1st DL.org Workshop

Digital Library Interoperability,
Best Practices & Modelling Foundations
1 October 2009, Corfu, Greece, within ECDL2009

www.dlorg.eu

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Welcome Message from the Workshop Chairs

The first DL.org Workshop on "Digital Libraries: Interoperability, Best Practices and Modelling Foundations" is held in Corfu, Greece, on 1 October 2009, in conjunction with the 13th European Conference on Digital Libraries (ECDL). It is the first workshop organised by the DL.org Coordination Action project, funded by the European Commission under FP7, and comes as a natural continuation of the three "Digital Library Foundations" workshops, held in conjunction with ECDL and Joint Conference on Digital Libraries (JCDL) in 2007 and 2008. Unlike its precursors, however, which addressed any fundamental aspect of Digital Libraries (DLs) from a general perspective, this workshop focuses primarily on DL interoperability. In particular, the workshop presents the initial outcomes of the collective work of a large number of researchers participating in DL.org activities on how DL interoperability can be addressed most effectively.

The DL.org project, which has adopted the DELOS Digital Library Reference Model as the underlying common language for describing DLs, is approaching interoperability in an innovative fashion, by structuring its activities and discussions according to the main conceptual DL components identified in the Reference Model. The workshop uses current DL.org outcomes as a springboard for further deliberations and exchanges of ideas on effective methods for DL interoperability and best practices for other related critical DL issues.

The workshop features presentations from a number of DL experts. Stefan Gradmann, a distinguished member of the Digital Library community, delivers the keynote on "Interoperability Challenges in Digital Libraries", with particular reference to Europeana, whose future development depends critically on the effective interoperation of multiple independent pieces. The structured part of the workshop programme includes seven additional presentations, starting with a brief introduction and outline of the Reference Model, followed by six expositions of recent research developments and future research challenges in the field, each one related to one of the main Digital Library concepts captured by the Model, i.e. architecture, content, functionality, policy, quality and user. Finally, there is an open discussion session where all workshop participants are invited to brainstorm the future of DLs and the role of interoperability.

First and foremost, we would like to thank all the DL.org external speakers for their willingness to address the workshop audience. We also thank the programme committee members: Marianne Backes, Stephen Griffin, Geneva Henry, and Dagobert Soergel for providing valuable advice and guidance on the programme structure.

Donatella Castelli, CNR-ISTI, Italy

Yannis Ioannidis, University of Athens, Greece

Seamus Ross, University of Toronto, Canada

DL.org – Laying the foundations of Digital Libraries

The DELOS Reference Model

DL.org and Europeana - Facing interoperability from different perspectives

DL.org - Laying the Foundations of Digital Libraries

Donatella Castelli, CNR-ISTI, Project Co-ordinator

DL.org is a two-year Coordination Action, which started in December 2008, funded by the Commission of the European Union (EC) under the 7th Framework Programme ICT Thematic Area "Digital Libraries and Technology-Enhanced Learning". DL.org is aimed at consolidating and enhancing the *DELOS Digital Library Reference Model;* identifying effective methods for achieving interoperability among Digital Library (DL) systems, pinpointing and promoting best practices and successful technological approaches on key aspects of DL systems.

- Consolidating & enhancing the DELOS DL Reference Model. This model, initially conceived within the context of the DELOS Network of Excellence (NoE), lays the foundations of DL systems by capturing their essence. The Reference Model identifies the fundamental entities of discourse within the universe of Digital Libraries (DLs) and organises them around six main domains: **architecture**, **content**, **functionality**, **quality**, **policy**, and **user**. DL.org aims to make a valuable contribution towards a universally accepted Reference Model by validating and refining it through feedback provided by the DL experts working with the project and the wider community.

- Identifying effective methods for **interoperability** among Digital Library Systems. Given the widely distributed nature of future digital libraries, heterogeneity is expected to be the norm. Techniques for interoperability are crucial in reconciling different approaches in such systems. DL.org is undertaking a comprehensive analysis with regard to any of the six domains that characterise DLs by covering a critical review of the current situation and of emerging trends. This evaluation will enable the identification of techniques, methods and approaches for DL interoperability based on the requirements of existing systems.

- Pinpointing & promoting best practices and successful technological approaches to key aspects of DL systems. One of the project's key outputs is a **Digital Library Technology and Methodology Cookbook**, containing a portfolio of best practices and outlining patterns and solutions to common issues faced when developing large-scale interoperable DL systems. The Cookbook will also contain guidelines for selecting the appropriate interoperability techniques, standards and approaches when implementing interoperable DL federated systems, or for describing resources which are shareable across systems.

These objectives are being achieved with the support and active contributions of the international DL research community, specifically through six Thematic Working Groups and a Liaison Group, thus ensuring participation across the board to advance the frontiers of knowledge on DL interoperability. DL.org thus has the ambition to bring to a successful conclusion the long journey undertaken by the DELOS Network of Excellence on Digital Libraries towards filling the gap between current DL practice and the needs of modern information provision.

DL.org Working Groups

The six working groups, one for each of the fundamental DL concepts, are chartered with deliberating key issues, sharing experiences and expertise, working on interoperability approaches, and fostering shared standards. The members include researchers in the DL arena and key representatives from major international DL initiatives and on-going projects who periodically meet together to make progress on the key related outputs. Over the course of the project, the findings of the working groups are offered for broader discussion, consultation and validation to the members of a Liaison Group.

