser plug-ins and extensions for different browser platforms (Internet Explorer, Firefox, Safari etc) and different versions of these browsers.

Examples illustrating the two categories of implementation mechanisms are illustrated below:

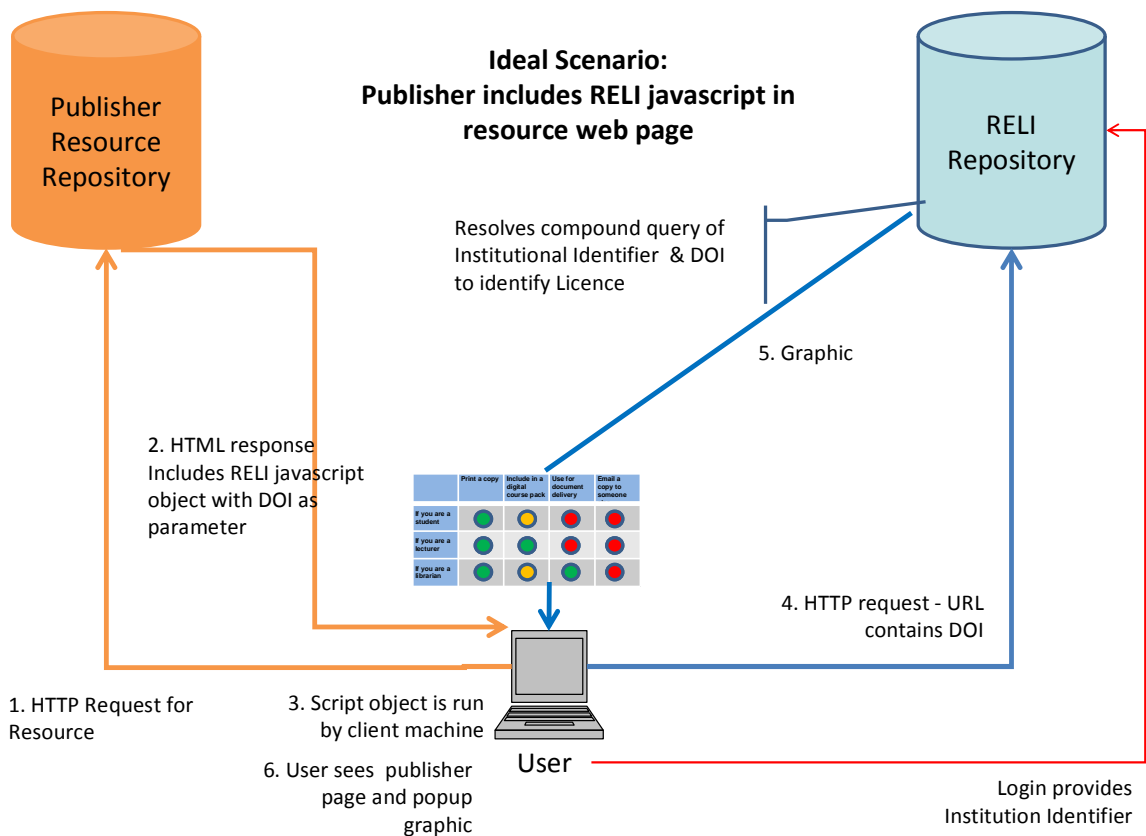
⁴ For an example abstract page which includes links to external services see <http://ard.bmj.com/cgi/content/abstract/62/9/894>



In this first scenario, the user must first install the RELI browser plug-in in their (Firefox) web browser.

When the user browses to a journal article abstract page which includes a DOI in an HTML meta-tag (1, 2), the browser plug-in recognises the DOI (3) and injects the necessary RELI "pop-up" display code into the page. The browser makes a request to the RELI server (5), which returns a display (6) of applicable usages for this resource as specified by the licence.

As the RELI server is a Shibboleth Service Provider, it is able to use the user's institution and role attributes to retrieve the correct licence.



In this second scenario, the publisher's page includes the necessary JavaScript code to interface with the RELI server. When the user browses to the journal article abstract page (1, 2), the JavaScript allows the user to interact with the page and request licence usage conditions. The RELI service is called (4) and an appropriate display of licence usage conditions is displayed.

As with the first case, RELI is able to retrieve user attributes through Shibboleth to retrieve the correct licence.

RELI Demonstrator Implementation

Various browser platforms and plug-in/extension mechanisms were examined, and it was determined that the most pragmatic option in terms of developing a demonstrator was a Firefox plug-in based on Greasemonkey⁵

6.4.4.2 Resource identification at point of use

RELI requires that a resource covered by a RELI licence is identified at the point-of-use, so that this information can be communicated to RELI services to determine the appropriate licence(s).

A sample of journal article abstract/splash pages were examined, at the HTML level, to determine if the web pages contained identifiers presented in a suitably structured manner for RELI to use.

⁵ Greasemonkey <https://addons.mozilla.org/firefox/addon/748> is a Firefox plug-in that allows deployment of "user scripts", i.e. it provides an environment for developing, testing and deploying plug-in functionality.

Whilst four publishers (ACS, BMJ, BPS and RSC) formed the focus of this investigation, journal abstract pages from eighteen publishers in total were examined, to determine the consistency of any approaches publishers used for identification of their resources.

The findings of this were:

- All abstract pages included DOIs somewhere in the HTML (bar a few exceptions for historic articles that had not been assigned DOIs)
- The majority of publishers (11 out of 18) encode DOIs in HTML "META" tags⁶. Two main schemes were in use ("dc.identifier" and "citation_doi") with a third ("rft_id") being less prevalent. Notably of the four RELI publishers, RSC did not encode DOIs
- Extraction of DOIs from HTML text alone would prove to be very difficult, DOIs are not positioned consistently on the page, and there are cases where multiple, different, DOIs are included (for instance as references to related articles), making it difficult to identify the definitive DOI for the article

RELI Demonstrator Implementation

The Browser Plug-in identifies the resource at the point of use by examining the HTML META tags, in particular it searches for META tags named dc.identifier, citation_doi and rft_id

Although one of the publishers (RSC) did not provide these META tags, the DOI was still present (as text) on the page so it is anticipated that it would only require a minor change to implement META tag identifiers for these.

An experimental "screen-scraping" approach was also tested (in the browser plug-in), to extract DOIs from the body of the page. This highlighted the problems with this approach, particularly where multiple DOIs were found, and illustrated the need for consistent and reliable resource identification at source.

6.4.4.3 User identification

In order for RELI to identify the licence terms that pertain to a particular user, two pieces of information are crucial:

- The user's institution
- The user's role in, or affiliation to, the institution

Shibboleth and the UK Access management Federation for Education and Research⁷ (that is, the Shibboleth Federation used by UK academic institutions) were examined. The UK Federation specifies⁸ the following attributes as *core attributes*:

⁶ HTML META tags encode information that is not displayed to the end user, but provides metadata to describe the web resource being displayed. One (historically) common usage is to provide keywords to search engines.

⁷ <http://www.ukfederation.org.uk/>

⁸ <http://www.ukfederation.org.uk/content/Documents/AttributeUsage>

- eduPersonScopedAffiliation: user's organisational affiliation
- eduPersonTargetedID: persistent user pseudonym for personalisation
- eduPersonPrincipalName: persistent user id across multiple services
- eduPersonEntitlement: extensible list of URIs for extra properties

The eduPersonScopedAffiliation attribute provides all the information required to determine usages for a user – it provides a user's affiliation (or role) and identifies a user's institution, in the format staff@organisation.ac.uk where *staff* is in this case the affiliation, and *organisation.ac.uk* is the domain name identifying the institution.

Additionally the eduPersonEntitlement attribute is commonly used⁹ for defining application-specific entitlements for a user. URIs were defined to represent the two RELI administrative roles – that of library administrator and systems administrator.

RELI Demonstrator Implementation

Given the overall timescales, and the requirements for interfacing with the Federation (anticipated at least to involve getting a Federation-recognised security certificate, obtaining a static IP address and obtaining a domain name) it was decided instead to implement a RELI-local shibboleth implementation, comprising

- A RELI Identity Provider (IdP) server, which would contain exemplar user identifiers, and implement values for eduPersonScopedAffiliation and values for eduPersonEntitlement
- The RELI service itself would act as a Shibboleth Service Provider (SP)

Users accessing the RELI application, which includes users of the browser plug-in for displaying point-of-use usages will be asked to authenticate themselves by the local Shibboleth Identity Provider. Once they have done so, the RELI application, as a Shibboleth Service Provider, is able to determine the user's eduPerson attributes.

N.B., in a full UK Access Management Federation solution, a user would have only had to sign on once to any Shibboleth-enabled (i.e., Service Provider) application, and would not be forced to authenticate again to access RELI (i.e., Single-Sign-On, or SSO).

6.4.4.4 Repertoire management and identity resolution

A project assumption is that journal articles would be identified using DOIs. However the candidate licences for RELI (based on the NESLi2 licence) generally identify works at the journal title level (or journal title for a range of years).

Therefore some mechanism of resolving individual article DOIs to the level specified by the licences was necessary. (One option would be for RELI to hold a list of article DOIs against journal titles; whilst this would allow an in-principle demonstration of

⁹ There seems to be evidence of common practice for using this attribute for defining application entitlements from the UK JISC Shibboleth mailing list.

RELI services, it was clear that this would either involve an onerous maintenance effort, or would restrict demonstration to a very few candidate journal articles).

CrossRef¹⁰ holds metadata against journal article DOIs. CrossRef's various web services were investigated, and a dialog was undertaken with CrossRef in order to determine the most appropriate usage of both CrossRef services and identifiers for both journal articles and journals themselves.

CrossRef advised that under current usage, ISSNs are not a reliable form of identifier to use for journals. The textual journal title held by CrossRef, whilst not an ideal form of identifier, was, pragmatically, going to be the best journal-level identifier available for RELI to use, in absence of widespread implementation of DOIs for journals¹¹

The CrossRef OpenURL resolver service¹² provided the necessary information required by RELI. The service is called using a URL structured as:

<http://www.crossref.org/openurl/?pid=user:password&noredirect=true&id=doi:10.1021/cb7000439>

Where

- pid: specifies a CrossRef user ID and password
- noredirect: specifies that metadata is to be returned, rather than redirecting to the resource
- id: specifies the journal article DOI

CrossRef provided a user ID and password to the RELI project for the demonstrator.

The format of the results returned by this service is (showing only a fragment of the returned XML, see CrossRef documentation for information on the full response):

```
<doi type="journal_article">10.1021/cb7000439</doi>
<issn type="print">15548929</issn>
<issn type="electronic">15548937</issn>
<journal_title>ACS Chemical Biology</journal_title>
<contributors>
  <contributor first-author="true">
    <given_name>Sung Bae</given_name>
    <surname>Kim</surname>
  </contributor>
</contributors>
<volume>2</volume>
<issue>7</issue>
<first_page>484</first_page>
<year>2007</year>
```

¹⁰ <http://www.crossref.org/>

¹¹ DOIs can in fact be assigned to any type of intellectual property in any medium. CrossRef supports the registration of DOIs for journals, journal titles, volumes issues and articles (see <http://www.crossref.org/02publishers/doi-guidelines.pdf>); however only article DOIs are in widespread usage.

¹² http://www.crossref.org/02publishers/openurl_info.html

```
<publication_type>full_text</publication_type>  
<article_title>Nongenomic Activity of Ligands in the Association of Androgen  
Receptor with Src</article_title>
```

From the above, it can be verified that CrossRef's OpenURL service not only returns the journal title, but also identifies the article, issue, year and page number of the journal article; thus if necessary licences could specify resources down to this level of detail, though for the demonstrator only the journal title level was implemented.

Section 4.2.1 also outlines the approach taken to dealing with Repertoire, and resolving resource identifiers (journal article DOIs) to the CrossRef journal title

RELI Demonstrator Implementation

The RELI demonstrator uses a resolver plug-in architecture to provide an interface to the CrossRef OpenURL resolver service to resolve resource DOIs to journal titles.

6.4.4.5 Format of licence information at point-of-use (i.e., layout)

At an early stage in the project, the project team agreed that a "traffic light" display should be used to present usage information to the user; this would show a grid with rows indicating the "role" or "affiliation" of the user (e.g., Student, Staff, etc), with columns representing different usages. In each cell appears a red, amber or green disc indicating whether a particular usage is permitted or not for a particular role (with amber indicating that the licence does not specify, or that further information should be sought).

A prototype implementation was developed in November 2008. This was reviewed by the project team, and was also used by JISC collections as part of their NESLi2 Onix Publisher's Licence Consultation exercise¹³. This is available at <http://www.nesli2.ac.uk/onix-pl/reli/>.

It became apparent that the number of potential usages specified in licences would result in an unworkable number of columns, and for the prototype the display was split into two separate tables, although even this resulted in a quantity of information that was inappropriate to present to user in a simple pop-up display at the point of use.

RELI Demonstrator Implementation

A grouping of usages by category was undertaken. The Traffic Lights HTML presentation generates a display with multiple "tabs" visible to the user; the user can then click on a tab representing a grouping of interest to them, to show the underlying usages.

6.4.4.6 Access control

There are three levels of access control required

- End user: any Shibboleth-authenticated user should be able to view the traffic-lights presentation of usages for a resource

¹³ <http://www.nesli2.ac.uk/onix-pl/compare.html>

- Library administrator: Limited access to administration functions – able to search for and view licences, upload and download licences and disable licences but only for their own institution
- RELI system administrator: Full access to all functions

These are defined in the Shibboleth Identity Provider (IdP) using the eduPersonEntitlement attribute (see above).

The standard Shibboleth Service Provider software includes an Apache module, and can be configured for access based on URL patterns.

Additionally, Apache can communicate with Tomcat (the J2EE platform for the RELI application) using AJP, and the Shibboleth Apache module can be configured to pass Shibboleth attributes through as HTTP request parameters.

A prototype implementation of a Shibboleth Service Provider, using Tomcat and OrbeonForms, was tested to identify any difficulties with this approach. It was verified that basic URL-level security, based on Shibboleth attributes, could be implemented, and it was also verified that Tomcat web applications (OrbeonForms in this case) had access to Shibboleth attributes via HTTP headers for more fine-grained access control and for ensuring that the presentation layer components are consistent with the user's attributes.

RELI Demonstrator Implementation

The RELI application implements a two-level solution to access control

- Basic URL-based access control as part of Shibboleth and Apache configuration (e.g., only allow access to authenticated users, only allow access to admin functions to library and system administrators)
- Fine-grained application-level access control implemented in application code (e.g. Search functionality is constrained to a user's own institution if the user is not a system administrator; licence display functions check a user's institution and the user's entitlement before allowing display)

6.4.4.7 Metadata and free text indexing service

Out-of-the-box, Fedora comes with two indexing and discovery mechanisms

- Basic Search, which indexes a Dublin Core metadata data stream, which must conform to the OAI_DC schema
- The Resource Index, whereby metadata elements stored in a RELS_EXT data stream are indexed

Additionally, there is the Fedora Generic Search Service (GSearch), a separately-installable search module, which is highly customisable, and can utilise a number of different back-end search engines, such as Solr, Lucene and Zebra.

The Basic Search and Resource Index were evaluated, and both were found to have deficiencies in fulfilling the RELI Demonstrator requirements.

Basic Search can only index a single Dublin Core data stream, OnixPL (and other) metadata elements cannot be indexed as they do not conform to the OAI_DC schema, and therefore cannot be included in this data stream. Furthermore, Basic Search has no ability to provide a full-text index of the original licence document.

The Resource Index is flexible-enough to allow indexing of arbitrary metadata elements, providing a suitable single-level RDF schema is designed. However again there is no capability to provide a full-text indexing service.

Fedora GSearch was then evaluated. GSearch is highly customisable, and allows if required the creation of a number of separate indexes. Any XML metadata data stream can be indexed, providing the elements to be indexed are identified in the GSearch configuration. Additionally GSearch can provide full-text indexing of any arbitrary datastream that can be interpreted as text; particularly PDF documents, which is the format of RELI's full-text licences.

GSearch integrates well into Fedora, with indexing taking place automatically after ingest or update of a Fedora Object through Fedora's implementation of the Java Messaging Service (although this does mean that the indexing requests are queued, and it is possible that the indexing will actually occur a short while after updates).

7 Results of demonstrator assessments

Two demonstrations took place at the end of May 2009 at Loughborough and at Cranfield Universities. The participants at Loughborough University were:

Gary Brewerton (Library Systems Manager)
Steve Corn (Support Services Librarian)
Sue Manuel (Research student & library systems team)
Steve Bayliss (Acuity Unlimited – developer of the demonstrator)
Valérie Spezi (LISU – Loughborough University)

The participants at Cranfield University were:

John Harrington (Information Support Manager)
Anne Knight (Facilities and Resources Manager)
Simon Bevan (Library Systems Team)
Mike Groves (Academic Liaison Librarian and Library Customer Service)
Steve Bayliss (Acuity Unlimited – developer of the demonstrator)
Valérie Spezi (LISU – Loughborough University)

7.1 Presentation of the end-user interface

7.1.1 Authorised users

Participants thought the ‘authorised user’ category was very ambiguous, as different licences may have different definitions of who the ‘authorised users’ are of specific electronic resources. They expressed a desire for a more explicit way of defining different groups of users, such as a breakdown by user types (academic staff, students, research students, etc.).

