

# LORE: A Compound Object Authoring and Publishing Tool for Literary Scholars based on the FRBR

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This paper presents LORE (Literature Object Re-use and Exchange), a light-weight tool designed to enable scholars and teachers of literature to author, edit and publish OAI-ORE-compliant compound information objects that encapsulate related digital resources and bibliographic records. LORE provides a graphical user interface for creating, labelling and visualizing typed relationships between individual objects using terms from a bibliographic ontology based on the IFLA FRBR. After creating a compound object, users can attach metadata and publish it to a Fedora repository (as an RDF graph) where it can be searched, retrieved, edited and re-used by others. LORE has been developed in the context of the Australian Literature Resource project (AustLit) and hence focuses on compound objects for teaching and research within the Australian literature studies community.

## 1 Introduction and Objectives

Within the discipline of literature research and teaching, the ability to relate disparate digital resources in a standardized, machine-readable format has the potential to add significant value to distributed collections of literary resources. Such compound objects can be used to track the lineage of derivative works which are based on a common concept, to relate objects around a common theme, or to encapsulate related digital resources for teaching purposes. For example, one might want to relate the original edition of *Follow the Rabbit-Proof Fence* to the illustrated edition, a radio recording and a digital version of the film – and to retrieve and present these resources, with their relationships visualized, regardless of their location. Our objective is to provide a software tool to enable such encapsulation and subsequent re-use and visualization, by building on the efforts of two previous digital library initiatives:

- The IFLA Functional Requirements for Bibliographic Records (IFLA, 1998)
- The OAI-Object Reuse and Exchange (OAI, 2008)

FRBR is a recommendation of the International Federation of Library Associations and Institutions (IFLA) to restructure catalogue databases to reflect the conceptual structure of information resources. It uses an entity-relationship model of metadata for bibliographic resources that supports four levels of representation: work, expression, manifestation and item. It also supports three groups of entities: products of intellectual or artistic endeavour (publications); entities responsible for intellectual or artistic content (a person or organisation); and entities that serve as subjects of intellectual or artistic endeavour (concept, object, event, and place).

The Open Archives Initiative Object Reuse and Exchange (OAI-ORE) is an international collaborative initiative, focusing on a framework for the exchange of information about Digital Objects between cooperating repositories, registries and services. OAI-ORE aims to support the creation, management and dissemination of the new forms of composite digital resources being produced by eResearch and to make the information within these objects discoverable, machine-readable, interoperable and reusable. Named Graphs (Jeremy, 2005) are endorsed by the OAI-ORE initiative as a means of publishing compound digital objects that clearly states their logical boundaries (Lagoze, 2007). They do this in a way that is discipline-independent, but that also provides hooks to include rich semantics, metadata, ontologies and rules.

*Our hypothesis is that OAI-ORE Named Graphs provide the ideal mechanism for representing literary compound objects that encapsulate the entities and relationships expressed by the IFLA FRBR.* To test this hypothesis, we are working with the Australian literature studies community through AustLit. AustLit is a non-profit collaboration between the National Library of Australia and twelve Universities. It provides the peak resource of bibliographic data for scholars undertaking research into Australian literary heritage and print culture history. The AustLit data model is also based on the IFLA FRBR (Kilner, 2005), making it ideal for evaluating LORE. Hence our core aims are to provide easy-to-use tools that can be seamlessly integrated within existing research practices through the AustLit Web Portal and that enable:

- the publishing of compound objects in open access repositories so they can be readily shared and re-used;
- the easy discovery and re-use of these compound objects through the attachment of simple metadata;
- the visualization of complex relationships between literary resources (including the lineage of derived intellectual products) through intuitive graphical user interfaces.