Liaison Group

This group, which co-operates with the project through remote tools and by participating in DL.org events, is made up of renowned experts, stakeholders and representatives from large European and international DL coalitions and initiatives.

CERN – European Organisation for Nuclear Research, Switzerland: **Jens Vigen**

Coalition for Networked Information, USA: **Joan K. Lippincott & Clifford A. Lynch**

Cornell University, Institute of Informatics Problems, USA: **Carl Lagoze**

Cornell University Library, USA: **Dean Krafft**

European Library Users Advisory Board: **Jela Steinerova**

Indian Statistical Institute: **ARD Prasad**

Internet Archives, USA: Peter **Brandley**

King's College London, UK: T**obias Blanke**

Nanyang Technological University, Singapore: **Schubert Floo**

National Archives of Australia, Australia: **Andrew Wilson**

Open Archive Initiative-Open Reuse & Exchange (OAI-ORE), US: **Herbert Van de Sompel**

Pittsburgh University, US: **Ronald Larsen**

Russian Academy of Science, Institute of Informatics Problems, Russia: **Leonid Kalin-ichencko**

Salzburg Research, Austria: **Andrea Mulrenin**

Tsukuba University, Japan: **Shigeo Sugimoto**

University of Queensland, Australia: **Jane Hunter**

Vienna University, Austria: **Erich Neuhold**

DL.org Consortium

Institute of Information Science & Technologies, National Research Council (CNR-ISTI), Italy

Department of Informatics & Telecommunications, University of Athens, Greece

Humanities Advanced Technology & Information Institute (HATII), University of Glasgow, UK

Trust-IT Services Ltd, UK

The DELOS Digital Library Reference Model

Leonardo Candela, (CNR-ISTI)

The DELOS Digital Library Reference Model stems from an ambitious and challenging initiative spearheaded in 2005 by the DELOS Network of Excellence (NoE) with the aim of providing the DL community with a functional and comprehensive framework which could collectively serve the community and capture the intrinsic nature of the diverse entities that constitute the DL universe.

The collective understanding developed by European research groups and through international collaboration within the context of DELOS led to two key outputs: the development of the Reference Model and the **Digital Library Manifesto**. The Manifesto, which is a declaration of the intentions, motives, overall plans and views of the initiative, introduces the main notions typical of the DL domain. The Reference Model presents the main concepts, axioms and relationships that characterise the domain irrespective of specific standards, technologies or implementations. These foundational artefacts are the starting point for a focused development framework envisioning the definition of other models, such as reference and concrete architectures, leading to the implementation of the aspects captured by the model systematically.

The Reference Model draws clear distinctions between three notions that have often been confused in literature, that is, Digital Library (DL); Digital Library System (DLS) and Digital Library Management System (DLMS). These systems are defined by a set of fundamental concepts belonging to six DL domains, namely **architecture**, **content**, **functionality**, **policy**, **quality** and **user**. These systems support the operations of diverse actors playing four key roles: end-users, DL designers, DL system administrators and DL application developers. The current version of the Reference Model captures and details these aspects through more than 200 concepts and 50 relations that connect them.

The Reference Model thus serves as a lingua franca in the DL domain, encompassing all the activities that require an organised and shared conceptual model, from teaching and research to resource annotation and interoperability. The work undertaken by DL.org since December 2008 is aimed at consolidating and enhancing this Model by harnessing global expertise and providing a forum for knowledge exchange with the broader DL community.

References

Candela, L.; Castelli, D.; Ioannidis, Y.; Koutrika, Y.; Meghini, C.; Pagano, P.; Ross, S.; Schek, H. and Schuldt, H. (2006). *The Digital Library Manifesto*. DELOS: a Network of Excellence on Digital Libraries

Candela, L.; Castelli, D.; Ferro, N.; Ioannidis, Y.; Koutrika, G.; Meghini, C.; Pagano, P.; Ross, S.; Soergel, D.; Agosti, M.; Dobreva, M.; Katifori, V. & Schuldt, H. (2008). *The DELOS Digital Library Reference Model* - Foundations for Digital Libraries. DELOS: a Network of Excellence on Digital Libraries

DL.org and Europeana - Facing interoperability from different perspectives

Donatella Castelli, Carlo Meghini, CNR-ISTI

Europeana is Europe's multilingual digital library providing an on-line collection of digitised items from European museums, libraries, archives and multi-media collections.