It was explained that the actual category of user(s) displayed depended on (a) the Shibboleth eduPersonScopedAffiliation attribute(s) for the user, (b) what was specified in the licence and (b) how closely the attributes could be mapped to the terms in the licence specifying "authorised user", and that in a full RELI implementation the category of user(s) displayed would be those most relevant to the user.

7.1.2 Shibboleth

Both groups expressed concerns about the demonstrator only working within the Shibboleth environment, but the developer of RELI relieved those concerns by explaining that the demonstrator could in theory work with other federated

environments if plug-in module(s) were written for those federated environments. A Shibboleth environment is not a requirement for a RELI-type service.

Loughborough currently uses Open Athens and authentication is IP restricted, which means there is no log-in on campus. Cranfield also uses IP-based restrictions for some resources. There are plans, at Cranfield University to move from the Athens gateway to Shibboleth in July/August 2010. The Cranfield group acknowledged that the more granular Shibboleth attributes are, the more room for negotiation (and opportunity to save money) the institution has. However, the group agreed that this requires a thorough analysis of who the users of the library are.

Although both Library Systems Managers at Loughborough and Cranfield Universities would like to move to a single sign-on technology, they thought that it may take some time as this was probably fairly low down the list of priorities for their respective IT services.

7.1.3 Traffic light presentation

The traffic light display attracted great discussion in both groups. The overall impression was very positive and both audiences, at Loughborough and Cranfield Universities, felt that the graphics (green/red bulbs) were fairly easy to understand, quite intuitive and very easy to see at a glance. Participants at Cranfield University also emphasised that the possibility to look up a glossary of terms from the user-interface was an important feature.

Some comments were however made about the drawbacks of the traffic light display:

Accessibility issue: the Loughborough group raised the issue of accessibility for users with disabilities or special needs; particularly the use of red and green traffic lights in the context of red/green colour blindness. The group felt that, although the coloured bulbs were very clear to most users, additional iconography such as a green-tick/red-cross display could solve the accessibility issue while retaining a fairly clear and obvious meaning. The group asked whether adding some more text for colour-blind users would be possible.

Exclamation mark on green bulb: the Loughborough group felt that requiring users to point to the exclamation mark in order to know what the extra conditions associated with the use/access of a specific resource are, may not be ideal as users might just simply not pay attention to the exclamation mark. The group thought that the extra conditions should be more visible. However, using amber to indicate "proceed with caution" (see below) instead of the exclamation mark icon may go some way to alleviate this.

Amber bulb for 'we don't know': When the licence does not give a specific condition, the Loughborough group felt that an amber bulb may not be appropriate as this could be understood by users as 'proceed with caution' instead of 'we don't know'. The group thought a question mark icon would be more appropriate in this case; with amber being used to indicate "proceed with caution", i.e., additional conditions apply..

Background colour: a participant said that a solid background colour for the display box, instead of a translucent background colour, may be better. It was acknowledged by the developer of the RELI demonstrator that there were expectations to work with publishers in the future in order to have the display box more embedded in the publisher's webpage. The colour scheme in practice would likely be customised to fit in with its display context.

Pop up window for traffic light display: some participants had concerns about whether the pop-up window for the traffic light display would be blocked by the university's IT protection system against pop-up windows. It was explained that the demonstrator browser plug-in "pop-up" was not a pop-up in the true sense, but was pure HTML; however it was noted that this restriction should be borne in mind for a full RELI implementation.

Ambiguity of usage terms in the display box: the Loughborough group thought that the term "material for presentation" may have different interpretations and therefore this should be stated more clearly. It was explained that the text displayed depended on the original licence, the OnixPL mark-up of the licence and the text in the OnixPL dictionary. The original licence text was examined and it was shown that there are cases where the original licence itself is ambiguous.

Link through to the full-text licence: some participants, both at Loughborough and Cranfield Universities, suggested that it would be useful to have access to the original licence from the user interface. The rationale for that was that academic staff may want to have access to the full-text licence and may want to make a copy of it to form a record of the information they were given regarding usages of the material; there is, however, a confidentiality issue arising from this as many publishers impose a confidentiality clause on their licensees.

Usages presented in each tab: Loughborough participants in particular wondered if those usages displayed in the first tab (i.e., the immediately-viewable usages) were the most important or relevant to the user. It was explained that this kind of behaviour would be customisable within RELI, so that displays could be customised to meet local needs.

Printable view: Loughborough expressed that it could be useful to provide a printable view of the usages for the resource, so that a user could take a copy of the information "for the record", for instance to provide a record that they complied with licence information they were given.

7.1.4 RELI icon

The group at Loughborough University thought the RELI icon was very small and suggested branding the service with a larger icon (maybe with RELI written on it). It was explained that the Firefox plug-in was good for a demonstrator but not for a production service, and that this issue would be addressed for a production service. Again, the developer of the demonstrator explained that he expected the service to be embedded in the publisher's website in the future, as Del.icio.us or Facebook are.

Both groups thought that if the traffic light information was embedded in the publisher's webpage, this would be much better and have much more impact. The groups also agreed that this would mean that end-users would not need to know the RELI service or recognise the icon, which would be much easier for them.

The Loughborough group agreed that it could be helpful to end-users to have basic information in key areas available directly on the publisher's webpage, including 'can I access it?', 'can I print?' or 'can I use it as part of my own work?' etc., i.e., graphics (sourced from RELI) directly present in the publisher's HTML abstract page for the most common usages, with a click-through to more detailed information.

7.1.5 Terminology

The terminology used in the display box could be more explicit. For instance, the difference between terms such as 'use' or 'access' is not always obvious and clear to end-users. It was explained that this was dependent on the text in the OnixPL dictionary, and ultimately on the licence text and the OnixPL mark-up of that text.

7.1.6 Duplication of information

The participant with the 'end-user hat', at Loughborough University wondered how the RELI traffic light sits alongside publishers' information as publishers already provide some basic information regarding access. It was explained that the traffic light display brings more detailed information to end-users, especially about copy and use, not only access.

7.1.7 Academic staff interface

Some participants at Cranfield University felt that academics should have a separate interface from other end-users. They thought it may be useful for academics to have a more guided version of the administrative query interface, although it was recognised that there may be an issue with divulging the terms of the licence in some cases.

7.2 Presentation of the administrative interface

7.2.1 Converting licences in ONIX-PL format

Both audiences raised the question of who would be in charge of converting publishers' licences in ONIX-PL format as this process requires knowledge of the ONIX-PL format, expertise in translating licence terms and staff time. The participants thought that it could be difficult for libraries to do that. The developer of the demonstrator acknowledged that this question was still open and, ideally, it would be publishers doing it, maybe by using the already-encoded NESLI2 model licences as a starting point.

Both groups raised the question of authority for creation of ONIX-PL licences as licences are often obscure and open to interpretation. The groups agreed that it was not a technical or system issue but a licence wording issue.

Participants recognised that the administrative interface was straightforward and also agreed that it did not really matter if ONIX-PL was a complex format as long as the

tool to create the ONIX-PL licence was easy to use. The Loughborough group insisted that if libraries were expected to convert licences in ONIX-PL format, then it was crucial that the tool to create the licence expression in ONIX-PL was easy to use, but it was recognised that this was out of the scope of the RELI project.

The Loughborough group also discussed whether a licence sharing practice between institutions could be a viable model to avoid duplication of effort across sector. A trust issue immediately emerged from the discussion. It was felt that the provenance of the licence was key because one may trust some institutions more than others. The group reiterated that, ideally, publishers should create the ONIX-PL licences because there is less room for interpretation.

7.2.2 LMS/ERMs

Participants raised the question of how RELI would fit in LMS/ERMs to avoid a lot of duplication effort. There were discussions about what additional features RELI was bringing on top of ERMs. The Resources Manager at Cranfield University explained that their licences were already imported to their ERM (Verde), there is a process of entering manually certain key licence terms (and it was stated that Verde can import electronic licences, though the format was not known) and licence terms could be forwarded to users by SFX technology, although licence terms were not at the article level and were not presented in a user-friendly way. This raised the questions of 1) what makes RELI a useful tool from an administrative point of view?, and 2) how to avoid duplication of effort? Participants expressed strong concerns about having to input data twice, and agreed that systems interaction was a fundamental issue. The Resources Manager at Cranfield University explained that the workflow on their ERM (Verde) was relatively satisfactory with different licence status available such as draft licence, waiting for signature etc. This raised the question of what makes RELI a better tool than an ERM, from an administrative perspective. It was explained that there were a range of scenarios, for instance RELI could provide electronic licence information to the ERMs, and if both used OnixPL then this would reduce effort.

7.2.3 Suppliers

The groups asked what happens when the same journal is provided by two different suppliers. In this case, the same DOI would have two different licences. Although this issue was recognised by the project team, it was stated that the team had not sought to resolve how to deal with conflicting or overlapping licence terms.

Some participants also asked whether a RELI-type service was primarily aimed at resources accessed as part of deals or whether it could be used for any publisher. It was answered that a RELI service would aim to work, theoretically, with any publisher as long as the journal title/article title could be identified (ideally, using the DOI), and that the resource identifier could be resolved back to licence(s) held by RELI.

The participants also raised the question of article titles without a DOI. The issue was acknowledged although it was stressed that the vast majority of titles do have DOIs, only old titles may not have one.

7.2.4 A-Z list (Repertoire)

The Cranfield group found it useful to have an A-Z list. However, the group was sceptical about the accuracy of such a list. They had concerns because, generally, not all licences have a list of resources that are included, and, when they do, the list is not always correct. Participants felt it was very hard to obtain a list of their subscriptions from publishers, and that maybe some form of financial incentive may help, or making the provision of A-Z lists a condition of the licence. They also expressed concerns about the list constantly changing as journal titles can be transferred from one publisher to another. In general, it seems that obtaining and communicating accurate A-Z/repertoire information is an issue, and one that the RELI team has already acknowledged (and has not sought to address as part of the project).

7.2.5 SHERPA

A participant remarked that what RELI does was similar to SHERPA, although SHERPA was not at the article level. (In fact, this statement is inaccurate; SHERPA provides information about licence agreements between authors and publishers; RELI provides information about publishers' licences for materials provided to libraries.)

7.2.6 Educational service

A participant asked whether such a RELI-type service could be part of a wider educational service. It was agreed by the Loughborough group that as long as licences were in a suitable format for input into a "database" such as RELI, queries could be made and therefore this could help to enhance user education about access and use of licensed material; in essence, this is the use case of RELI providing services to other systems.

7.2.7 Repository

Some participants asked whether such RELI service would be useful in a repository workflow. They said that the fact that the RELI display box gives detailed information could be interesting in a repository context. Both groups put much emphasis on the need for such service in a repository workflow as repositories are becoming very important in an academic library environment. Cranfield highlighted IEEE publications as being an example where different terms cover repository and published versions.

7.2.8 Access to the full-text licence

A participant remarked that having access to the full-text licence was a good point because, sometimes, institutions may be more restrictive than publishers!

7.2.9 Materials covered by a RELI-type service

A participant suggested that it would be useful if the service could include non-journal materials, such as technical papers or British Standards. Although these resources are technically not journals, it was felt that it would be appropriate to have everything in the same place. Other participants expressed a desire to see all licensed materials (e-books, databases, newspapers, digital maps, etc.) covered by a RELI-type

service. It was explained by the developer of the demonstrator that journals were just a case for RELI. In theory, any electronic resource could be covered by RELI as long as 1) the licence was translated on a standard such as ONIX-PL and 2) there was a reliable identification mechanism for the resource allowing it to be related to licence(s) covering the resource.

7.2.10 Business model

The two groups had a discussion about whether a hosted solution would be preferable to a locally-managed system with a data delivery service. The two groups thought a hosted solution would work best for them as this means that the institution does not need to implement a local development or solution. They also emphasised that most institutions do not have the IT infrastructures to support a local solution. It was said that a hosted solution would work for virtually all and it is easy to pay for a service. The groups also discussed whether a central service (same type as CrossRef) would work better than publishers linking to individual institutions but did not reach any conclusions.

7.2.11 Comparing licences

A participant said that comparing two licences side by side would be key. This led to the question of whether RELI would include some ability to investigate costings for different licences. It was felt by the groups that this feature could help institutions to negotiate their licences better.

7.2.12 Open source system

One group asked whether RELI would be available as an open source system. It was pointed out that RELI is a demonstrator, rather than a full system ready to be installed, but that the code was developed under the terms of open source licences and would be released to the JISC.

7.2.13 Versioning

The groups thought that versioning could be an issue and, therefore, it would be good to build some workflow into RELI. The developer of the demonstrator acknowledged the point made and explained that versioning was in fact built in to the back-end registry/repository used by RELI (Fedora Commons), but the versioning capabilities were not exposed for the Demonstrator implementation.

The groups also felt that propagating changes in licences would be easier with a hosted solution (for instance, once a month obtaining a list of changes in licences (but this is more a governance issue)). The groups felt that publishers may feel safer with a hosted solution.

7.2.14 Usage information

The participants wondered whether RELI could also be used to gather usage information, i.e., capture information when people have clicked through to obtain the full-text licence. This could be valuable information and indicate whether a specific licence needs clarification.

7.2.15 Search terms

Participants at Cranfield University asked whether it was possible to search for specific terms within the licences, such as ‘walk-in users’, ‘Interlibrary Loans’ etc. The group thought that knowing which resources allow walk-in users or interlibrary loans would be extremely useful to library staff, as it is currently a slow process to obtain such information. Although this is not part of the RELI interface, the need for such mechanism was acknowledged and it was agreed that this could be easily built into the indexing.

One specific query type was investigated during the session – whether the licence specified COUNTER-compliance. On investigation, it was found that the licence text for the NESLi2 model licence did specify COUNTER-compliance, but this was only encoded in OnixPL as a supply term to provide usage statistics without encoding any more detail as to the type or format of those statistics.

7.2.16 SFX resolver

Participants at Cranfield University raised an issue pertaining to their use of the SFX resolver. As users would click on the SFX button to get to a specific resource, they would bypass the publisher’s page where the RELI information is displayed, and access the article directly. The group agreed that the users’ discovery route could be an issue if the SFX link was used to access an article. The group suggested that this could be mitigated by a mechanism where the DOI may be encoded in the open URL and something was used to intercept the link and display the RELI information, for instance in a splash/cover page.

7.3 Conclusions

The presentation of the demonstrator received positive feedback. Both groups agreed that a RELI-type service would be very useful, but whether it would be adopted would depend on price, functionalities and coverage (i.e., getting the biggest publishers on board).

Who would host such service also raised some questions. It was felt that it could not be UK-focused, as the UK is a small part of the publishers’ market. The groups concluded that it will be the publishers who make it work in the end, and therefore it was essential to get publishers on board.

8 Extension project – barriers to take up of a Registry of Electronic Licences

In January 2009, JISC commissioned from the original RELI partners, working with LISU, a report on the barriers to take up of a Registry of Electronic Licences. The research was designed to gain a better understanding of the factors affecting the likelihood and timing of the take-up of ONIX-PL through the e-resources supply chain, and the demand for a RELI-type service.

8.1 Methods adopted

The additional research used several different approaches:

- An online survey
- Interviews with stakeholders (publishers, e-resource management system vendors and subscription agents)
- Case studies in two libraries
- A workshop for librarians managing e-resources

The survey questions were designed to gather information on current practice regarding the management of electronic resources and licences in academic libraries. The survey was aimed at managers of electronic resources and/or administrators of licences in UK academic libraries and was, therefore, sent on three mailing lists most likely to reach directly the targeted audience. Those lists were the LIS e-resources, the JISC e-collections and the NESLI2 mailing lists. Because the NESLI2 list is a closed mailing list, the researchers had to make an initial contact with the list manager presenting an outline of the project and asking for permission to post the email invitation for the survey, which was readily agreed by the list manager.

The survey also included an invitation to the follow-up workshop aiming at exploring the issues raised by the survey. Participants were invited to specify whether they would be interested in participating in such workshop.

8.2 Summary of responses to web survey

The survey received a good response, with 154 responses in total. As the research specifically targeted UK-based electronic resources managers, responses from abroad were discounted in the statistical analysis. However, free-text comments from non-UK respondents were added to the quantitative analysis as they generally represent a valuable source of information. Such free-text comments from overseas institutions are explicitly indicated throughout the analysis in order to avoid any confusion with UK-based answers. The total number of UK responses was 96, coming from 86 UK-based HE institutions. The survey analysis was based on these 96 responses. Note that the percentage figures have been rounded to the nearest integer.