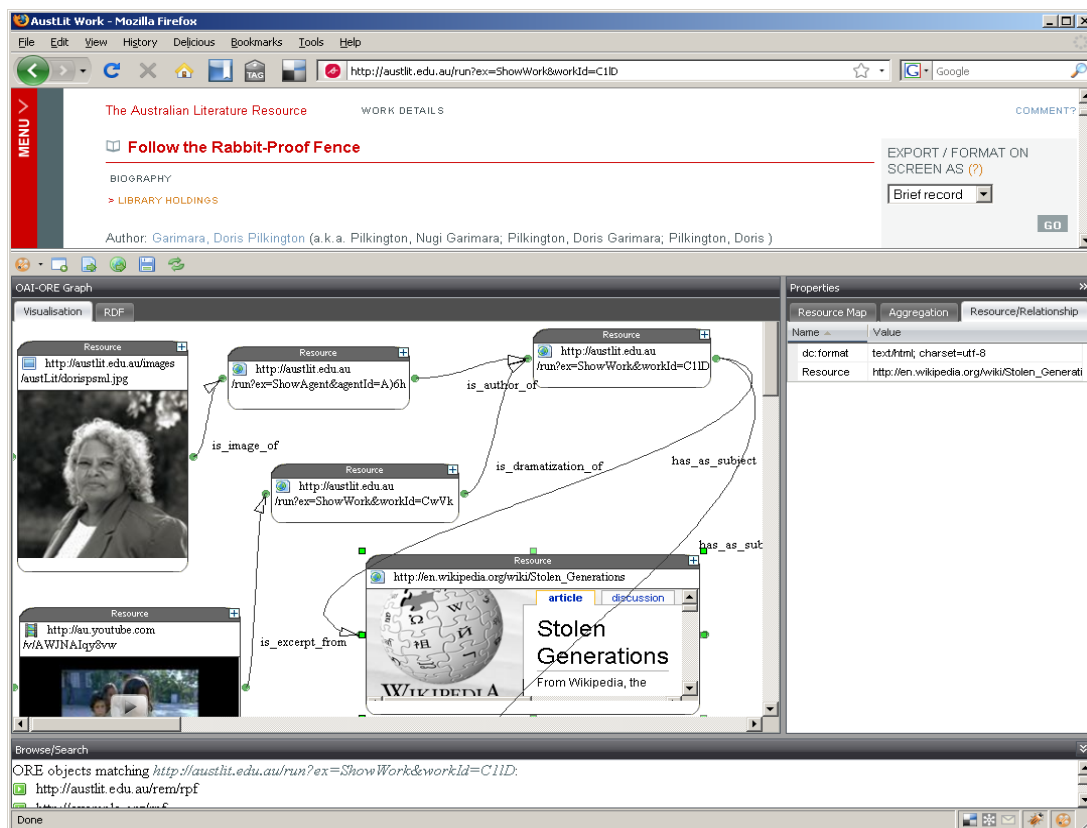
## 2 Related Work

A number of previous efforts have applied OAI-ORE to specific scientific disciplines to encapsulate experimental data and results. These include: Foresite (2008), eChemistry (Van Noorden, 2008), UIUC (Cole, 2008) and SCOPE (Cheung et al, 2007). Although CULTOS (2003) uses RDF to represent multimedia and hypertext presentations for e-Humanities applications, it does not combine OAI-ORE and IFLA-FRBR to capture or label the precise relationships between entities. Also relevant is an overview of previous implementations and applications of IFLA FRBR, provided by Babeu (2008). A significant past focus of eHumanities tools development has been on scholarly mark-up and annotation tools to attach interpretations to individual objects or parts of objects (e.g., paragraphs within an article). LORE takes the annotation paradigm a step further, enabling authors to annotate links between multiple resources of mixed media type, with tags from an ontology.

## 3 Implementation and User Interface

LORE is implemented as a Mozilla Firefox extension using AJAX technologies. The LORE tool stores and queries Named Graphs representing compound objects via web services on either a Sesame 2 RDF data store or Fedora. The *types* for intra-aggregation relationships, as well as metadata terms for aggregated objects, are specified using an OWL ontology, which is configured at start-up or via the *Options* menu. Through examining all of the topic types and relationships from the AustLit database, we developed an OWL ontology which is based on IFLA FRBR, but extended to support additional relationships (e.g., between people).

Figure 1 shows LORE's editing interface. OAI-ORE resource maps are displayed in a graphical form, as shown in Figure 1, as well as RDF/XML. In the graphical view, the nodes represent the resources aggregated within the resource map and the arcs represent typed relationships between them. Clicking on a node provides an interactive preview of the resource that it represents in the top Browser window. Node previews can be collapsed to conserve screen space or resized to display more content. This allows users to view and interact with aggregated resources directly from within LORE rather than having to load them individually in the main browser window.



**Fig. 1.** Compound Object Editing Interface

Metadata about the OAI-ORE resource map, aggregation, and aggregated resources is displayed and can be added to or edited via the *Properties* panel (Bottom RHS). The metadata terms that are supported include: OAI-ORE, DCMI Metadata Terms (DCMI, 2008), selected terms from FOAF (FOAF, 2007), and datatype properties from the domain ontology. Relationship types are indicated by labels on the arcs, and these can be changed by editing the properties or by selecting from the arc *context menu*, which is populated by the object properties from the domain ontology (the default ontology is based on FRBR but alternative ontologies can be specified through the *Options* menu).

New resources to be added to the resource map are discovered via the Web Browser. Clicking on the OAI-ORE logo in the status bar toggles the editor's visibility, so that the full browser window can be used for resource discovery, whilst the resource map being constructed remains accessible throughout the browsing session. A resource loaded into the browser can be added to the resource map via context menus or LORE's toolbar. The toolbar also provides options for saving and loading compound objects stored in the RDF repository specified in the user preferences. Resource maps can be discovered and loaded via the *Browse/Search* panel.

## 4 Discussion, Future Work and Conclusions

The features that AustLit researchers ranked most highly during a user feedback study were: the interactive node previews, the direct integration of the editor with the browser and the ease with which they could customize the relationship types and metadata supported by the editor. However, missing features that they would like to see included: alternative visualizations such as conventional scholarly edition formats and research trails, as well as support for bi-directional relationships. They also found the IFLA FRBR terminology to be overly complex for use by many literary scholars. Strategies for addressing this issue could include adding

more semantic checks to the UI to assist users in applying the ontology terms, or tailoring the domain ontologies based on community needs and understanding. The system also has difficulty handling objects that do not have persistent URIs. Many objects that exist in institutional repositories have local identifiers only. In order to handle such objects, the system may need to incorporate a persistent identifier service.

Future work will also focus on the dynamic generation of multimedia presentations (e.g. SMIL files) from mixed-media compound objects. This will build on previous work (Little, 2002) that maps semantic relationships to spatio-temporal relationships within presentations.

The on-going development and evaluation of LORE in the context of AustLit will provide an essential contribution to the cyber-infrastructure requirements of the Australian literary scholars, as well as literary scholars globally.

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