"*DL architecture fundamentally rely on interoperability which in turn has its foundations in standards, especially in settings such as Europeana which are built on multilateral interoperability of many independent partners and platforms. One of the first steps the Commission took for preparing Europeana was to create a working group on 'Interoperability of Digital Libraries'. The DELOS Reference Model was very useful for this group and I strongly believe that the same will be true for the work of DL.org for the DL community as a whole*". **Stefan Gradmann, Humboldt University**

DL.org and Europeana are both facing the challenges of interoperability but from different perspectives. Europeana needs to find a viable solution to the interoperability challenge while implementing a large-scale operational DL system. Europeana's objective is to realise a unique, multilingual point of access to the content of European cultural institutions. In order to achieve this goal, Europeana has to solve many interoperability issues. These fall in two main categories: issues arising from the provider side, that is, when gathering content from the provider institutions, and issues occurring from the consumer side, that is, when third parties use the Europeana services either as end-users or as services providers. As far as the first category is concerned, Europeana must interoperate with memory institutions to obtain the metadata used to offer its services. This is currently achieved by adopting a standard solution, namely the Open Archives Initiative Protocol for Metadata Harvesting (**OAI-PMH**) (*http://www.openarchives.org/pmh/*). Once Europeana acquires the data, it has to map it from the original format to the Europeana **Data Model**. This mapping requires the knowledge of the semantics of the source and target data models. It can thus be regarded as a semantic interoperability problem at the content level. With regard to the consumer side, in the near future Europeana will make its contents available through a number of Application Programming Interfaces (APIs), each one addressing the needs of a particular category of users. These APIs will be used by consumers to obtain services from Europeana based on the outcomes of negotiations between the parties concerned.

DL.org is aimed at developing a comprehensive framework that characterises various interoperability challenges and promoting solutions systematically. Within this framework, key representatives from major initiatives and on-going projects may co-operate to deliberate key issues, share experiences and expertise, work on the interoperability of their solutions, and promote shared standards. DL.org expects to provide the DL research and application community with a deeper understanding that will pave the way towards innovative foundational and technical advances.

In particular, the project is facing the interoperability challenge from diverse perspectives, encompassing **architecture**, **content**, **functionality**, **policy**, **quality**, and **user**, aimed at contributing to raising awareness on the intrinsically multi-faceted nature of this problem. As a result, the enhanced Reference Model will characterise the DL universe in terms of well-established concepts and relationships, thus providing a conceptual framework within which interoperability issues are addressed. This outcome will be enforced by the **Digital Library Technology and Methodology Cookbook**, containing guidelines, best practices, enabling technologies and approaches which will guide DL developers and designers with off-the-shelf certified solutions ready to be used when dealing with interoperability.

Because of their complementary missions, DL.org and Europeana can benefit from the outcomes achieved by both projects. The outcomes of the research conducted by DL.org can be effectively leveraged by Europeana during its next phases, in which a more sophisticated interaction scheme with providers and consumers will be defined. Vice versa, the experiences and knowledge gained by Europeana provides extremely valuable input and feedback to DL.org activities.

The synergy between the two projects is implemented through the active participation of Europeana members, supporting several of the Working Groups co-ordinated by DL.org.

DL.org's interview with Jill Cousins, Director of Europeana, is available at:
http://www.dlorg.eu/index.php?page=interview-with-jill-cousins-europeana

DL.org Working Groups

Architecture

Content

Functionality

Policy

Quality

User

Architecture Working Group – The Approach to Interoperability

Pasquale Pagano, CNR-ISTI

A considerable number of DL software systems have been implemented over the years. These software systems range from Repository Systems, that is, software supporting the development of digital repositories; to DL[Management] Systems of various types, that is, systems offering enhanced services on material aggregated from different data; and systems supporting eResearch, such as, co-operation environments supporting scientists in performing their daily research activities. These systems have been developed independently from each other with very limited effort spent on the design of facilitating technologies that promote the re-use and sharing of assets from other systems. The high costs involved are hampering the wider uptake of innovative DL applications in many domains. The purpose of DL.org's Architecture working group is to investigate the main barriers preventing different systems from working together from the architectural perspective and to propose approaches and technologies to deal with these issues.

From the Architecture perspective, interoperability concerns software systems of the DL Universe: DL Systems and DL Management Systems. The purpose of interoperability is to enable the use of **architectural components** belonging to one system (the provider) from another system (the consumer). These can be **software components**, that is, artefacts implementing a set of functions, or **system components**, such as running elements contributing to the operation of the overall system like hosting nodes and running web services.

The Architecture working group has identified two main, related aspects concerning architectural components that are particularly critical when addressing interoperability: **component profile** and **application framework**.

Each architectural component is associated with a profile that describes its characteristics, the component profile. The richer the profile, the higher the possibility of re-using the component in a context different from the context it has been developed for. For example, a profile clearly and systematically characterising the functionality implemented by a software component can enable the service of another system to dynamically select the component and aggregate it in a workflow implementing a desired functionality. Similarly, the availability of a rich system component profile can support the development of a system that automatically selects, through a match-making process, the most appropriate server from those available to host a certain software component.

The application framework characterises both the software architectures and the system architecture which the component has been conceived to work with. The framework captures component roles, component-to-component interaction patterns, and prescribes interfaces and protocols to which components should conform in order to interact, that is, exchange information. For example, the systems component conceived to operate with the support of a Registry can be successfully re-used, is a scenario that provides them with the same support. An understanding of the framework the component has been designed for is a necessary prerequisite for interoperability.

The above aspects are only very marginally addressed in current DL architectures since distribution and re-use have emerged only recently as important factors for increasing the sustainability of DL applications. Given the novelty of the topic and the complexity of the Architecture context, the Architecture working group has decided to initiate its activities by focusing on the analysis of the interoperability issues outlined above, within the context of two specific classes of **architecture components**: **content storage** components, dealing with the storage of information objects; and **content access** components, in charge of offering the necessary functionality to access information objects in all their parts and relations.