8.2.1 How important is it to be able to manage licence information in a structured form?

All respondents felt that it was at least 'quite important' to manage licence information in a structured form, with a large proportion of the respondents (75%) thinking it was 'very important'. Although a negative option was offered ('not very important'), no respondents chose this.

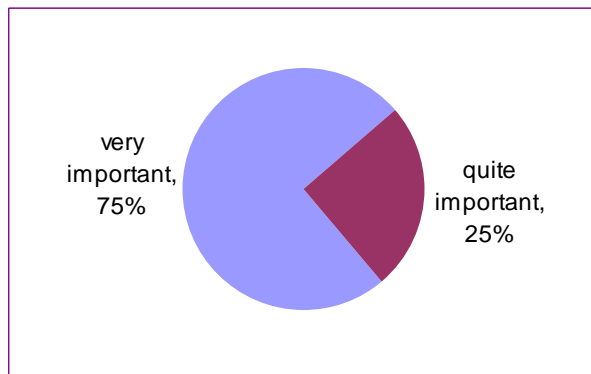


Figure 3 How important is it to be able to manage licence information in a structured form?

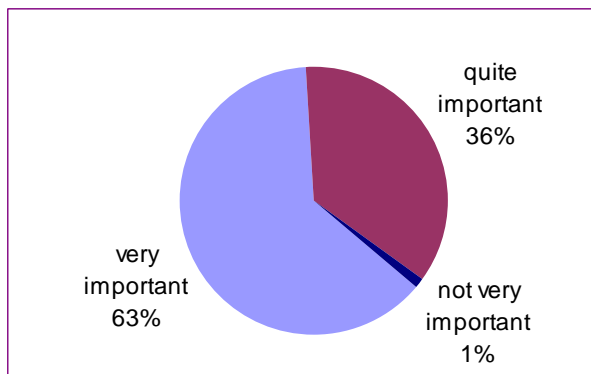


Figure 4 How important is it to be able to communicate licence information to library staff?

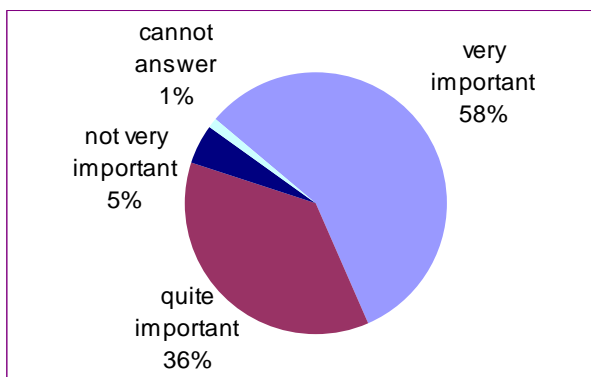


Figure 5 How important is it to be able to communicate licence information to library patrons?

The majority of respondents felt it was 'very important' to communicate licence information to both library staff and patrons.

8.2.2 Are you aware of the ONIX-PL standard for communicating the terms of the licence information to library patrons?

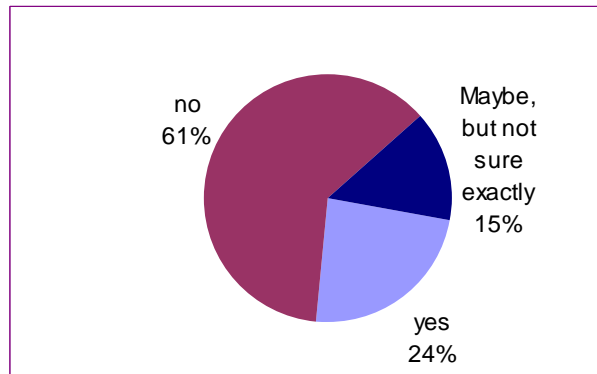


Figure 6 Are you aware of the ONIX-PL standard for communicating the terms of the licence information to library patrons?

The survey indicated that a majority of electronic resource managers is unfamiliar with the ONIX-PL standard for communicating licence terms to users. 61% of the respondents did not know anything about the ONIX-PL standard and a further 15% were unsure about what it meant and its purpose.

8.2.3 In principle, how useful would a standard way of communicating licence terms to library staff and patrons be to your library?

75% of the respondents thought a standard way for communicating licence terms to patrons would be at least 'useful', with 63% thinking it would be 'very useful'.

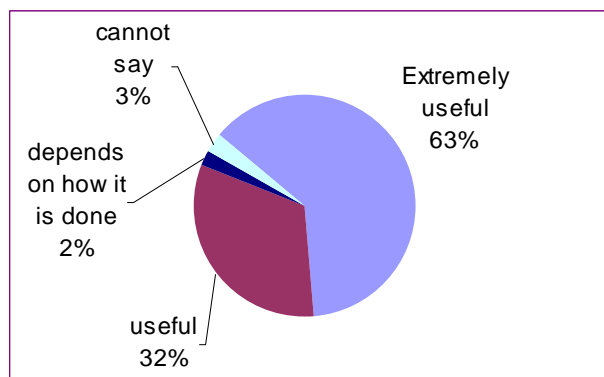


Figure 7. In principle, how useful would a standard way of communicating licence terms to library staff and patrons be to your library?

8.2.4 Does your library have either a stand-alone Electronic Resource Management System or an ERM module in your LMS/ILS?

A majority of academic libraries (68%) do not currently have an ERM.

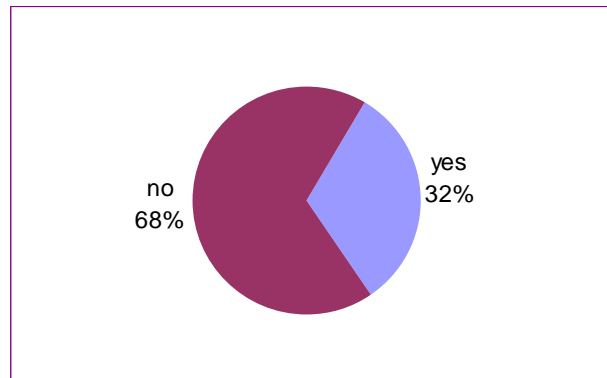


Figure 8 Does your library have either a stand-alone Electronic Resource Management System or an ERM module in your LMS/ILS?

Respondents were invited at that stage to name the ERM system (or vendor) they use. Amongst the 32% of respondents who currently used an ERM system, a large proportion (42%) was using the Innovative/Millennium electronic resource management system. The Verde system (from Ex-Libris) was used by 29% of the respondents whilst Serials Solutions 360 was used by 16%. A small proportion of libraries were using other ERMs, such as Orion or Meridian, and one academic library was using a 'home-grown' ERM, as commercial systems were deemed too expensive for that university library.

8.2.5 Are there any plans to purchase a stand-alone ERM system or an ERM module in your LMS?

Amongst the respondents who did not currently use an ERM, 64% were considering whether to acquire an ERM or not, 5% already decided to acquire one and 14% decided not to acquire an ERM.

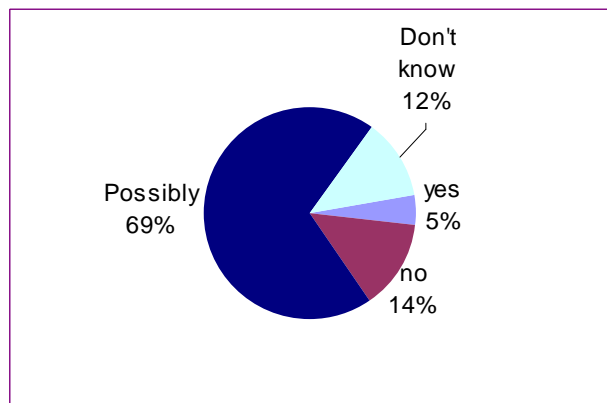


Figure 9 Are there any plans to purchase a stand-alone ERM system or an ERM module in your LMS?

8.2.6 How does your library currently store information about the licences you hold?

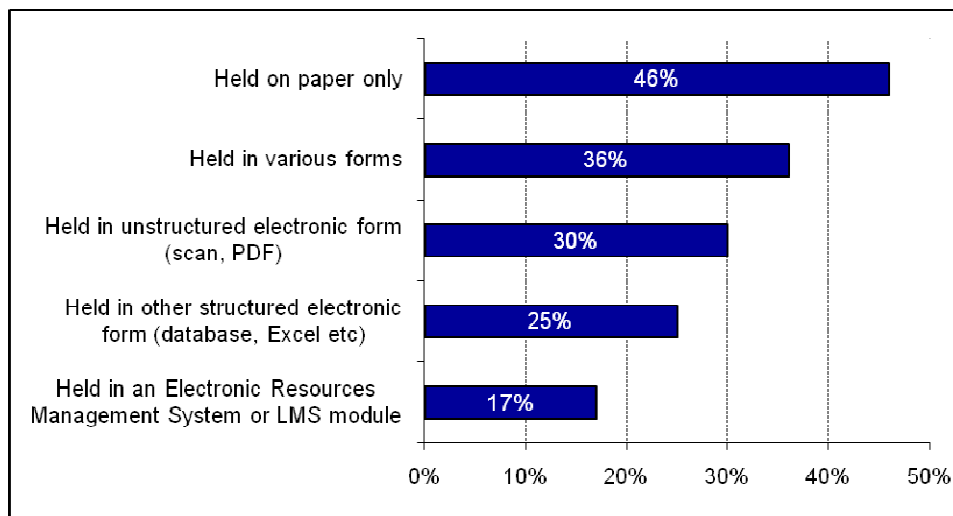


Figure 10 How does your library currently store information about the licences you hold?

All libraries were asked how information about licences was stored, and respondents could mark all applicable responses (8).

For those academic libraries that had an ERM, 96% answered that they had to enter the licence details manually into their ERM system or LMS/ILS module. The proportion of licences held in ERMs varied greatly between libraries.

Table 2 summarises the free-text responses to Question 9 of the survey, which asked academic libraries currently using an ERM to give an estimated proportion of the licences already entered in their ERM.

Some of the free-text comments provided by the electronic resource managers indicated that manual licence input in ERM is perceived as a 'slow' process. Free-text comments also sometimes suggested some level of demand for an easy mechanism to enter licences into the ERM. One respondent from a US-based university said that "it may be possible to batch-load this info, but we haven't figured it out yet" whilst another US-based respondent indicated that one-third of their licences were already in the ERM and they were "waiting on ONIX-PL to become available to do the rest." Another licence administrator hoped to be able to enter in the ERM both e-resources licences and software licences, suggesting that institutions may want to have a single mechanism to manage all their licences in electronic format, not just the library's resources.

Table 2 What proportion of licences have been entered into the ERM system or LMS module manually?

Proportion of licences already entered in your ERM or LMS module (estimated)	Frequency	Valid Percent
0	3	12
few	4	16
5%	4	16
25%	1	4
30%	1	4
40%	1	4
45%	1	4
50&	1	4
60%	1	4
80%	1	4
100%	3	12
Don't know	4	16
Total responses	25	100

8.2.7 What would be the main barriers to you making use of licence terms in machine-readable format?

Respondents could again mark several responses to this question. The most important barriers were not having a suitable system in place, and lack of staff time. Electronic managers were invited to provide further details when ticking the 'other barrier' box. Comments on other barriers included:

- the cost of acquiring an ERM,
- vendors currently not providing licence terms in machine-readable format (Germany-based respondent),
- clauses which are specially amended through negotiation, and therefore different from the pre-negotiation original licence, or supplementary information added after clarification with licensors,
- fields customisation in ERMs might make importation into it difficult,
- non-standardization of licence terms at present (Luxembourg-based respondent),
- difficulty to find staff time to investigate setting this up,
- an import process which would not be seamless,
- what happens when a library changes its ERM system, would it be possible to move information about licences to another system?,
- risk of losing current functionalities in ERMs, which work very well, by adding this import process.

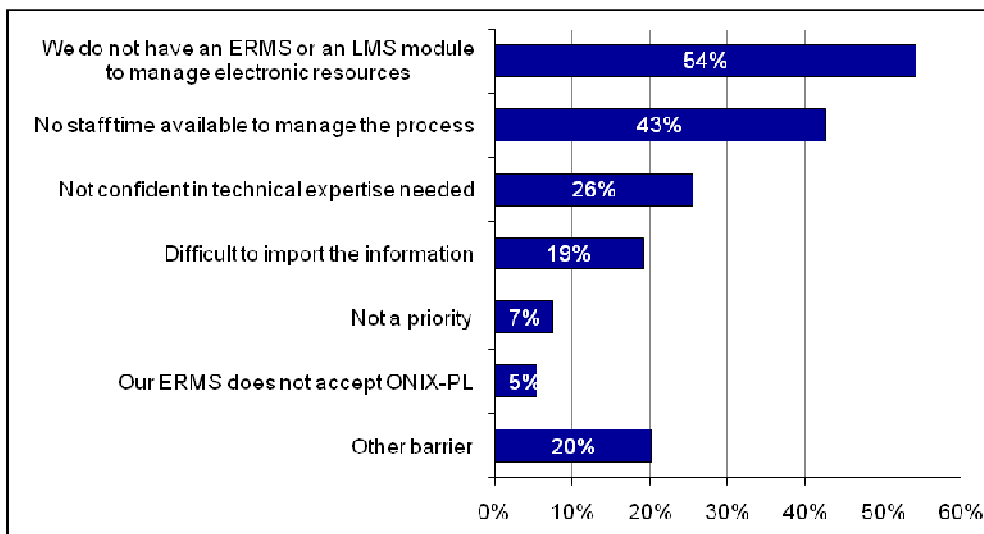


Figure 11 What would be the main barriers to you making use of licence terms in machine-readable format

8.2.8 Usefulness of a licence registry for e-journals and other e-resources

Most respondents (91%) thought that a registry for licences of e-journals and other resources would be at least 'useful'.

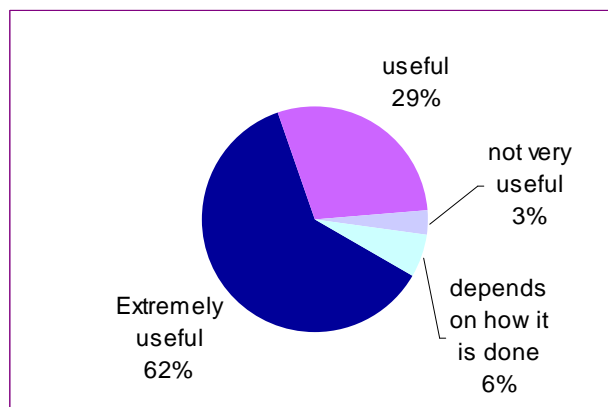


Figure 12 Usefulness of a licence registry for e-journals and other e-resources

8.2.9 General comments provided by electronic resource managers on the management of licences

Comments indicated that there is definitely a demand from libraries for a better system to manage their licences in order to make better use of their resources (“I think we would be able to make more of what licenses do enable us to do if we could have them all in consistent, searchable format”), as well as simplifying and streamlining licence processing and management. Respondents also mentioned the need to make licence searching easy, to facilitate retrieval of key licence terms. Some licence administrators commented on the time involved in reading through the licences and manually updating the ERM and concluded “an electronic import tool

using standards is key.” One licence administrator pointed out that “the barriers to good licence management are the inability to import licence data in structured format and difficulties in making it available to the public in a comprehensible way”, thus reaffirming the need for a registry of electronic licences.

Licence managers were, however, also concerned about how such a registry of licences would work in practice, and whether it would apply to a specific set of licences (for instance, JISC licences) or to all licences, as illustrated in the comments below:

- “I can see the benefits if we can embed the info into our library catalogue/SFX without needing to acquire an ERM. But the usefulness would be limited because we have so many non-JISC licences. We are keen to promote SERU as an alternative to the mountain of licences! There are many single e-journals which require us to complete a licence, sometimes every year. How would this proposal help that situation?”
- “Different institutions tend to change different terms, so if there were a central registry I'm not sure I could necessarily trust it--our institution may have changed some of the terms to suit our needs, in which case we'd still need to look at the original licenses we signed for this info and check it against what was in the registry. Currently, EBSCO provides some info about license terms in their EBSCOnet database. We'd happily use this if we could be sure it were the same as what we signed” (US-based respondent)
- “Can be very difficult for smaller libraries” (Ireland-based respondent)
- “Obscure and non-mainstream resources and associated licenses may be difficult to accommodate in a standardised licensing framework.”

8.2.10 Survey conclusions

The survey results reinforced the conclusions reached by earlier focus groups which examined user requirements for an electronic registry of licences (see section on user requirements). The main conclusion from the survey is that there is great demand for structured, machine-readable licences, which are seen as facilitating licence negotiation, management and user compliance with licence terms.

8.3 Case studies

Two library case studies were carried out; in each case the library was visited and on-site interviews conducted to determine how licences for e-resources are currently managed within the context of the particular demands placed on the libraries by the nature of their user groups. This also encompassed the manner in which authentication is managed. The interviews covered the problems encountered and how these might be ameliorated.

8.3.1 Case Study A

This is the library of an institution specialising in science, technology and management, though it does have a few small non-science departments. It has two main physical sites, but it has several libraries with varied budgetary arrangements,

though most of the negotiation for resources is done centrally. It subscribes to approximately 15,000 e-journals and has an Electronic Resource Management System (ERMS).

Most of the journals are part of Nesli2 deals, or other packages, but a few, mainly in financial and management areas, are negotiated directly e.g. from Thomson Reuters.

They also subscribe to a number of databases and e-book collections e.g. Knovel, MyiLibrary and dawsonera, as well as acquiring many individual e-book titles. The models for these vary from licences which are either single-use or multi-use, to a fixed number of downloads per year.

8.3.1.1 User groups

In addition to the standard registered student and staff user groups, they also serve many professional development students who attend the university for short periods. It has proved challenging to negotiate access for these students for some resources, though a few publishers have been happy to include them as registered students.

They also license a small number of resources for alumni to use, for which alumni pay an annual fee.

There are no distance learners, but there are students based overseas on a number of courses, and as properly registered students, they get access to the appropriate library resources, as do the local teaching staff. However, the local librarians do not have access to the resources, which can cause problems as they cannot advise the students if they have difficulties.

Though there are spin-off companies, they have not negotiated for any resource access on their behalf.

8.3.1.2 Authentication

This is currently managed in variety of ways. They still have a few users on classic Athens, which they are currently migrating to AthensDA, for off-campus use they also have a proxy server, EZProxy, and a virtual private network. They have guest passwords for walk-in users. As mentioned, some of the more business-oriented resources have individual usernames and passwords. It can be difficult sometimes for the library staff to deal with queries about authentication because of this complexity.

The executive/professional development students are not normally given general log-ins to the university network or Athens usernames and passwords. For some resources, the username and password is embedded in a link in the VLE, and the users will first have to authenticate themselves to the VLE, and for others, a service-based username and password will be issued for a fixed period of time.

The move to Shibboleth is driving a different approach to these students, which may involve issuing them with a network log-in but with access only to specific resources.

The university will stay with OpenAthens for the coming academic year and then move over to Shibboleth.

8.3.1.3 ERMS

Local factors delayed the implementation of the ERMS (Verde from Ex Libris), but now that it is up and running it has brought benefits: the biggest one is probably simply bringing all the information about subscriptions together, which has also exposed gaps in the information. It has made it much easier to keep track of when subscriptions are due to end, and of information about how much has been paid, and the terms and conditions of use. All the licences are now scanned and held in the system as PDFs, and they are in the process of pulling out the key licence terms e.g. walk-in use, ILL restrictions etc. As they also have SFX and MetaLib from Ex Libris, it is possible to feed the key licence terms through to SFX and the A to Z list of e-journals. Through the Sync facility, SFX is updated from Verde. When pulling the key licence terms out, they tried to come up with a standard framework, and contacted other libraries and JISC to discuss this, but in the end they are using the terminology in the particular licence to be on the safe side, and as far as they know, that is what other libraries are doing.

There is also a drive to get the online catalogue up to date and for this they are looking at another Ex Libris product called MARCIt!, which pulls information from SFX and creates MARC records for the catalogue, though there are other ways of doing this. They would like to be able to pull the key licence terms through as well as the holdings data.

One of the benefits of the ERMS has been that they have become more aware of the individual terms in different licences. While all the licences go through the contracts department to ensure they comply with the university's legal requirements, the closer process of examination by the library has led to the library deciding that if certain licence terms were not changed that they could not sign the contract; for example, some cancellation clauses.

8.3.1.4 The future

As a library with a relatively small staff, but which provides the same services as much larger academic libraries, they are looking to automate the management of all resources, print or electronic, as far as possible. Besides the licences, they would also like publishers to give them accurate and up-to-date information on the holdings they take from them, not just what they subscribe to, but including free resources, in a spreadsheet form so it can be uploaded.

In terms of licences, the time-consuming part of the job at the moment is not really the scanning, though that takes some time, it is the pulling out of the key terms. They would like to be able to receive machine-readable licences from publishers to ingest into Verde, which would then feed through to SFX and the catalogue.

8.3.2 Case Study B

This is the library of a new university, which has a focus on arts and humanities and education.

Most of the e-resources are covered by Nesli2 or other JISC licences or CHEST. Very occasionally they negotiate changes to a licence. The library has a policy of moving towards electronic wherever they can, but some of the very small arts and humanities publishers are still offering paper-only. Other small publishers do have e-journals but via the large platforms, which reduces the need for direct contact.

Students based at eight or nine partner institutions are divided between those that are registered students of the university itself and those with a less direct relationship. Generally there are no problems with access for them (either by right or by virtue of a separate negotiation on their behalf when the course was established, with an extra payment). In some cases, the local teaching staff also have access, but the local librarians don't, which can be difficult when it comes to trouble-shooting. In a few cases, there are no local staff, with teaching being delivered through a combination of the VLE and visits from university teachers to the overseas locations.

There are ad hoc arrangements in place for the small number of retired members of staff and walk-in users. They have also had to refuse access to users from their Enterprise Office as commercial use, which is not allowed under the licences.

They have not had any real problems with the licences for e-books, though they do wonder about the implications of e-book readers in the longer term. They have contracts with Dawsonera and MyiLibrary, and e-books are extremely well-used.

The library does not have an ERMS. Licences at present are held on paper only. They have been held back by incompatibility between their LMS and their preferred ERMS vendor. Management of finances is the main motive for getting an ERMS, rather than licence management.

The volume of acquisition is not huge, which makes it perfectly possible to have a pretty thorough knowledge of the licence terms and conditions before they sign any contracts. The fact that they have not experienced rapid turnover among library staff has also helped to reduce problems. However, if the licences were put into an ERMS or held in a more readily accessible form, then they may become more aware of gaps in information or problems with the licences. They think it is less likely that they would discover that they are not getting all the value they should from the resources. Occasionally, there have been problems as a result of transfers between publishers which they have not been informed about. In general they find that many publishers are not very good at either providing the initial licence, which may arrive a long time after access starts, or answering queries about the terms of a licence; often it is unclear who inside the publisher is responsible for dealing with the query.

The ability to display terms and conditions to other staff would be particularly useful in the case of the staff responsible for the VLE, as it would reduce the queries coming back to the library about what was permissible for each resource. It would also be useful to display any restrictions on usages to end users. The vast majority of users, and even most library staff, do not tend to think about e-resources in terms of the licence but whether the user has a password that allows them to access the resource or not.

8.3.2.1 Authentication

The university is currently implementing Shibboleth. As their users are a fairly homogeneous group they don't foresee much need for a very granular approach to authorisation. There will be a need to manage access to a subset of content for some of the partner institutions' students and staff (those that are not registered members of the university but for whom the library has negotiated access to some resources) and also to ensure that visitors for conferences and other events over the summer who can get a network account for email and so on do not get access to e-resources.

8.4 Workshop

A workshop was held in London, attended by 15 HE e-resources/serials librarians responsible for licensing issues in their institutions. The workshop had a number of interrelated objectives:

- explaining more about ONIX-PL and progress to implementation
- demonstrating the current functionality of the RELI prototype
- gaining detailed input from librarians about how they see ONIX-PL and a RELI-type service addressing their current problems with managing licences and how the architecture of a RELI service might work in practice (central, local, federated etc)

The workshop discussions revealed the major concerns that librarians have about the current arrangements for communicating licence terms to themselves and to their end-users (and in that sense, the concerns they have about the complexity and ambiguity of many of the licences themselves):

- Both publishers' sales staff and many library staff who are not responsible for licensing focus on the *content* being sold or purchased, rather than the *permission to use that content in various ways*, which what is actually being transacted
- It is often difficult or even impossible to find out what the licence terms and conditions are before the purchase is agreed (this is especially true of e-book packages)
- Licences may turn out to be nothing more than an order form, leaving many questions to be resolved
- Licences are often ambiguous or leave out important information, meaning that librarians have to contact the publishers for clarification, though it was pointed out that some degree of ambiguity can sometimes be necessary in order to conclude a negotiation
- Licences can vary with titles within a package where a commercial publisher is publishing on behalf of a society, according to when the journal moved to a particular publisher and the date at which the institution started to subscribe

- The communities being served by higher education libraries are changing in terms of the context of study and behaviour. More students are studying off-campus, sometimes in other countries, part-time etc. and this is likely to increase. Resources are also changing. Therefore it is very important that the means of informing students (and others) about the uses that may be made of the resources be improved. Sophisticated rights management is needed, not in a restrictive enforcement sense but in terms of an automated way of serving the right content with the right usage permissions to the appropriate groups of users
- There is no doubt that most librarians hope that this process eventually leads to more standard licences which are not encrusted with layers of clauses or which reflect historical subscriptions, but it was recognised that this would only be a possible by-product of the implementation of ONIX-PL and not its major purpose, which is to allow the terms of existing licences to be encoded
- There was a substantial discussion about the role of ERMS. Some libraries have ERMS but have found that they simply do not have enough staff time to populate them. Others would acquire one, but only if it had the ability to ingest licences and communicate terms to end users and other staff; they feel that being able to hold licences in the system and for a few staff to be able to retrieve them is only a kind of electronic filing cabinet and does not deliver what is needed
- It was noted that some consortia in the UK and the USA have put the requirement for ONIX-PL in tenders for ERMS, though it was not clear whether this was listed as an essential or a “nice-to-have” feature, which makes a lot of difference to how seriously it is perceived by the vendors

Workshop delegates generally liked the functionality of the RELI demonstrator, especially the way that terms and conditions are displayed to the end-user by means of ‘traffic light’ symbols, with more detail as the browser rolls over the symbol. For example, the system can display whether a resource can be used in a VLE, which is frequently asked. There is an issue about how usable the interface would be if it contained too much information for the end-user.

It was explained that the ability to display conditions to an end-user depends on the existence of secure identifiers both for the content and the user, as well as the licence terms, since RELI is effectively resolving all these pieces of information in real time. There are problems about the secure identification of all three elements, the content, the user and the licence. For example, it had been hoped to use title-level DOIs as well as article-level DOIs, but too few publishers use them, so the system has to rely on matching the words instead. In terms of the licence, it can be extremely difficult to represent some licensing situations, for example, where a library subscribes to some titles in a package, and has pay-per-view rights to all the others. On the other hand, the level of detail about the type of user available to the registry

depends on the granularity with which Shibboleth is implemented in a particular institution. That in turn depends on the quality of identity management.

It was also explained that other views into the data are possible, for example to allow one publisher's licence to be compared with a licence from another publisher, or a publisher's new licence with a previous one for the same resource.

The workshop discussed the best way to implement a licence registry in some detail; the options were perceived to be:

- Completely centralised. In this case, a registry would contain both standard template licences, open to all to view, and local versions containing negotiated variations, open to each library to view its own
- Central/local: a central repository of standard licences, downloadable to each library, which would add its own modifications and upload directly negotiated licences
- Completely local: the functionality would be reproduced in each location and all the licences uploaded and held locally

There was a strong view expressed that the right place for the service was where the data was entered about a library's exact subscriptions, which would be the ERMS (although not all libraries have ERMS), and alongside the link resolver and repertoire management functions (A to Z list). It could also be an adjunct to the data provided by the subscription agents, though this was not always completely accurate. It must form part of this network of services, though exactly where it will sit is not yet clear.

There was a consensus that it was important for libraries to avoid duplication of effort for licences which many have in common, while having the ability to modify the licences to reflect local negotiations and clarifications. The need for the functionality to be tightly tied into detailed local information would tend to argue against a completely central implementation, and more towards a central/local model.

8.5 Interviews

- Seven journal publishers were interviewed: two UK society publishers; a US society publisher; a UK university press; two commercial UK publishers (one large and one medium-sized); and one large European commercial publisher
- Three subscription agents were interviewed.
- Two e-resource management system vendors were interviewed.

8.5.1 Analysis of interviews

Perceived drivers/advantages for publishers

- Publishers do get considerable 'push-back' from customers over the lack of clarity in licences, and this should help with transparency

- ONIX-PL will help communicate usage terms more effectively to both library staff and end users, both by being more accessible and by standardising the language of usage terms
- It will therefore assist in ensuring compliance, though publishers do not have a huge concern about this because they believe librarians do an excellent job
- It should reduce the number of enquiries to the publisher
- It will help to manage the different licence conditions where publishers act on behalf of society journals
- It will help to manage licence terms for content when it is part of aggregations and make them more visible to end-users, which is often a source of problems for libraries and publishers
- It will be a more efficient way of managing licences internally (the advantage here is more marked for larger publishers) and knowing what rights have been granted
- It could help to streamline the negotiation process
- Standards have proven to be useful in the supply chain and consequently many publishers support this extension of ONIX
- It is something that libraries want and implementing it is good for customer relationships, reputation and brand

8.5.2 Perceived challenges for publishers

- There is a cost in time and effort which, particularly in the present economic climate, may be hard to justify in terms of direct benefit to their businesses – it will be important to have concrete examples of costs and benefits from publishers who have actually implemented it
- While there is an awareness of library dissatisfaction with the current arrangements, there is little specific and strongly articulated demand from customers for ONIX-PL encoded licences, so sales staff have not yet heard much about it
- Other participants in the chain, especially system vendors, need to be ready for the licences and they are not yet – though publishers expect that they will respond to the demand from both ends as they are essentially servicing both publishers and libraries
- Sales staff are not responsible for technical development, while technical staff have no knowledge of licensing issues. There are no ‘standards’ staff.

- Many large companies have IT policies requiring all software to be centrally approved and installed, so getting the tools (e.g. OPLE) installed to encode the licences can be a task in itself, when IT services have other priorities.

8.5.3 Perceived drivers/advantages for system vendors

- Enhance their product offering in the marketplace
- At the moment, entering the licences into the system is the most time-consuming element of populating an ERMS and many customers have only done it partially (e.g. on the 80/20 rule, or putting in the most critical terms from each licence); making this happen more easily will enhance the system's value to existing customers
- To satisfy increasing demand from customers

8.5.4 Perceived challenges for system vendors

- The cost and effort of implementation is obviously a consideration
- How stable and final the standard is. Experience of the development of the SUSHI standard, for example, was that was rather a start-stop process. This has substantial implications for staffing a development team and the length of time spent on development, and past experience can make vendors cautious
- There is a related issue of each vendor's release cycle for new features and how that fits in
- There is a lot of work to do in determining precisely how to implement this within each system and in particular, how the terms will be displayed to staff and end-users, and if and how libraries can make their own interpretation of a licence (where it is silent on something, for example) operational within the system
- Some vendors are not getting a strong enough demand signal from libraries to drive them to push the implementation of ONIX-PL up their priority list for feature development
- Others see this feature mentioned a lot in library customers' RFPs and RFIs, but wonder whether some of the customers have unrealistic expectations of what it will deliver, especially library directors or general staff, who perhaps believe it will mean the library will never have to negotiate or handle licences again, merely receive them automatically and just decide whether or not to push the terms out to the end users; e-resource librarians have a much stronger grasp of what it will mean in practice
- The vendors perceive a need for libraries and consortia to communicate their wishes more strongly to publishers to ensure a supply of ONIX-PL encoded licences

- Vendors may have already implemented ERMI or their own proprietary schemes for mapping licence terms, and there is also the issue of how to map licence terms already entered into libraries' systems to ONIX-PL

8.5.5 Perceived drivers/advantages for subscription agents

- They have seen considerable interest from library customers for the ability to manage and negotiate licences more easily; specifically, the customers want to be able to display licence terms in a consistent manner, both to end users and members of staff responsible for acquisition and other areas e.g. ILL; they would like to be able to compare licences, exchange them easily with publishers during negotiation and edit them easily; and some would like to be able to search the licences
- The agents feel they will be able to add value for library customers if they can display licence terms in the product catalogue when customers are considering acquiring or renewing resources
- They expect to be able to offer the encoding of licences as a service both to publishers and library customers
- There is evidence that some library customers are specifically aware of ONIX-PL and are approaching agents for implementation

8.5.6 Perceived challenges for subscription agents

- Cost and effort of implementation

8.5.7 Balance of costs and benefits

The major costs in the existing system fall on the libraries in dealing with the complexity of the licences from many publishers for e-journals and databases, and increasingly for e-books. The larger publishers and especially those who publish on behalf of others, or who aggregate other publishers' content, also bear the costs of managing licences in a non-standard form. Publishers of all sizes also have the cost and effort of replying to questions from customers about what they can and cannot do with content, clarifying licence conditions in respect of walk-in users and so on. Subscription agents too have a burden in this respect.