In order to pinpoint proposed solutions, the working group is also performing a survey on the approaches to interoperability with regard to the identified aspects implemented by well-known DL Systems offering content storage and access facilities.

Working Group wiki

https://workinggroups.wiki.dlorg.eu/index.php/Architecture_Working_Group

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Leader & Rapporteur: Leonardo Candela, CNR-ISTI

Members of the Architecture Working Group

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Content Working Group - Interoperability Approaches

Donatella Castelli, CNR-ISTI

Selecting, digitising, describing, and digitally curating content resources are very time-consuming activities and, often, a primary source of costs for the development of Digital Libraries. Content sharing across DLs is now being promoted as an important strategy to reduce this cost. Also, it is a fundamental approach to foster the greater visibility and use of human knowledge, as well as to generate new knowledge. However, the realisation of a broad and generalised content-sharing is still problematic due to the considerable heterogeneity of models, ontologies and strategies adopted by existing systems and because of the lack of systematic approaches to interoperability.

Content interoperability is a multi-faceted issue arising whenever two entities, usually two software systems, playing the role of provider and consumer are willing to share **information objects** initially owned by the provider only. Facets correspond to different aspects characterising the shared information objects. The level of detail is directly correlated to the level of exploitation. Hence the higher the level of detail from the consumer entity on the shared object, the greater the exploitation of the object it can perform. DL.org's Content working group aims to make progress in terms of identifying appropriate solutions to this type of interoperability. In particular, the group has decided to focus its attention on a subset of information objects characterising aspects relevant to the most common interoperability issues. For each of them, existing strategies and approaches mitigating or resolving the interoperability issues are being analysed and validated.

1. **Information Object Format** corresponds to the notion of "data type", that is, capturing the structural properties of the objects. It is a formal and intentional characterisation of all information objects. A consumer can safely and/or efficiently execute operations over an information object based on the structural "assumptions" declared by the associated information object format.

2. **Information Object Attributes** are also known as the metadata that enrich the information object for various management purposes including advanced searches. The granularity of such metadata, as well as their quality, are the defining characteristics of the pool of services that can be built by exploiting them. The wider the understanding of metadata that the consumer has, the richer the functionality it will be able to realise through its exploitation.

3. **Information Object Context** is a specific kind of metadata devised to characterise the circumstances that form the setting for the information object. This metadata capture the relations with other entities like people, places, moments in time or abstract ideas that complement the object semantics. The relations that link the contextual entities to the objects, in addition to the nature of the contextual entities themselves, are aspects the provider and consumer entities are interested in sharing.

4. **Information Object Provenance** is a specific kind of information object metadata describing the process causing the object to be in its current state. This information is usually context and time -specific, with regard to the aspects captured and their representation, as well as in terms of the objects and processes referred. While standard models for provenance representation are emerging, the heterogeneity of the expected content is a barrier that the provider and consumer have yet to overcome.

5. **Information Object Identifier** is a token bound to the information object that sets it apart from others within a certain scope. Achieving interoperability for this particular aspect would enable the provider and consumer to univocally refer to the same information object.

To systematise this activity, the Content working group has started to develop a comprehensive interoperability framework capturing the multi-faceted nature of interoperability issues and solutions. In addition, activities dedicated to characterising interoperability issues, identifying and analysing existing approaches and solutions are on-going and will be the main focus of the group.

Content Working Group wiki

https://workinggroups.wiki.dlorg.eu/index.php/Content_Working_Group

Scientific chair & leader: Donatella Castelli, CNR-ISTI

Rapporteur: Leonardo Candela, CNR-ISTI

Members of the Content Working Group

Detlev Balzer, European Film Gateway; Leonardo Candela, CNR-ISTI; Donatella Castelli, CNR-ISTI; Stefan Gradmann, Humboldt University; C.H.J.P. (Kees) Hendricks, Naturalis (Dutch National Museum of Natural History); Paolo Manghi, CNR-ISTI; Carlo Meghini, CNR-ISTI; Luc Moreau, School of Electronics & Computer Science, University of Southampton; and John Mylopoulos, University of Toronto.

The Functionality Working Group Towards richer digital library functionality, interoperability, and re-use

Dagobert Soergel, University at Buffalo

The Functionality Domain represents the richest and most open-ended dimension of the world of DLs, as it captures all the processing that can occur on resources and activities that can be observed by actors in a DL. Specific interoperability issues that fall within the functionality domain should be primarily related to the traits and properties of the Function concept.

> *In the DELOS Reference Model, a "function" denotes an action that a DL component or a DL user performs. Thus a "function" is not restricted to mathematical function nor to functions in the programming sense.*

The goal of DL.org's Functionality working group is to **support rich functionality** over a wide range of systems with a consistent interface. This will be accomplished by expanding the Reference Model so that it provides a framework for the **precise description of functions**, and **software modules** implementing these functions for complementary and mutually dependent purposes. Such purposes encompass educating DL designers, developers, administrators, and users about the rich array of DL functionality, including detailing the description of individual DL functions, thus fostering best practices and innovation. The finding and re-using of software modules that implement the desired functionality is targeted at three groups of people: software developers, DL managers and users.