Not all of these questions will be resolved by implementation of ONIX-PL, but many will be.

However, it is obvious that the libraries, as customers, bear the greatest cost as not only do they have to negotiate and manage the largest number of licences, but also they are responsible for advising end-users on the terms of access and use of the resources and are liable for breaches.

The major costs of change will fall on the publishers, who will have to encode their licences (or take up third party services to do this on their behalf) and on the intermediaries in the chain, who will have to ensure that their systems are able to comply with the standard.

Intermediaries will expect to make gains through offering new or enhanced products and services, to both publishers and libraries in the case of subscription agents. There will be costs to libraries as well, especially in staff time.

It seems likely that size will be an important factor in the decisions made by publishers in taking on the task. If a publisher has a large number of journals and a set of standard licences, it may be relatively straightforward to train a member of staff to do the encoding. For the many small publishers in the 'long tail' with one or two titles, it will almost certainly be something that they contract with a third party – a subscription agent or licensing society – to do on their behalf. As with all digital developments, from moving journals online, to e-commerce in the book supply chain, small publishers have relied on third party services from commercial suppliers or industry bodies.

9 Conclusions

9.1 Introduction

The major problem in implementing any standard is the chicken-and-egg conundrum. In this case, publishers won't encode licences on any scale unless there are libraries to receive them, and libraries can't receive them if the systems they have cannot ingest them. Vendors may not implement the standard in their systems until there is proven demand and this can be quite a slow-burn as the procurement cycle (especially at present) will not produce a critical mass of demand at any one time.

Fortunately, this research has shown a number of reasons to be optimistic that the conundrum is not a Catch-22:

- There are definite plans by some ERMS vendors to implement ONIX-PL in the next year;
- Some subscription agents are keen to work with individual libraries to encode their licences as pilot exercises and are planning to offer services to their publisher customers;
- JISC has shown itself to be willing and able to help, both by funding the registry demonstrator and encoding its own licences;

The registry could play an extremely useful role in providing a repository for ONIX-PL licence

9.2 Our conclusions in detail

It is clear that the requirement for better management of licences is real; however, progress by publishers in offering their licences in ONIX-PL means that we are not yet at the stage of being able to say that RELI offers an immediate solution. Even the stable version on ONIX-PL now published will take time to become established, and then publishers have to be persuaded to invest the time and effort in converting their licences into this form. Only libraries can create the demand

Expressing licences in XML is a considerable discipline for publishers and everyone else in the chain; it is likely in the first instance to highlight gaps, inconsistencies and ambiguities; in the long run, such developments will be to everyone's advantage. But the whole process will take time and involves a steep learning curve.

Furthermore, the way licences are expressed should not be confused with the licences themselves – getting XML expressions will not necessarily make the licences more or less acceptable to users; indeed, by making licences easier to compare, the use of a RELI-type service may lead to greater discrimination by libraries when deciding whose licence to adopt. Greater transparency of licence terms will also lead to challenges of interpretation and trust. Interpretation of licences will increasingly happen at various levels. There is a need to build greater trust in the supply chain; probably best built from experience of working together. A licence

registry service using ONIX-PL offers an excellent way for publishers and libraries to work closely together to increase trust and resolve ambiguities and inconsistencies.

The project has also highlighted challenges of licence IDs, user identification, the slow adoption of Shibboleth, the fact that some implementations of Shibboleth will be at a superficial level, failing to distinguish clearly between different types of users, and of repertoire management. A licence registry service cannot necessarily solve such issues, but can draw attention to them and suggest possible solutions.

The RELI project focused on one area of functionality – communication of licence terms to an end user at the point of use. This is clearly useful, but may be too ambitious for a comprehensive first-step implementation. There are other possible areas of functionality, explored in requirements gathering (see Section 5)

A licence registry can be useful to an institution in a number of ways:

- Storing all licences in one place for access by library staff

- Enables comparisons of licences, e.g.,:

 - Highlighting changes

 - Enabling comparison between terms from different suppliers

 - Enabling comparisons with “institutional norms”

A number of issues were recognised by the RELI Project Team but were not explored because they were out of scope or because of lack of time or resources. These included issues of overlapping licences (including where institutional policy may override individual licence terms), and issues of architecture. A small scale implementation like that developed in RELI could be easily implemented at a local level by any institution. Alternatively, a large-scale service could be implemented at national level. Some combinations are also possible, e.g., standard “template” licences (such as NESLI) held nationally and available for download, combined with localisation of individual instances of negotiated licences. These possibilities require evaluation of matters such as governance and ownership, workflow and technical implementation, though the latter is likely to be the least significant.

10 Recommendations

Our recommendations are divided into two broad areas – technical and non-technical.

10.1 Technical recommendations

There are a number of possible technical developments that could be implemented to improve the RELI demonstrator, moving it from a demonstrator to an implementable system.

10.1.1 Our approach

The recommendations from the RELI Extension Project consist of investigations of further options, which necessarily lead to a potentially wide number of variables in terms of questions yet to be answered in the requirements gathering and analysis phase. In order to provide a reference point on which to base initial indicative costings, a fixed-scope ‘scenario’ was constructed based on hypothetical scoping decisions that would come out of discussion with project stakeholders.

The scenarios used to cost the follow-up phase assume that the JISC adopt the Extension Project and RELI Project recommendations. The high-level functional scope of the Licence Registry remains as per the original RELI project proposal, but in terms of key stakeholders, the focus moves away from services to support interpretation of licence terms for the end user in favour of supporting functionality to assist the library community with licence management, together with publishers insofar as they impact the library community.

To minimise costs involved, the scenario also assumes subsequent development builds upon both the RELI Demonstrator codebase, and the knowledge and experience gained by the RELI development team in undertaking the RELI project. This especially impacts non-trivial development tasks surrounding use of data referenced by ONIX-PL in an overall systems context, as opposed to merely reformatting ONIX-PL XML documents for display.

The costings provided in this section are therefore indicative only and are based on the definition of scope given in the scenario below.

Items considered out-of-scope for the purposes of the costings exercise include those “non-technical” recommendations that suggest separate sub-projects or studies

The costings are also dependent on the delivery approach presented below.

10.1.2 Out of scope for Costings Scenario

The following items were considered out-of-scope in the costing of the implementation of the Licence Registry

- Deployment architecture: whether the Licence Registry would deliver most value via a centrally-hosted service with web-based applications/tools, a partially-distributed system that has locally-installed application component(s), or delivered as a completely stand-alone software application installed and managed locally by each institution (in which case there would be no central “registry”). As is the case for the RELI Demonstrator, a single, centrally-managed installation is assumed for the purposes of providing costs for an initial implementation.
- Operational hosting and management costs are not included, so that they can be managed independently of system development costs.
- Authorisation and Authentication: the use of Shibboleth attributes in the context of resolution of end-user institutional affiliation to user roles specified in licences.
- Licence Authoring: how licences are initially created is considered out of scope, as different options are available, including direct XML authoring, the OPLE tool created by Editeur, and taking forward those Java API and libraries pertaining to ONIX-PL created by Acuity Unlimited during development of the RELI Demonstrator
- Integration options for point-of-access display of resource usage conditions, integration with publisher systems and those specific needs driven by other discovery and delivery systems
- Conflict resolution: rules that specify the nature of a conflict when dealing with overlapping licences, especially where they contain terms that conflict with each other. This is a potentially large topic that builds on the initial work done in determining semantic categories underpinning the RELI registry, ONIX-PL and the entities they reference, although a simple solution has already been provided within the RELI Demonstrator.
- Provision of an open-access (and secured) version of the RELI web service API so that other systems may integrate with RELI over HTTP. The provision of such a service clearly would help drive adoption of the registry and ONIX-PL through easing development of applications and services that serve local needs at a later stage.
- Beyond those functionalities specified in the next section, supporting potentially advanced licence lifecycle and workflow enhancements suggested as examples during the extension project, as priority and specification is as yet unknown. Examples of these are:
 - Granular annotation of licences, the ability to add comments and annotations to different elements of licences.

- Including encoded forms of institutional policy within the Licence Registry
- Licence comparison that depends upon complex rules specifying equivalence of entities referenced by the Registry and ONIX-PL; again, this work would benefit from building on the initial semantic analysis and development carried out for RELI);

10.1.3 Summary of Scope for Licence Registry implementation

10.1.3.1 Robustness and scalability

- The RELI Demonstrator has not been tested with large volumes of licences or with a significant number of users concurrently accessing the service. However, the technology stack is, by design, based on J2EE and uses software components that are proven in highly-scalable, high-availability systems environments. Work will be carried out in testing, tuning and configuring the application and on determining reference specifications for systems hardware and software suitable for hosting and management of the RELI registry.

10.1.3.2 Deployment architecture

- The Licence Registry is assumed to be a single, centrally-managed implementation accessible using the major standard web browsers.
- Investigation and consultation with the JISC will be carried out to determine requirements for integration with the JISC Information Environment and compliance with JISC policies.

10.1.3.3 Authentication, Authorisation and Security.

- The Licence Registry will be implemented as Shibboleth Service Provider (SP) as a member of the UK Federation to provide basic userid/password authentication and authorisation.
- Investigations into Shibboleth attribute coverage and usage across institutions will be carried out. Ideally the eduPersonEntitlement attribute will be used to implement access controls to the Licence Registry. If the current state of Shibboleth roll-out and attribute usage does not permit this, user attributes will be implemented within the Licence Registry.
- Security will be robust and enforced at the service API level to the underlying registry/repository technology, restricting access to licence to those that are authorised. Users will only be able to view licences pertaining to their own institutions, model and template licences.

10.1.3.4 Repertoire management

- Repertoire management capabilities will be implemented: librarians will be able to set up and maintain lists of journal titles to define repertoires, and will

be able to associate these with licences. The repertoires will exist as distinct, accessible and indexed entities (and therefore shareable by permission) within the registry.

- A standard textual form of journal title will be used as the journal resource identifier. CrossRef provides a source for standard journal titles.
- Standards for encoding repertoire lists within the Licence Registry will be examined. It is anticipated this would include the Onix for Serials Coverage Statement

10.1.3.5 Enhanced licence management capabilities

- The current user interface will be reviewed and refined based on feedback obtained from the major stakeholders, primarily libraries, although publisher needs may also be considered.
- Existing metadata indexing, query/discovery services and the user interface will be refined in line with user requirements
- Requirements will be gathered to establish how the RELI system can best provide various interpretations of licences with respect to the resource, user and usage data available for the librarian community. This is similar in nature to the provision of the traffic light display in the RELI Demonstrator, which is driven from introspection and a level of automated interpretation of licence data held in the registry, but which was designed to serve the end-user community. Technically, this work will therefore focus on refinement and further development of RELI's underlying data model and semantic technology as well as presentation software, and should serve as the basis for future work on licence comparison, conflict and ambiguity detection (and any other licence analyses such as may arise),
- Requirements for licence presentation will be gathered. Limited changes to existing licence presentation formats have been allowed for in the costing.
- A side-by-side layout for a basic comparison of licences will be provided to allow different licences and versions of licences to be compared.
- Provision will be made to allow users to add comments to licences and persist them in the Registry, for instance to describe differences from the previous version, to identify why a new version has been uploaded, and generally note issues where for instance licence ambiguity has been identified.
- A history view of licence versions will be provided identifying who uploaded the licence version, the date and time and any comments provided.

10.1.4 Delivery Approach

The costings are based on availability of key representatives from the initial user community of the Licence Registry: librarians are identified as key stakeholders in the short term. The costs cater for the technical development team working with a

working group of librarians from a number of institutions, chosen to represent the variety of needs of the institutional librarian community. We suggest this is established as the best means to define requirements for sustainable functionality moving forward.

Frequent review, feedback and refinement will be necessary during the development process to ensure that the final system deliverable closely meets the needs of its intended users within the project timeframe and cost estimates. To most effectively manage this, the costing scenario envisages an agile, iterative approach to development is adopted in which requirements are prioritised and are implemented in order of priority within the fixed time available in each iteration. Outstanding requirements are then reprioritised for the next development phase.

Costs for transitioning software makes the assumption it will be packaged and provided to the JISC under a combination of open source licences.

The costings cater for the following phases:

- *User requirements analysis*: Meetings and workshops with key representative users, documentation of user requirements. Costs given cater for expected impact on the development team's resources, and do not cater for librarian or other institutional costs. Likewise, costs of conducting additional "non-technical" sub-projects or studies are not covered, including the recommended study to look at the most appropriate long-term architecture (centralised or distributed, or stand-alone).
- *Organisational setup*: Cost estimates cover consultation with all relevant organisations to the degree it impacts effective technical delivery of the system: primarily CrossRef, Editeur, UK-Access Management Federation and JISC IE.
- *Technical investigations*: Investigations into only those areas which need further definition at a technical level. We recommend the investigations be into Shibboleth roll-out and attribute usage, definition of appropriate repertoire formats, and refinement of RELI's data model (N.B. we recommend resources are provided for assistance from Editeur over the precise definitions of those terms represented in the ONIX-PL format, but these potential costs are not included in the development costs given).
- *Performance, Robustness and Security development*: System refinement and configuration to meet the demands of the volume and licences anticipated; review and refinement of application security to meet requirements.
- *Development iteration 1*: Initial Implementation of highest-priority/highest-impact requirements only
- *Test and review* of outputs of Development iteration 1

- Development iteration 2: Implementation of changes from test and review, implementation of medium-priority requirements
- Test and review of outputs of Development iteration 2; reprioritisation of remaining requirements
- Development iteration 3: Implementation of remaining requirements according to priority
- Final test and fixing: outstanding bugs
- Transitioning and handover: Handover to the JISC of the software, reference systems specification, and initial advice regarding operational, hosting and managed service options. A working VMWare Virtual Machine environment on DVD for the purposes of software test and demonstration (as per the current RELI Demonstrator) would be included. Costs do not include installation on a host environment or ongoing operational costs.
- Technical Project Management: At 10% of budget, this is lower than typical technical developments, as the costs associated with some requirements and organisational tasks are separately itemised in the recommendations as “non-technical”. Project management includes ongoing risk identification and management, reporting activities to the JISC and project partners, and administrative functions pertaining to the technical development.

10.1.5 Cost

Breakdown by task area:	% cost overall	Min est.	Max est.
User requirements analysis	5%		
Organisational setup	2%		
Technical investigations	9%		
Performance, Robustness and Security	4%		
	20%	£5,000	£14,300
Development iteration 1	20%		
Test and review	4%		
Development iteration 2	20%		
Test and review	4%		
Development iteration 3	14%		
Final test and fixing	3%		
	65%	£16,250	£46,475
Transitioning, handover, initial support	5%		
Technical Project Management tasks	10%		
	15%	£3,750	£10,725
Total Cost	100%	£25,000	£71,500

There is a large spread between minimum and maximum estimates; this reflects that requirements at this stage are known only at a very broad level.

10.2 Non-technical recommendations

- Encouragement for implementation and support of ONIX-PL by everyone in the supply chain
- Explicit inclusion of ONIX-PL support in requirements for systems
- Need for a better forum for communication between publishers and libraries about licences. It is clear that the people in publishing with whom librarians typically have contact (i.e., sales people) have little understanding of licences and licensing issues. As ONIX-PL becomes embedded, the shortcomings of publishers' licences from a customer standpoint will become increasingly clear. Licensees will be demanding that licences are clear, unambiguous and comprehensive in their terms. There needs to be more open dialogue (while acknowledging commercial and competition issues) between the parties. Within the UK, the UK Serials Group could provide such a discussion forum.
- Identification – need for publishers to think carefully about
 - Unambiguous identification of resources and management of repertoire
 - We recommend that EDItEUR works on the implementation of standard approaches to repertoire management

- Need for standards for the identification of licences. We recommend that EDItEUR consider taking this on.
- There is a need for licensees to think about user identification issues raised by RELI and whether the way Shibboleth is being implemented in Institutions is sufficiently fine-grained to satisfy licence requirements.
- We recommend that JISC funds a project to look at the different architecture models for a fully fledged licence registry service.

Appendix 1 Findings from the Focus Groups

Problems with Licences

- Licences are not specific enough, there are JISC licences that are generally quite clear, and then there are licences from other publishers that are a page long and miss out all sorts of things. This can result in librarians having to contact publishers to clarify what they can and can't do.
- Definition of authorised users is a big concern. Licences often refer to 'authorised users', but there is a lot of confusion over who an authorised user is.
- Post cancellation use is a big concern as many licences are restrictive on how resources can be used after cancellation.
- Many licences are not clear on what timeframe during which libraries have perpetual access. Consequently librarians have to take the steps of contacting the publisher and asking them – this is usually done via an exchange of emails which are kept by the institution as proof of permission.
- Multi-level licences - it is quite common for an institution to sign one licence to get an interface and then another licence to get the content through that interface, e.g. Ovid, SwetsWise. A concern is that the two don't always run in parallel i.e. the licence to access the data does not coincide with licence to use the interface
- What happens about possible constraints that are not included in the licence? The ERMI view seems to be that if it is not explicitly forbidden, it is permitted (however, there is no consensus on librarians about this – some librarians are much more cautious). It was accepted that many licences do have ambiguity within them. Publishers expect librarians to contact them if licensing terms are unclear. Similarly librarians expect users to contact them and they will contact publishers on their behalf. A mechanism for recording queries would be useful to libraries so that a) audit trail can be maintained and b) case 'law' can be built up. These details would also be useful for future negotiation purposes – if libraries are aware of users' queries, etc., then they can try and get these issues included in subsequent licences.
- There is an issue with resources that are not covered by a paper licence but are covered by terms and conditions on the publisher's website – this is problematic because librarians are unaware of when changes are made.
- Institutions have lots of resources that are accessible via three or more servers and each has a different licence (e.g., via different aggregators). Librarians agreed that these situations existed, but in practice they were not causing huge problems. Some institutions use SFX, this enables librarians to see where resources are coming from.

Interpreting Licences

- Interpreting a clause within a licence and presenting it in a meaningful way has a lot of problems and issues around it because there is a danger of misrepresenting the legal terms.
- Most librarians tend to err on the side of caution; failure to understand licence terms may result in librarians advising users against using a resource in a manner which would be allowable under the licence.

Repertoire Management

- Membership of a particular class (group) will often confer different rights on different users. User identity, and particularly the identification of a user as belonging to a

specific class, is therefore a crucial element in licence administration. The issue is accurately determining authorised users (alumni, corporate users, partnership colleges, etc). Shibboleth allows for categories of users, but in practice this is not widely used. Categories of users could include staff in spin-out companies, partnership colleges, etc. In one instance, a medical school was part of two different Universities. Staff from the medical school may have different access rights depending on which institution they belong to. Academics from institution X accessing resources from institutions Y's machines may be granted access (and permissions) that they are not entitled to.

Multiple Licences

- Licence conflict and licence conflict resolution: There are cases where the same resource may be covered by two different licences with different terms for the same User.
- Click-through licences. User rules on 'click through licences' are, in some instances, more restrictive than the licence signed with institution. Librarians are confused as to which takes precedence – the general feeling among the participants was that the institutional licence takes precedence.
- Articles within the same journal covered by different terms. Some journals have some content that is OA and some covered by a licence (e.g., Springer's Open Choice). Similarly some articles are funded by Governments and must be available under different terms - the publisher accepts this when the article is accepted for publication – however this is often overlooked.

Repositories and VLEs

- An electronic licence should be able to explain whether users can take extracts and include them in a repository or just link (as in case of JSTOR licence).
- Some institutions may not have usage policies for their repositories, however if they do the general opinion seemed to be that one set of terms/conditions would cover all material in the repository.
- Currently, academics and teaching staff are typically given one-to-one tuition with a subject librarian about embedding content on to VLEs – but this is not sustainable as the VLE grows.

User Perceptions and Issues

- Librarians suspect that, at the moment, end users don't know anything about licences. Therefore, they do not ask for permission to undertake tasks (such as mounting as resource on a VLE). This may result in breaches of licence terms through ignorance.
- Under-use of resources does not appear to be a problem, as students/academics generally just go ahead and do what they like.
- End users' expectations are changing. They expect material to be available, and expect it to be free. Some participants raised issues such as users sharing Athens password on MySpace.
- Users are often unsure of the final use of a resource when accessing it. In some circumstances a resource may be accessed for one purpose, such as research for a conference presentation, but the usage may change. For example, the presentation at a conference may lead to an abstract on a conference website or it may lead to publication in the conference proceedings, which may be subsequently sold for

commercial purposes. If an author uses material for one purpose, it may end up being used for another.

- There are major differences between users' behaviour with regard to their understanding and adherence to licensing requirements.
- Users access resources through many different routes (e.g., library database, Google Scholar). A licence registry has to work with all access routes.

Scope of a Licence Registry

- There are many possible resource types that a licence registry should cover, including e-journals, databases, images (ArtStore, JISC Image Database), moving images and audio.
- E-books are also becoming popular and uptake will grow immensely. However, there is a lot of variety amongst what publishers offer under the terms and conditions of each e-book licence (site licences, single use or concurrent use).
- Some resources – such as OS maps - have very different terms and conditions of use.
- Although RELI has a UK focus, licences may be with overseas publishers. Aggregators will have agreements with international publishers, which must be passed on to the libraries/end users.
- A licence registry could cover licensing of theses, etc., in repositories where © may belong to an institution or student.
- The general feeling was that even if a licence registry was restricted to NESLI and Chest licences, it would still be very helpful as it would cover a large number of journals.

Creation and maintenance of electronic licences

- A simple method of ingesting licences into a registry is required
- Most participants felt that publishers should be responsible for making electronic versions of licences available.
- The ability to compare publisher licences with standard institutional policies regarding licences is desirable, specifically at times when licences are being re-negotiated. This would ensure that licences meet institutional requirements. Although this functionality is desirable, it is not a requirement.
- Licences, particularly those from aggregators, may change. For example, if a new publisher becomes part of an aggregation, then the licence terms may have to be altered. This needs to be indicated to the library and subsequently to the end users.

Dissemination of Licence Terms

- Making the licence terms available to users is very important. Institutions may be held vicariously liable if employees or students breach licence terms but the institution has not taken sufficient steps to make the terms available to end users.
- Presentation to users at point of use seems appropriate; this should occur at the article level.
- The enforcement of the licence terms should not be an issue for a licence registry; however an indication to library staff of when/how usage terms are challenged may be useful for future licence negotiation.
- The user Interface is important – it must not scare users and must present what IS allowed as much as what IS NOT.
- When presenting licence terms to users, it is important to use simple, concise text, taking out the legal jargon and telling users clearly what they can and can't do.

- Users only want to know about the things that relate directly to them and to the resources that they currently wish to access.
- A traffic light system would be good, so that it is obvious to users what is acceptable and what isn't. Alternatively, symbol representation would also be welcome, such as red crosses and green ticks.
- Only the basic usage terms of a licence need to be displayed to end users.
- It would be useful (though not an absolute requirement) to link to the publishers' permissions department for human intervention. Librarians and publishers agreed that if the question does not have an obvious clear answer, it should go directly to the publisher. However, if there were fees involved, e.g., an academic wanted to print out more copies, then the librarian should be contacted first, because an element of budget management would be involved.

Integration Issues

- Integration with ERM systems – certain library systems vendors have similarly functioned component for presenting license terms. If RELI is not to compete with these, then the two could work together – it may be that RELI could be a central licence repository and ERM systems could download licence data from it (it was felt that Onix-LT would be an appropriate format for this data transfer). The presentation to end users would therefore be the responsibility of the ERM system. However, it is likely that in the foreseeable future, there will be mixed-mode operations with some institutions having ERM systems and some not. In the short term it is therefore important that any licence registry solution is not reliant on any specific ERM system.
- The licence could integrate with link resolver software – in the case of multiple licences covering the same resource it may be that the link resolver software is ideally placed to know how the user reached the resource. However, there will be circumstances in which users do not use link resolver software, so the solution should not be dependent on such software.
- Libraries without ERM systems indicated that RELI could provide some of the functionality of an ERM system (e.g., providing reminders of renewal dates, etc). It was however accepted that this was beyond the scope of the RELI project.

Searching based on licence terms

- The general feeling was that it would be useful to be able to search on usage definitions in licences (e.g., return resources that can be mounted on a VLE). However, concerns were raised that this would impact the usability of search tools.

Publisher's perspective

- Publishers do ask that authorised users are made aware of the terms and conditions of the licence. But increasingly publishers are now looking at "click through" licences to get to the end-user directly rather than relying on the libraries giving that information over.
- Publishers claimed that they would not mind providing the text that is shown to the end-user, they also would not mind creating machine-readable licences if there is sufficient demand.

Appendix 2: RELI Use-Cases

Use Case 1

End user provided with licence information at point of access

Use Case Summary

This is the primary RELI Use Case; providing an individual end user with licence information which relates the specific end user (in the case of RELI, normally in the role of a member of an HEI or FEI) to the particular licence terms which relate to a particular resource *at the point of access to that resource*.

Actors (people)

- Individual End User

Actors (systems)

- Identity management (Athens; Shibboleth) – assumed part of Information Environment which enables (at a minimum) the identification of the end user with role as “authorised user” at a specific HEI/FEI
- Resource serving – this may be undertaken by the HEI/FEI, but is much more likely to be served by the publisher or by an aggregator (either on behalf of the publisher or as licensor)
- RELI – providing access to the licence expression

Use Case Brief Description

- End User authenticates her identity as authorised user at particular Institution
- End User discovers (in any way) the particular resource which she wishes to access
- End User accesses this specific instance of resource
 - access management issues assumed dealt with elsewhere
 - “appropriate copy” issues assumed dealt with elsewhere
- End User is presented (on a single screen) with
 - Access to resource
 - Access to simplified expression of licence information about resource
 - Specific “Key Usages”
 - These remain to be identified; maybe start with one or two
 - “Traffic Light” system relating to Key Usages
 - Green: you can do this
 - Amber: you may be able to do this – consult
 - Red: you cannot do this
 - [Possibly] Access to “complete” licence information about resource by linking back to RELI
 - Issues here relate to: what a complete licence expression might be (bearing in mind confidentiality of commercial terms); display of XML record in human readable form

Requirements

- Capability to link end user identity with institution identity with licence expression identity
- Capability to link resource identity with licence expression identity
 - “Repertoire management”
- Capability to display simplified licence expression at point of access
 - Complicated by the fact that “point of access” is likely to be a remote web site, hosted by the licensor

Necessary RELI preconditions

- **Appropriate licence expression** (specific to particular licensee and licensor) ingested into RELI
 - ONIX-PL is specified format
- Licence expression metadata created/linked/stored
 - **Licensor** and **Licensee** uniquely identified
 - **Licence expression** uniquely identified
 - **Resources** covered by licence (“repertoire”) uniquely identified
 - Note that there are various ways in which repertoire management can be managed, but for the first iteration of RELI it is the intention that management of repertoire should be by means of the listing of unique identities of resources against the licence
 - Other licence expression metadata required?
 - e.g., versioning data
 - dates of application
 -

Necessary RELI functionality

- Ingest machine-interpretable licence expression
 - Only those parts of the licence that relate to selected “Key Usages” need to be machine interpretable
 - Store licence
 - Create/store licence metadata
- Ingest/link repertoire data
- Mechanism by which “Key Usage” elements in licence expression can be converted to simple “traffic light” data
- Mechanism by which, when user accesses specific resource, RELI
 - Is interrogated with the following pieces of data:
 - Resource Identity
 - User Institution Identity
 - Identifies appropriate licence (by matching Institution Identity and Resource Identity to Repertoire and thus to Licence Identity)
 - Returns (in an appropriate format) “traffic light” data which can then be displayed to the User
 - Note that the actual display of the data to the User is remote from RELI, and probably depends on Web Service provided at the Resource Provider; this needs to be further explored
 - [Possible] Mechanism to link back to “complete” licence expression and read licence in human readable form

Use Case 2

Specialist Users provided with machine readable version of standard licence expression to download

Use Case Summary

This is the secondary function of RELI: to provide downloadable versions of “standard” licence expressions (provided by publishers, by intermediaries and by licensors) in a format which can then be consumed in other systems; for the purpose of RELI, this is assumed to be ONIX-PL.

Actors (people)

- Specialist user – someone who requires a copy of a downloadable version of an ONIX-PL licence expression
 - Key issue: does this require identity management or is *anyone* allowed to download any *standard* licence expression from RELI

- [It is assumed, for current purposes, that no one is allowed to download licence expressions with an identified Licensor and Licensee except (perhaps) for authorised representatives of the Licensor and Licensee; from the point of view of RELI, this is not a capability that needs to be Piloted, since the general case and the specific case are essentially the same, with the exception of the requirement for identity management which is, in any event, lies outside RELI]

Actors (systems)

- Identity management: if required
- RELI – providing access to the licences

Use Case Brief Description

- Specialist User authenticates his identity as authorised user of this RELI capability (if necessary)
- Specialist User discovers the particular licence expression which he wishes to download
 - Discovery by:
 - Unique identity
 - Metadata search
 - Full text search?
 - Browse?
- Specialist User downloads licence expression

Requirements

- Capability to discover individual licence expressions in RELI
- Converse capability to make individual licence expressions undiscoverable in RELI

Necessary RELI preconditions

- **Appropriate licence expression** (generic) ingested into RELI
 - ONIX-PL is specified format
- Licence expression metadata created/linked/stored
 - **Licensor** and **Licensee** uniquely identified
 - **Licence** uniquely identified
 - Other licence expression metadata required?
 - e.g., versioning data
 - dates of application
 -

Necessary RELI functionality

- Ingest machine-readable licence expression
 - Store licence
 - Create/store licence metadata
- Provide licence expression discovery mechanism
- Provide licence expression download mechanism

Use Case 3

Specialist Users provided with a licence ingest capability

Use Case Summary

This is the Use Case that describes how licences are initially ingested into RELI; in the pilot, it can be assumed that licences are only loaded by project staff; in a “production” environment, it would be necessary to create more sophisticated access management, user interface and versioning tools.

Actors (people)

- Specialist user – someone who has a Licence Expression in ONIX PL format to upload to RELI
 - For current purposes, assumed to be internal to the project, so access management can be managed using local infrastructure, and no sophistication of interface is required
 - Assumes that ONIX-PL format Licence Expressions are created elsewhere – either using the OPLE tool, or hand crafted XML

Actors (systems)

- Identity management: local infrastructure
- RELI – providing the infrastructure to upload and store licence

Use Case Brief Description

- Specialist User authenticates her identity as authorised user of this RELI capability
- Specialist User uploads Licence Expression to RELI
- Licence Expression is Uniquely Identified
 - Issues relating to Version Control of Licence Expressions need to be thoroughly explored; questions raised include
 - A Licence Identity model
 - How should Licence Expressions be identified
 - Relators between different Licence Expression (X is a version of Y)
 - In providing Licence Expressions (either in Use Case 1 or in Use Case 2) how is “version serving” managed?
 - How are versions managed with respect to Repertoire Management
 - Note for the purposes of the Pilot, a complete version management capability may be unduly ambitious
- Licence Metadata Record is created
 - By extraction from Licence Expression?
 - Manually?

Use Case 4

Specialist Users provided with Repertoire Management capability

Use Case Summary

The creation of a licence expression management capability is broadly irrelevant in the absence of repertoire management capability. Licences may refer to the resources they cover in many different ways, but broadly by some attributes of the content (e.g., “all medical journals published by...”). The simplest way of creating and managing a repertoire is by listing all the resources covered, by title (the typical approach in a schedule to a licence) or by unique identifier. However, even this creates considerable complexity – if a licence lists a series of journals (by title and by ISSN, for example) and a date range, the complexity of determining whether a particular resource (an article) is or is not part of a repertoire is dauntingly complex (which is an essential first step in resolving the appropriate licence). In the first instance, it is proposed that RELI will manage repertoire through the listing of resource identifiers *at the level of granularity of the individual resource*. It is this simple Use Case that is described below. More complex cases may be explored subsequently.