- Software developers will be able to incorporate existing modules into the module they are developing, either by incorporating the code or by calling another module as a service.
- DL managers will be able to use these modules in configuring a DL system.
- "on the fly" solutions will enable users to adopt a module to accomplish a given task.

Additionally, the aim is to design and implement **new software modules** that include the desired functionality and that are interoperable with targeted platforms and other modules.

The focus of the working group is not on the syntax of a module or service descrip-

tion, that is, handled by Web standards, but on the **content**. The aim is to provide a very specific vocabulary for the description of a function, such as "browse" to capture sub-functions, characteristics, and interface features so that it is possible to tell from the description whether a given module implementing "browse" meets the requirements at hand.

A number of products are envisioned as outputs from the working group and from subsequent work carried out on the basis of the principles established by its members. One output will be a document describing best practices with regard to functionality coupled with a vision for DL functionality. Work within the group will lead to an improved, more complete and much more detailed functionality section of the Reference Model in terms of both content and presentation, with different modes of presentation for different audiences. The selected functions serve as a starting point to pave the way for the full implementation of this idea, which requires considerable collaborative effort within the framework established by this working group.

The group is leading discussions and focusing on explanations of both the different ways in which functions can interoperate and of the "product compatibility" of functions, which, from a user's point of view, equates with similarity in operations as well as look and feel. The exchange of expertise will also enable the development of a template, based on the extended Reference Model, for the creation of a **detailed functionality profile of a DL**, a **DL software system**, or a **DL software module** and the **associated interfaces**.

These functionality profiles could be used to compare two DLs or software modules or to find a software module that would make "DL B" more interoperable and/or more product-compatible with "DL A". This will provide the basis for the collaborative creation of a collection of functionality profiles of important DLs to be used as a guideline by other DLs. Similarly, the group envisions an inventory or a registry of DL software systems and modules with functionality profiles compiled collaboratively.

Another key outcome is a pilot in which two large DL systems share information about functions using the tools mentioned above. Related activities comprise teaching modules about DL functionality, forming part of DL.org's training programme with both eCourses and a summer school.

One or more papers produced by individual members of the working group or by the group as a whole will bring into sharp relief key discussion points, conclusions and outputs, with the aim of informing the community at large and enlisting wider collaboration.

Functionality Working Group Wiki

https://workinggroups.wiki.dlorg.eu/index.php/Functionality_Working_Group

Scientific Chair: Dagobert Soergel, University at Buffalo

Leader: George Athanasopoulos, University of Athens

Rapporteur: Eleni Toli, University of Athens

Members of the Functionality Working Group

George Athanasopoulos, University of Athens; Vassilis Christophides, University of Crete; Ed Fox, Virginia Tech; Yannis Ioannidis, University of Athens; George Kakaletris, University of Athens; Natalia Manola, University of Athens; Carlo Meghini, CNR-ISTI; Andreas Rauber, Vienna University of Technology.

Policy Working Group - Interoperability Approaches

Perla Innocenti, University of Glasgow

The DL.org Policy working group is chartered with investigating and proposing DL interoperability requirements from the perspective of quality. Taking the DELOS Reference Model as an initial conceptual framework, the working group will define policy interoperability and investigate approaches and strategies related to policy classification. The working group will define policy interoperability for DLs as "**business level interoperability**", because, within a policy framework, it is possible to compare and trust values and purposes of each organisation. This type of interoperability not only concerns **peer-to-peer interoperability** but also about the **interoperable policies** of third-party service providers, such as data archives and the policy exchanges with cloud providers.

The Working Group is investigating approaches and strategies related to policy classification, with a focus on Policy as defined in the Reference Model:

- Manual versus automated policies, in particular how to encode those policies for machine discovery, which languages can be used to represent policies, and making them functional, with particular attention to semantic web technologies.

- Policy management with special emphasis on how policies are appraised and enforced.

- The evolution of policies over time.

- The interconnectedness between policy and quality.

The working group is also exploring policies outside the traditional DL domain, including the W3C Policy Working Group, policies from the medical domain and the Open Access Initiative. Brief **descriptive user scenarios** that are being produced serve to support the collection and definition of best practices for the use of policies in the DL domain, while the suggestions proposed by this group for a standard terminology vocabulary for policy interoperability will be deliberated with the members of the other groups.

The Policy working group collaboratively contributes to DL.org outputs, such as the state-of-the-art survey and the enhancement of the Reference Model, while working in close synergy with the Quality working group given the close connections

between the two concepts and charters.

The Policy group has provided an initial set of recommendations for the enhancement of the policy section within the Reference Model and has completed a preliminary investigation into existing approaches and best practices with regard to interoperability requirements and policies for digital libraries across multiple domains, scientific literature and pertinent projects.

Future activities of the group will focus on further recommendations for the enhancement of the Policy section within the Reference Model and DL.org's **Digital Library Technology & Methodology Cookbook**. The group will continue its investigation into existing approaches and best practices in relation to interoperability requirements and policies for digital libraries and will contribute to the DL.org Summer School, and publication of the working group outcomes.