Actors (people)

- Specialist user – someone who has a list of identifiers of Resources which are covered by Licences, for which Licence Expressions are stored in RELI
 - For current purposes, assumed to be internal to the project, so access management can be managed using local infrastructure, and no sophistication of interface is required

- No assumptions are currently being made about format; for the purposes of the Pilot Project, this might be an Excel spreadsheet or a comma delimited file

Actors (systems)

- Identity management: local infrastructure
- RELI – providing the infrastructure to upload, link and store Repertoire data

Use Case Brief Description

- Specialist User authenticates her identity as authorised user of this RELI capability
- Specialist User uploads list of Resource identifiers to RELI
- Specialist User associates list of Resource identifiers with all Repertoires of which they are part
 - Note that different individual Licences may cover the same Resources, and therefore the same Resources may belong to many different Repertoires within RELI

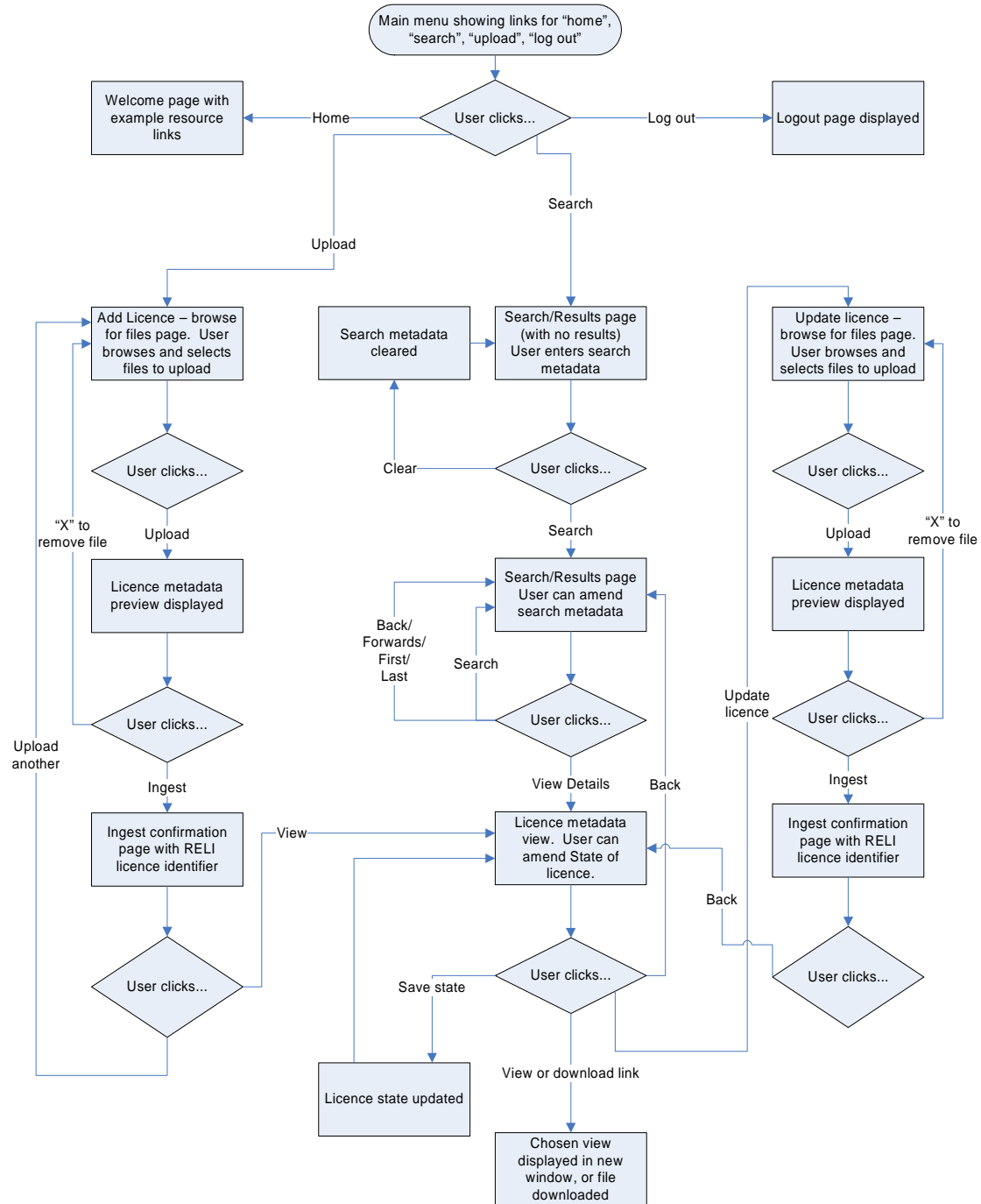
Appendix 3: RELI Business Requirements

- **Licence and commercial model neutral:** the Licence Registry must not dictate licence models or commercial terms
- **Generic and specific:** the Licence Registry must be capable of managing “generic” licences (normally those with a named licensor but no specific licensee – although in the case of JISC model licences, with a named licensee but no specific licensor); and also specific licences (which both licensor and licensee are identified); in the latter case, necessary confidentiality must be maintained
- **Media neutral:** the Licence Registry must be capable of managing licences for all media
- **Flexibility and extensibility:** the Licence Registry must not be constrained by current licensing models; it must be capable of being extended and developed to take in account (unknown) future licensing models
- **Standards neutral:** in order to provide any sort of Pilot Service, it will be essential to instantiate a Licence Registry which is compliant with a certain specific standards (including, for example, ONIX-PL for licence communication and the DOI for resource identification); however, to the extent that this is possible, the Licence Registry should be architecturally neutral with respect to standards
- **Using existing technology:** the Licence Registry should seek to use existing technology and to avoid “reinventing wheels” to the greatest extent possible.
- **Supporting machine-to-machine processes and workflows:** human intervention and decision making should be minimised
- **Capable of staged implementation:** functionality will be identified during the Pilot project which it would be highly desirable to include in a Licence Registry service but which is beyond the scope of the project itself; such functionality should be identified in the final project report; the technical architecture should be sufficiently open to allow such functionality to be implemented in future; and a development “roadmap” proposed
- **Wide stakeholder acceptance:** the Licence Registry must be trusted by a broad constituency of stakeholders – content providers (commercial and non-commercial), content users, and intermediaries
- **Low barriers to entry:** comprehensiveness will be a key value metric for a Licence Registry service; the barriers to entry for all stakeholders must be as low as possible
- **Sustainability:** a Licence Registry service must have a “business model” which makes the delivery of services sustainable over time

Appendix 4: RELI Application Description

Application overview, screenshots

Admin - overview flowchart



Welcome page and menu, authentication

The RELI demonstrator administrative application is accessed using the Firefox web browser¹⁴

Given the demonstrator uses live licenses, these screens give a view of what the end user could expect to see. Work is ongoing at JISC to anonymise the licenses and to provide the demo for download or as a working copy, hence leaving the instructions as a user guide.

RELI Demonstrator - JISC Registry of Licences

home search upload

RELI Welcome page

Using the RELI demonstrator

The Firefox plugin

To view usages specified in licences, you must first install Greasemonkey from [here](#). Then download the RELI plugin script from [here](#), once you have downloaded it, drag the file onto a Firefox window to install it.

Some example journal articles to try

Try these example links. You can use either the URL which links directly to the article, or you can use the DOI which should resolve to the same place.

Publisher	Journal	Example Article DOI	Example Article URL
BPS	Journal of Neuropsychology	10.1348/174866407X231001	http://bpsoc.publisher.ingentaconnect.com/content/bpsoc/jnp/2008/00000002/00000001/art00006
...	British Journal of Clinical Psychology	10.1348/014466505X29972	http://bpsoc.publisher.ingentaconnect.com/content/bpsoc/bjcp/2005/00000044/00000003/art00001
...	British Journal of Mathematical and Statistical Psychology	10.1348/000711005X66888	http://bpsoc.publisher.ingentaconnect.com/content/bpsoc/bjmsp/2006/00000059/00000002/art00010
BMJ	Annals of the Rheumatic Diseases	10.1136/ard.62.9.894	http://ard.bmj.com/cgi/content/abstract/62/9/894
...	Archives of Disease in Childhood - Education and Practice	10.1136/adc.2007.136192	http://ep.bmj.com/cgi/content/extract/93/6/177
...	Gut	10.1136/gut.2005.080523	http://gut.bmj.com/cgi/content/abstract/55/6/782
RSC	Analytical Communications	10.1039/a802897d	http://www.rsc.org/Publishing/Journals/AC/article.asp?doi=a802897d
...	Journal of the Chemical Society, Faraday Transactions	10.1039/a803794i	http://www.rsc.org/Publishing/Journals/FT/article.asp?doi=a803794i
...	Soft Matter	10.1039/b700871f	http://www.rsc.org/Publishing/Journals/SM/article.asp?doi=b700871f
ACS	ACS Chemical Biology	10.1021/cb7000439	http://pubs.acs.org/doi/abs/10.1021/cb7000439
...	Energy & Fuels	10.1021/ef00034a009	http://pubs.acs.org/doi/abs/10.1021/ef00034a009
...	Molecular Pharmaceutics	10.1021/mp0500014	http://pubs.acs.org/doi/abs/10.1021/mp0500014

Note that if you try the RSC examples, the browser plug-in will not detect that the pages are abstract/splash pages for journal articles, as RSC do not include an HTML "Meta" tag with the DOI. To enable detection for these pages you need to point your browser at about:config, then find the Preference named `greasemonkey.scriptvals./RELI Licence Display.doRSC` and set the value to true.

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If you are using the RELI Demonstrator for the first time, please follow these instructions.

Apart from this RELI Demonstrator home page, there are two other main entry points of the application

- Search: for searching the registry for licences, viewing those licences and uploading new versions
- Upload: for uploading new licences

Navigation to these parts of the applications is through the menu bar towards the top of the screen.

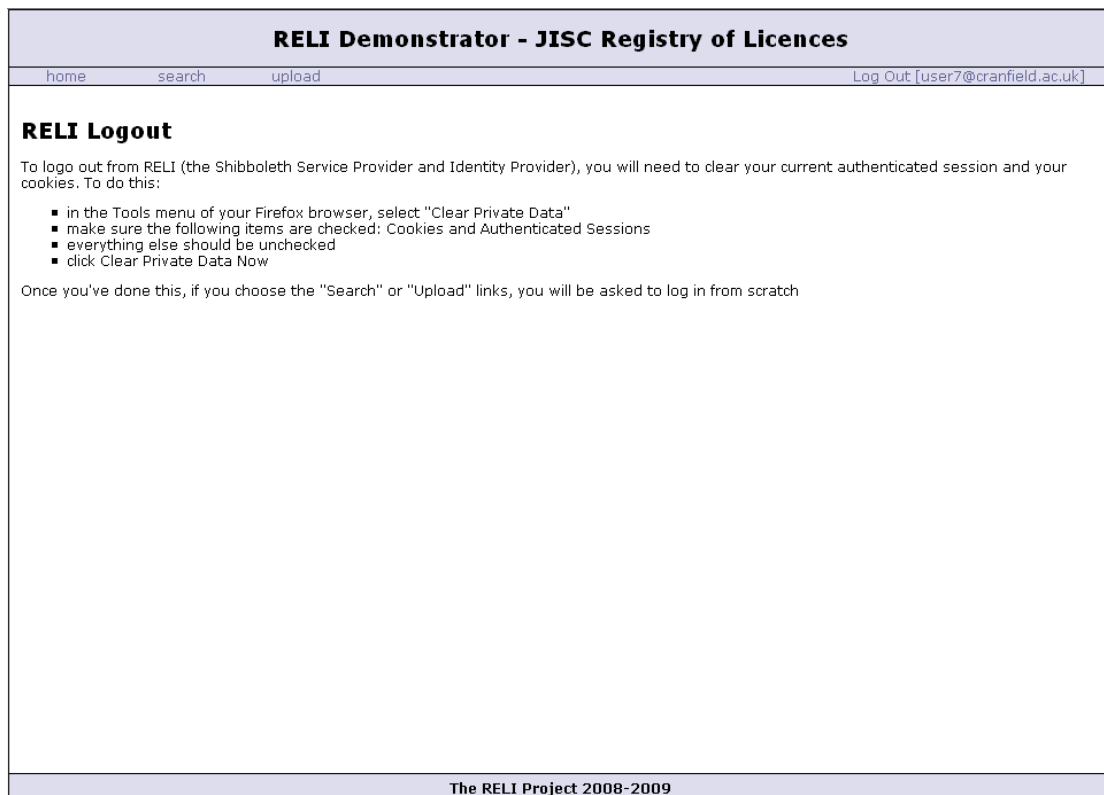
¹⁴ The Admin application has only been fully tested with Firefox version 3, as a Firefox plugin is necessary for the RELI traffic lights display.



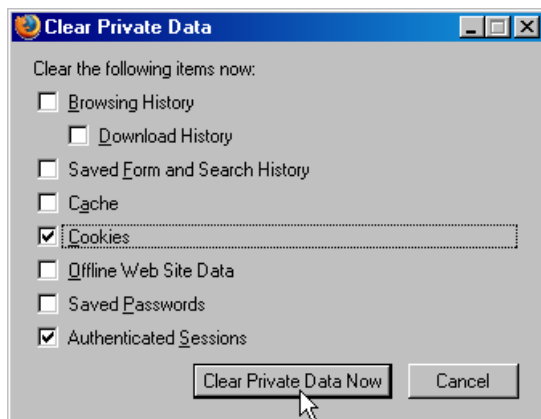
Both of these application areas require you to be logged in – when you try and access them for the first time you'll be prompted for a user name and password.



If you wish to log out of the application (for instance to log in as a different user), click on the logout link at the top right of the screen, and you will see some instructions for logging out.



To log out, you must use the Firefox menu option for clearing private data as per these instructions.



Make sure you follow the instructions carefully and check the two options illustrated above.

Admin – Search and view licences

To search for licences, click on the "Search" link in the main menu bar.

You will be presented with a "Search" screen

RELI Demonstrator - JISC Registry of Licences

home search upload Log Out [user5@cranfield.ac.uk]

Search parameters

RELI identifier

Description

Licensor

Licensee

Licensed resource

OnixPL type

Licence text

State Active Inactive Deleted

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Here you can enter metadata describing the licence(s) you want to search for. Note that the search terms are combined in an "all" rather than "any" fashion – so the search terms licensor: "Blackwell" and licensee: "Leeds University" will result in licences matching *both* of these criteria.

Once you have entered your search terms, click "search" to perform the search (or click "clear" to start from scratch).

You'll then see the results of your search on the same page – listing the total number of results found, and showing the first ten results if there are more than ten.

RELI Demonstrator - JISC Registry of Licences

home search upload Log Out [user5@cranfield.ac.uk]

Search parameters

RELI identifier

Description

Licensor

Licensee

Licensed resource

OnixPL type

Licence text

State Active Inactive Deleted

Results:

Showing results 1 to 1 of 1

RELI identifier	reli:114 [view details]
Description	JISC ACS Web Editions licence 2009
Licensor	AMERICAN CHEMICAL SOCIETY
Licensee	Cranfield University
Licensed resource	ACS Chemical Biology // ACS Nano // Analytical Chemistry // Biochemistry // Bioconjugate Chemistry // Biomacromolecules // Chemical Research in Toxicology // Chemical Reviews // Chemistry of Materials // Crystal Growth & Design // Energy & Fuels // Environmental Science & Technology // Industrial & Engineering Chemistry Research // Inorganic Chemistry // Journal of Agricultural and Food Chemistry // Journal of the American Chemical Society // Journal of Chemical & Engineering Data // Journal of Chemical Information and Modeling // Journal of Chemical Theory and Computation // Journal of Combinatorial Chemistry // Journal of Medicinal Chemistry // Journal of Natural Products // The Journal of Organic Chemistry // The Journal of Physical Chemistry A // The Journal of Physical Chemistry B // Journal of Physical

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Note that only a RELI systems administrator can view licences for all institutions – if you are not a systems administrator the search results will only show licences for your institution.

From here you can use the back/forward/first and last buttons to navigate through the matching licences to locate the one you're interested in.

State Active Inactive Deleted

Results:

Showing results 1 to 5 of 6

RELI identifier	reli:117 [view details]
Description	RSC NESLi2 2009 licence
Licensor	Royal Society of Chemistry
Licensee	Loughborough University
Licensed resource	Analytical Communications // Annual R

If no licences matched your criteria, you'll see a message informing you of this

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Licensee	
Licensed resource	philosophy
OnixPL type	
Licence text	
State	<input checked="" type="checkbox"/> Active <input checked="" type="checkbox"/> Inactive <input type="checkbox"/> Deleted
<input type="button" value="Search"/>	<input type="button" value="Clear"/>
No results were found for your query	

You'll need to amend your search criteria and try searching again (you can use the "clear" button to start from scratch).

Once you've located the licence you are interested in, click on the "view details" link next to the licence

State	<input checked="" type="checkbox"/> Active <input checked="" type="checkbox"/> Inactive <input type="checkbox"/> Deleted
<input type="button" value="Search"/>	<input type="button" value="Clear"/>
Results:	
Showing results 1 to 5 of 6	
<input type="button" value=" << First"/>	<input type="button" value=" < Back"/>
<input type="button" value=" Forwards >"/>	<input type="button" value=" Last >>"/>
RELI identifier	reli:117 [view details]
Description	RSC NESLi2 2009 licence
Licensor	Royal Society of Chemistry
Licensee	Loughborough University
Licensed resource	Analytical Communications // Annual Report Chemistry) // Annual Reports Section "C" (CrystEneComm // Dalton Transactions; Jew

This will take you through to a metadata profile view for the licence, showing a full range of metadata describing the licence

RELI Demonstrator - JISC Registry of Licences

home search upload Log Out [user7@cranfield.ac.uk]

Licence metadata for licence reli:118

Description	JISC NESLI2 2008 model licence
Licensor	[Name of licensor]
Licensee	[Name of licensee]
Licensed resource	
Prepared by	David Martin
Uploaded by	user7@cranfield.ac.uk
OnixPL status	onixPL:Draft
OnixPL type	onixPL:LicenseTemplate
Last Modified	2009-06-01T11:17:23.737Z
State	<input checked="" type="radio"/> Active <input type="radio"/> Inactive <input type="radio"/> Deleted

[Save state](#) [Update licence](#) [Upload New](#)

View Licence

[OnixPL as Raw XML](#)
[OnixPL as formatted XML](#)
[OnixPL summary view](#)
[Full Licence Document](#)

Download Licence

[OnixPL XML](#)
[Full Licence Document](#)

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From this screen you can

- Update the status of a licence, marking it as
 - active
 - inactive
 - deleted
- View and download the licence in various formats, including
 - Raw XML
 - formatted XML
 - the "OPLE¹⁵" summary view
 - the full licence text (eg as a PDF document)
- Update the licence by uploading a new OnixPL XML file and the corresponding licence full text

To update the licence status, first select your desired status

¹⁵ OPLE (Onix-PL Editor) is the open-source OnixPL editing tool
http://www.editeur.org/licensing/ople1.0/OPLE_intro.html

Last Modified	2009-06-01T11:17:23.737Z	
State	<input checked="" type="radio"/> Active <input type="radio"/> Inactive <input type="radio"/> Deleted	
Save state	Update licence	Upload New

View Licence

Then click on the Save state button.

To view the licence in various formats, click on the link of your choice towards the bottom of this screen.

Examples of the various views available are:

Raw XML view

```
This XML file does not appear to have any style information associated with it. The document tree is shown below.

- <PublicationsLicenseExpression datestamp="20090326T105111Z" sourcename="OPLE V1.0 Build 1.2.0" version="1.0">
- <ExpressionDetail>
  <ExpressionType>onixPL.LicenseTemplate</ExpressionType>
  <ExpressionStatus>onixPL.Draft</ExpressionStatus>
- <ExpressionRelatedAgent>
  <ExpressionAgentRelator>onixPL.PreparedBy</ExpressionAgentRelator>
  <Name>David Martin</Name>
</ExpressionRelatedAgent>
- <ExpressionRelatedTimePoint>
  <ExpressionTimePointRelator>onixPL.PreparedOn</ExpressionTimePointRelator>
  - <TimePointIdentifier>
    <TimePointIDType>onixPL.YYYYMMDD</TimePointIDType>
    <IDValue>20081205</IDValue>
  </TimePointIdentifier>
</ExpressionRelatedTimePoint>
</ExpressionDetail>
- <LicenseDetail>
  <Description>JISC NESLi2 2008 model licence</Description>
  <LicenseStatus>onixPL.Template</LicenseStatus>
  <LicenseRenewalType>onixPL.NonRenewable</LicenseRenewalType>
- <Annotation>
  - <AnnotationText>
    This draft ONIX-PL expression of the JISC model licence is provided for illustrative purposes only, and must not be taken to represent an
    authoritative expression. JISC Collections is not responsible for any inaccuracies in the interpretation of licence terms.
  </AnnotationText>
</Annotation>
- <LicenseDocument>
  <LicenseDocumentType>onixPL.LicenseMainTerms</LicenseDocumentType>
  <DocumentLabel>License</DocumentLabel>
```

Formatted XML view

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PublicationsLicenseExpression datestamp:20090326T105111Z sourcename:OPLE V1.0 Build 1.2.0 version:1.0

ExpressionDetail
ExpressionType onixPL:LicenseTemplate
ExpressionStatus onixPL:Draft
ExpressionRelatedAgent
ExpressionAgentRelator onixPL:PreparedBy
Name David Martin
ExpressionRelatedTimePoint
ExpressionTimePointRelator onixPL:PreparedOn
TimePointIdentifier
TimePointIDType onixPL:YYYYMMDD
IDValue 20081205

LicenseDetail
Description JISC NESLi2 2008 model licence
LicenseStatus onixPL:Template
LicenseRenewalType onixPL:NonRenewable
Annotation
AnnotationText This draft ONIX-PL expression of the JISC model licence is provided for illustrative purposes only, and must not be taken to represent an authoritative expression. JISC Collections is not responsible for any inaccuracies in the interpretation of licence terms.

LicenseDocument
LicenseDocumentType onixPL:LicenseMainTerms
DocumentLabel License
OtherDocumentReference
ReferenceRelator onixPL:BasedOnTermsOf
DocumentLabel JISCPublisherAgreement
LicenseRelatedAgent
LicenseAgentRelator onixPL:Licensee

OPLE (OnixPL Editor) summary view

JISC NESLi2 2008 model licence
License status: [Template](#)
License renewal type: [Non Renewable](#)
License Start Date: 20090101
License End Date: 20091231
Place Of Governing Law: England (GB-ENG)
Place Of Jurisdiction: England (GB-ENG)
Note: This draft ONIX-PL expression of the JISC model licence is provided for illustrative purposes only, and must not be taken to represent an authoritative expression. JISC Collections is not responsible for any inaccuracies in the interpretation of licence terms.

License Document(s)
License Main Terms: [Title or brief description of license document]

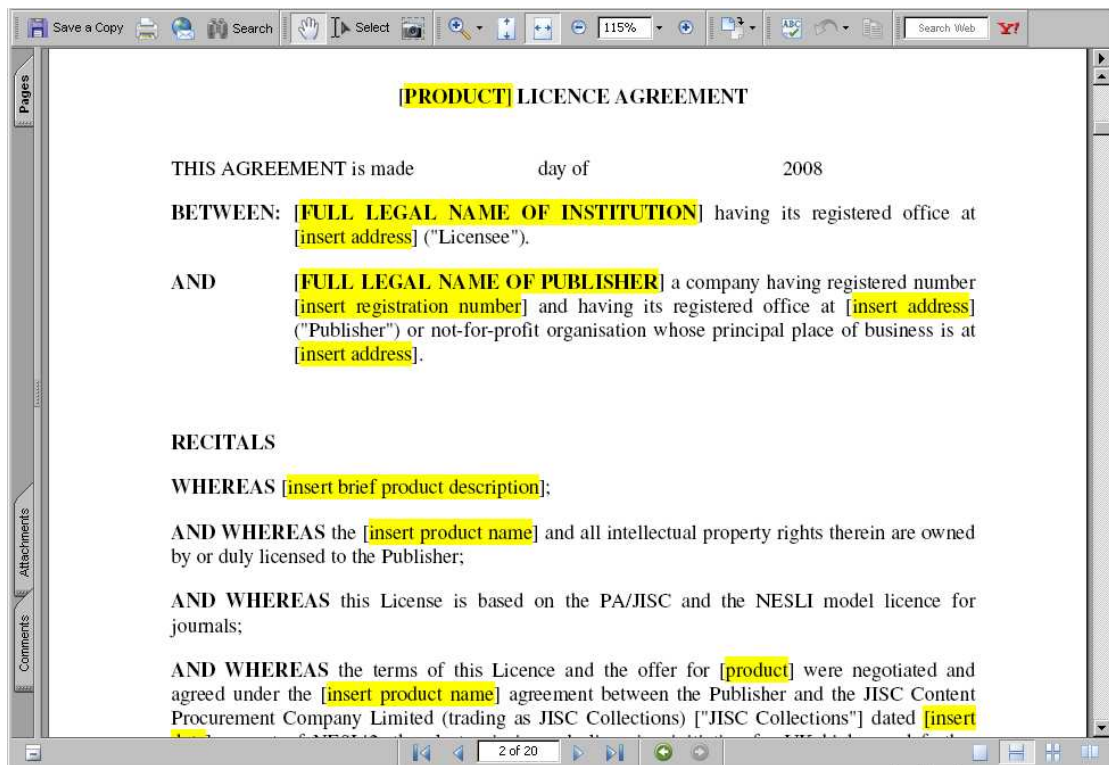
Licensor:
[Name of licensor] ⓘ
Company Registration Number: [Registered number]
Place Of Corporate Registration: [Name as free text]
Registered Address: [Address]

Licensee:
[Name of licensee] ⓘ
Principal Place Of Business: [Address]

Licensed Content:
Description: [Brief description of resources licensable under this license] ⓘ

The original (pdf) licence document

RELI—Final Report



Admin – Uploading new licences and updating existing licences

The procedure for uploading a new licence to RELI and updating an existing RELI licence with updated OnixPL and full-text files is broadly similar.

In the case of uploading a new licence, click on the "Upload" link. If you want to update an existing link, first search for your licence (see above), and once you have found it click on the "Update Licence" button.

You will then be presented with a page where you can browse for the files to upload.

RELI Demonstrator - JISC Registry of Licences

home search upload Log Out [user7@cranfield.ac.uk]

Adding new licence to the registry

Licence XML file

Licence text file

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Click on the browse button and locate the OnixPL file you want to upload

RELI Demonstrator - JISC Registry of Licences

home search upload Log Out [user7@cranfield.ac.uk]

Adding new licence to the registry

Licence XML file

Licence text file

File Upload

Look in: Final Set tmp2

- Cranfield
- Loughborough
- 090324 JISC NESLI2 Model Licence 0809.doc
- 090324 JISC NESLI2 Model Licence 0809.pdf
- licences 2009-04-30.zip
- TX-JISC NESLI2 2009 for RELI 090324-ople-t-1237925129984.xml**

File name: TX-JISC NESLI2 2009 for RELI 090324-ople-t-1237925129984.xml

Files of type: All Files

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Repeat this process for the full-text licence file (e.g., a PDF of the full licence text).

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Once you've located both files, click on the "Upload" button.

The files will then be scanned, and you'll be given the chance to review the metadata (extracted from the OnixPL) for the licence, to ensure you have selected the correct OnixPL file.

RELI Demonstrator - JISC Registry of Licences

home search upload Log Out [user7@cranfield.ac.uk]

Adding new licence to the registry

Licence XML file	
TX-JISC NESLi2 2009 for RELI 090324-ople-t-1237925129984.xml <i>text/xml</i> 85 KB ✘	
Licence text file	
090324 JISC NESLi2 Model Licence 0809.pdf <i>application/pdf</i> 98.6 KB ✘	
Ingest	

Licence metadata	
Description	JISC NESLi2 2008 model licence
Licensor	[Name of licensor]
Licensee	[Name of licensee]
Licensed resource	
Prepared by	David Martin
Uploaded by	user7@cranfield.ac.uk
OnixPL status	onixPL:Draft
OnixPL type	onixPL:LicenseTemplate

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If at this point you decide you've selected the wrong files, simply click the red "x" next to either or both file, the "browse" button will reappear and you can select a new file – click on the "upload" button once you're done to preview the metadata for your newly selected file.

Once you're happy and want to proceed, click on the "Ingest" button to load the licence into RELI.

Once complete, you'll see a confirmation screen, informing you either of:

The RELI identifier of the new licence you have just created in RELI

RELI Demonstrator - JISC Registry of Licences

[home](#) [search](#) [upload](#) Log Out [user7@cranfield.ac.uk]

Adding new licence to the registry

Licence files successfully ingested. The identifier of the new RELI licence object is reli:119

[View](#) [Upload another](#)

↔

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Or the RELI identifier of the existing licence you've just updated.

RELI Demonstrator - JISC Registry of Licences

[home](#) [search](#) [upload](#) Log Out [user7@cranfield.ac.uk]

Updating RELI licence reli:119

Licence files successfully ingested. The identifier of the updated RELI licence object is reli:119

[Back](#)

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From here you can either upload a new licence or go to the licence metadata view of the licence you've just uploaded or updated.

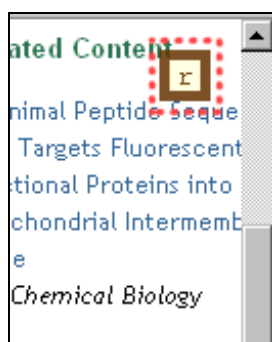
User

Once the Firefox RELI Demonstrator plug-in is installed, whenever the user navigates to a journal article page that contains a DOI encoded in the page in an HTML META tag, the RELI Demonstrator icon will be displayed.

The screenshot displays a journal article page for "Nongenomic Activity of Ligands in the Association of Androgen Receptor with Src". The article is by Sung Bae Kim, Akira Kanno, Takeaki Ozawa, Hiroaki Tao, and Yoshio Umezawa. The abstract section includes a diagram illustrating the nongenomic pathway where androgen binds to the AR (Androgen Receptor) and Src, leading to a nongenomic pathway that bypasses the cell membrane. The diagram shows Androgen binding to AR, which then interacts with Src, leading to a nongenomic pathway that bypasses the cell membrane. The genomic pathway is also shown for comparison.

The RELI icon, a small square with a stylized 'r' inside, is located in the top right corner of the page, near the "Related Content" section. The icon is highlighted with a red dashed border in the screenshot.

The icon is an unobtrusive [r] icon in the top right corner of the page.



To show usages for this resource, the user clicks on the icon, which then expands into a "window" showing what the user is permitted to do with the resource.

The screenshot shows an ACS article page for "Nongenomic Activity of Ligands in the Association of Androgen Receptor with Src". A central overlay titled "What can I do with this?" displays a table of usage permissions for an "Authorized User".

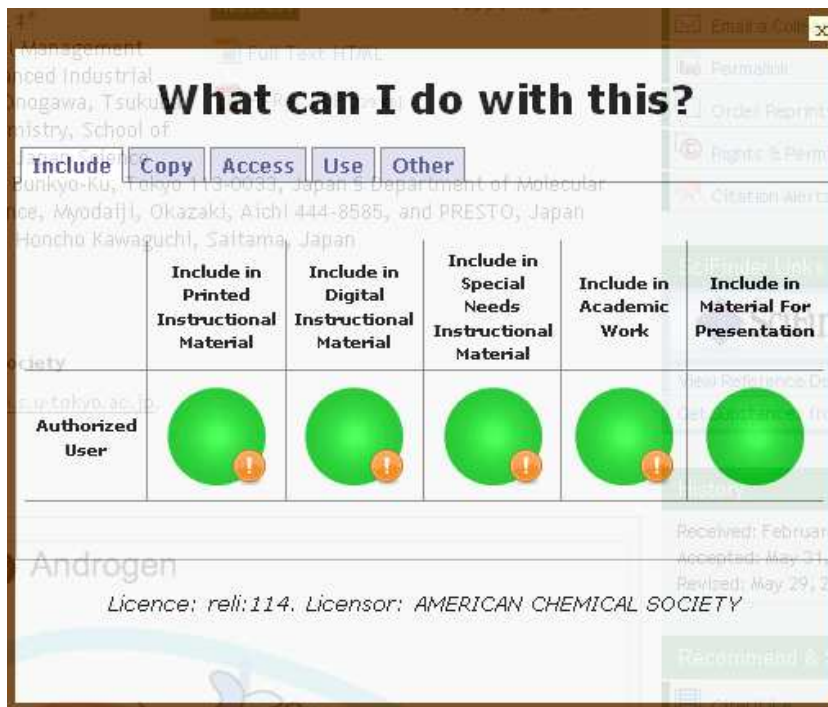
	Include in Printed Instructional Material	Include in Digital Instructional Material	Include in Special Needs Instructional Material	Include in Academic Work	Include in Material For Presentation
Authorized User	Green circle with exclamation mark	Green circle with exclamation mark	Green circle with exclamation mark	Green circle with exclamation mark	Green circle with exclamation mark

Below the table, a diagram illustrates the "Nongenomic pathway" involving AR and Src proteins near a cell membrane. The article's license is noted as "Licence: reli:114. Licensor: AMERICAN CHEMICAL SOCIETY".

The various usages are listed along the top of the traffic lights display, and the category of user is listed down the side. The traffic light icons consist of

- Green – usage is permitted
- Green with exclamation mark – usage is permitted, but conditions apply
- Amber – usage is not specified in the licence
- Red – usage is forbidden

The "tabs" along the top of the screen can be clicked on to show different categories of usages.



In the event that the journal article DOI is for a resource that cannot be resolved back to a licence in RELI (ie a resource that is not covered by a RELI licence), the user will be informed of this.



Although licence conflict resolution was not tackled as part of the RELI project, in the event that more than one licence is found for the resource (which does indicate some form of conflict), the user will be informed of this.

The screenshot shows a web browser window displaying a SciFinder search result. The main heading reads "More than one licence matches this resource". Below this, the article title "Androgen" is visible. The author information includes "Japan Science and Technology Agency, Tsukuba, Ibaraki 305-8565, Japan" and "Department of Molecular Science, Myodaiji, Okazaki, Aichi 444-8585, and PRESTO, Japan Honcho Kawaguchi, Saitama, Japan". The resource ID is listed as "(Resource 10.1021/cb7000439)".

The matching licenses are:

- reli:120
- reli:114

The right sidebar contains various utility links such as "Permalink", "Rights & Permissions", "Citation Alerts", "SciFinder Link", "View Reference Details", "Get Substance from", "History" (with dates: Received: February, Accepted: May 31, Revised: May 29, 20), and "Recommend & Share".