"There is real potential for this group to provide some useful leadership and guidance". **Steve Knight**, Manager of Digital Strategy Implementation, National Library of New Zealand

Policy Working Group wiki

https://workinggroups.wiki.dlorg.eu/index.php/Policy_Working_Group

Scientific Chair: Steve Knight, National Library of New Zealand

Leader: Perla Innocenti, University of Glasgow

Rapporteur: Perla Innocenti, University of Glasgow with the support of Kevin Ashley, University of London Computer Centre (ULCC)

Members of the Policy Working Group

Kevin Ashley, University of London Computer Centre (ULCC); Antonella De Robbio, University of Padua; John Faundeen, U.S. Geological Survey's – USGS; Perla Innocenti,

University of Glasgow; Steve Knight, National Library of New Zealand; Hans Pfeiffenberger, Alfred Wegener Institute; Seamus Ross, University of Toronto; and Mackenzie Smith, MIT Libraries.

Quality Working Group - The Quality Concept

Giuseppina Vullo, University of Glasgow

Today only a small fraction of all the work on DLs are devoted to quality. DL.org's Quality working group agrees that a **DL Quality framework** is needed to allow DLs to co-operate and share experiences. In this regard, investigating Quality Interoperability within DLs means taking into account several definitions of quality:

• what and how to measure the different approaches, including the quality of content, quality of services and quality of policies, in addition to DL organisational contexts.

The Quality working group is thus chartered with investigating interoperability issues that prevent DLs from working together from the perspective of quality and selects the most pressing issues for further deliberation. The group, which adopts the DELOS Reference Model as its conceptual framework, is working to identify effective and **interoperable quality patterns** and **best practices.**

The aim of the working group is also to promote the exchange of experiences and co-operation between DL initiatives, looking towards the implementation of a common vocabulary in the field and the constitution of a shared framework. The first face-to-face meeting in July 2009 initiated the investigation into existing research and best practices with regard to DL interoperability and quality models. After defining its official charter, which incorporates its mission and scope, the group has agreed on a **quality pattern** serving as a basis for a **core model**, grounded on the **quality concept map** defined in the Reference Model and intended to promote a broadly applicable quality framework to encourage DLs to interoperate.

The group is currently focusing on the development of this quality core model, with the aim of delivering a set of **recommendations**, which will inform both the enhanced Quality Section in the Reference Model and DL.org's **Digital Library Technology and Methodology Cookbook**. Additionally, the group will conduct a further investigation into existing approaches and best practices regarding interoperability requirements and quality, contribute to the DL.org Summer School in spring 2010, and publish its findings and outcomes.

"In the networked world where people work increasingly on the network, the interoperation between DLs is a network property. Individual libraries may increase interoperability by adherence to standards, but the quality of interoperation with

other DLs is as much determined by the quality of the standards. The DL.org Quality Working Group is working enthusiastically to offer a quality framework within the interoperability of DLs networks, fostering knowledge exchange and co-operating with other international initiatives." **Dirk Roorda**, Infrastructure Coordinator, DANS, Royal Netherlands Academy of Arts and (http://www.dans.knaw.nl), a member of the Quality Working Group

Quality Working Group wiki

https://workinggroups.wiki.dlorg.eu/index.php/Quality_Working_Group

Scientific Chair: Nicola Ferro, University of Padua

Leader & rapporteur: Giuseppina Vullo, University of Glasgow

Working Group Testimonial for the ECDL09 Workshop: Sarah Higgins, Digital Curation Centre (UK)

Members of Quality Working Group

Genevieve Clavel, Swiss National Library; Nicola Ferro, University of Padua; Sarah Higgins, Digital Curation Centre (University of Edinburgh); Wolfram Horstmann, University of Bielefeld; Sarantos Kapidakis, Department of Archives and Library Sciences, Ionian University; Dirk Roorda, DANS, Royal Netherlands Academy of Sciences; Seamus Ross, University of Toronto; Tefko Saracevic, School of Communication, Information and Library Science, Rutgers University; and Giuseppina Vullo, University of Glasgow.

User Working Group - Towards User Interoperability

Yannis Ioannidis, University of Athens

The User Domain is very critical in a Digital Library and represents all the entities that are external to a DL 'system' and interact with it seeking a satisfactory and fruitful experience. As defined in the DELOS Reference Model, the dominant concept of this domain is that of "**Actor**", which could be an **individual person**, a **group of people acting in unison**, or **inanimate entities**, such as software programmes or physical instruments. Digital Libraries connect actors with content and support them in their ability to consume and make creative use of it to generate new content. "**User**" is thus an **umbrella concept** including all notions related to the representation and management of actor entities within a DL. It encompasses such elements as the rights that actors have within the system and the profiles of actors with characteristics that personalise the system's behaviour or represent these actors in collaborations.

The User working group has a threefold goal:

- Identifying and deliberating the most important interoperability issues that prevent heterogeneous DL systems from working together from the User perspective.

- Discussing the state-of-the-art regarding implementations that resolve the interoperability issues identified.

- Proposing patterns of approaches that are effective in such a resolution.

The Reference Model, which serves a multi-faceted role within DL.org, facilitates the activity of classifying DL interoperability concerns and provides a framework upon which the focus of the User working group is based. After several successful discussions, the group has identified **two categories** of **user-level issues** relevant to the interoperability of Digital Libraries (DLs) and Digital Library Systems (DLSs): interoperability with regard to what is captured within each DL or DLS about a user, as well as interoperability between actors through their use of the DL. These two are the focus of the efforts of the working group and are briefly analysed below.

Use-level interoperability of DLs arises with respect to issues such as user modelling, user profiling, user context, and user management. The user model captures the kind of information about an individual user that is essential for an adaptive system to behave differently towards diverse users. An instantiation of a user model is a

user profile. With interoperable user models and profiles, DL systems provide users with a **personalised DL usage experience**. Up to now, however, there is no generally accepted user model that can be used in every DL application and that can ensure that a profile created within a certain DL may be moved effortlessly to another.

A potential solution could be to describe and put in place appropriate **mapping mechanisms** within DLs to be able to map between different user models. However, identifying such mapping is far from trivial. On the one hand, there is the issue of **user rights** and how they are propagated from one DL to the other. On the other, there is the issue of **reconciliation of different** and, in some instances, even conflicting **preferences** or **user profile characteristics**. Furthermore, user context includes issues of how "external" factors affect the user profile and result in differences in user preferences and actions when interacting with a DL. In this sense, user context interoperability may be seen as a generalisation of that of user profiles as the user is one aspect of the context. Interoperability in terms of **user management** refers to the ability of heterogeneous DL systems to work in synergy on issues that are intimately bound up with users' privileges, therefore applying concrete and shared, but transparent to the end-user, authentication and authorisation policies. Interoperability between actors through their use of the Digital Library is related to **user-to-user interactions** and chiefly includes issues of collaboration and "social" networking in the context of the DLs.

Several outcomes are expected to be produced by the working group deliberations and from subsequent work carried out on the basis of the principles established within them. **A state-of-the-art survey** will be produced which will further serve as the groundwork for identifying and evaluating the most appropriate solutions and will lead to the creation of the part of the **Digital Library Technology and Methodology Cookbook** related to the **User Domain.** Furthermore, the work within the group will lead to an improved, more complete and more detailed "User Section" in the Reference Model. Additional outcomes include contributions to DL.org activities, such as the creation of training material related to user interoperability that will form part of the project's training programme with both eCourses and a Summer School.

User Working Group wiki

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DL.org's Strategic Alliances

Strategic Alliances

DL.org is creating a pool of Strategic Alliances that can work in partnership with the project to lay down the foundations of DL systems and pave the way for the development of large-scale interoperable DL infrastructures. Strategic Alliances will offer insight into current and emerging standards, policy and quality issues for DL interoperability with a cross-domain focus and by harnessing the expertise that exists on an EU and global level, particularly DL.org Working Groups and Liaison Groups. Knowledge Exchange through the Strategic Alliances will thus underpin the core technical work within DL.org, with the aim of addressing key issues surrounding interoperability challenges.

Representatives from Strategic Alliances are invited to contribute to DL.org dissemination activities through interviews and special reports on themes of mutual interest, spanning from interoperability issues, best practices, policy and standards, as well as cross domain perspectives on DLs. Input through Strategic Alliances will not only underpin the core technical work within DL.org, but will also play a key role in promoting the benefits of DL interoperability, and guide the development of the next generation DL systems by capturing and sharing knowledge on interoperability efforts across a spectrum of domains. The following Strategic Alliances have been established to date:

CASPAR (Cultural, Artistic and Scientific knowledge for Preservation, Access and Retrieval) is a digital preservation project partially funded by the EC, bringing together key digital holdings with scientific, cultural and creative expertise, commercial partners, and leading organisations in the field of information preservation. **Website**: *www.casparpreserves.eu*

D4Science is one of the main European e-Infrastructure projects. Co-funded by the EC, D4Science aims to continue the path that the GÉANT, EGEE, and DILIGENT projects have initiated towards establishing networking, grid-based, and data-centric e-Infrastructure that accelerates multi-disciplinary research by overcoming several crucial barriers that stand in the way, primarily those related to heterogeneity, sustainability and scalability. **Website**: *www.d4science.org*

DANS (Data Archiving and Networked Services) is an institute under the auspices of Royal Netherlands Academy of Arts and Sciences (KNAW) which is also supported by the Netherlands Organisation for Scientific Research (NWO). Since its establishment in 2005, DANS has been storing and making research data in the arts and humanities and social sciences permanently accessible. **Website**: *www.dans.knaw.nl/en*

Digital Curation Centre (UK),the DCC DIFFUSE Standards Frameworks aims to provide a single point of access to a range of standards and specifications related to the curation and preservation of access to data and other digital materials. **Website**: *www.dcc.ac.uk*

Digital Preservation Coalition (DPC), a not-for profit membership organisation whose primary objective is to raise awareness of the importance of the preservation of digital material and the attendant strategic, cultural and technological issues. **Website**: *www.dpconline.org*

DRAMBORA (Digital Repository Audit Method Based on Risk Assessment) presents a methodology for self-assessment, encouraging organisations to establish a comprehensive self-awareness of their objectives, activities and assets before identifying, assessing and managing the risks implicit within their organisation.**Website**: *www.repositoryaudit.eu*

DRIVER-II, an EC-funded project focusing on a fully functional, state-of-the art service by extending the original DRIVER-I network to a larger confederation of repositories. DRIVER-II aims to demonstrate the successful interoperation of the data network as an integral part of the e-infrastructure for research and education in Europe, performing a path-finding role towards a European knowledge infrastructure. **Website**: *www.driver-community.eu*

DuraSpace is the joint organisation of Fedora Commons and the DSpace Foundation to provide leadership and innovation in open source technologies for global communities who manage, preserve, and provide access to digital content. **Website**: *duraspace.org*

E-LIS (E Prints in Library and Information Science) aims to further the Open Access philosophy by making available papers in LIS and related fields. It is a free-access international archive, in line with the Free Online Scholarship (FOS) movement and the Eprints movement, based on the Open Archive Initiative (OAI) standards and protocols. **Website**: *eprints.rclis.org*

Europeana, Europe's multilingual digital library, currently hosts 4.6 million digitised books, maps, photographs, film clips and newspapers accessible to internet users. The target is to bring the number of digitised objects to 10 million by 2010. **Website**: *www.europeana.eu/portal/*

European Film Gateway (EFG) is developing an on-line portal, providing direct access to about 790,000 digital objects including films, photos, posters, drawings, sound material and text documents. EFG is part of the Europeana project group supported by the EC. **Website**: *www.europeanfilmgateway.eu*

EU Provenance aims to conceive, design and implement an industrial strength open provenance architecture for grid systems, and to deploy and evaluate it in complex grid applications, namely aerospace engineering and organ transplant management. **Website**: *www.gridprovenance.org*

Fedora Commons, a non-profit organisation, is the home of the unique Fedora open source software, a robust integrated repository-centered platform that enables the storage, access and management of virtually any kind of digital content. **Website**: *fedora-commons.org*

GRL2020 - A Vision for Global Research Libraries is a think-tank set up to form a vision shaping the evolution of digital and research libraries to overcome top-level challenges, such as curation issues regarding the huge amounts of digital content and ensuring that researchers are provided with new services for exploiting data so that new knowledge can be generated more effectively. **Website**: *www.grl2020.net*

Helmholtz Open Access supports scientists as well as the respective Helmholtz Centres in the realisation of Open Access to research data as an essential asset for scientific culture now and in the future. **Website**: *oa.helmholtz.de/index.php?id=137*

Library of Congress is playing a pioneering role in tackling the challenges bound up with rapid advances in the arena of digital libraries on both an institutional level and through the National Digital Information Infrastructure and Preservation Program (NDIIPP), the mission of which is to develop a national strategy to collect, archive and preserve the burgeoning amounts of digital content for current and future generations. **Websites**: *http://www.loc.gov/index.html* and *http://www. digitalpreservation.gov/*

National Digital Heritage Archive, National Library of New Zealand refers to the technology, new business processes and other organisational changes the National Library has put in place to provide on-going preservation of and access to and pres-

ervation of digital heritage collections under the guardianship of the National Library and Alexander Turnbull Library. **Website**: *www.natlib.govt.nz/*

OGF-Europe is aligned with the Open Grid Forum's (OGF) mission of fostering the pervasive adoption of distributed computing through open, barrier-free standards with a focus on domains, sectors and technology trends key to European innovation. DL.org's alliance with OGF and OGF-Europe leverages the expertise of OGF's Digital Repositories Research Group (OGF DR-RG), aimed at developing standards for DRs and enhancing current specifications. **Website**: *www.ogfeurope.eu*

Papyrus is aimed at being a dynamic digital library that understands user queries in the context of a specific discipline, looks for content in a domain alien to that discipline and return the results presented in a way that is both useful and comprehensive to the user validated through a use case focusing on the recovery of history from digital news content. **Website**: *www.papyrusonline.com*

Planets (Preservation and Long-term Access through Networked Services) is an EC-funded project to address core digital preservation challenges. Planets will deliver a sustainable framework to enable long-term preservation of digital content, increasing Europe's ability to ensure access in perpetuity to its digital information. **Website**: *www.planets-project.eu*

SHAMAN (Sustaining Heritage Access through Multivalent ArchiviNg), funded by the EC, is aimed at creating a technology environment which may be used to manage the storage, access, presentation, and manipulation of potentially any digital object over time. SHAMAN mitigates losses of socially valuable digital assets and minimises costs of poor digital content management, while generating new value-added services. **Website**: *shaman-ip.eu/shaman*

SIMILE (Semantic Interoperability of Metadata and Information in unLike Environments) is focused on developing robust, open source tools that empower users to access, manage, visualise and reuse digital assets. SIMILE is a joint project conducted by the MIT Libraries and MIT CSAIL seeking to enhance interoperability among digital assets, schemata/vocabularies/ontologies, metadata, and services. **Website**: *simile.mit.edu*

STERNA (Semantic Web-based Thematic European Reference Network Application) is the contribution of twelve European natural history museums and other institutions that collect and hold content on biodiversity, wildlife and nature in general, to the objectives and realisation of a European Digital Library. **Website**: *www.sterna-net.eu*

Swiss National Library collects all publications relating to Switzerland. Established in 1895, it holds today more than three million documents that are available to the public. The NL also houses special collections, such as the Swiss Literary Archives, the Print Room and the Dürrenmatt Centre Neuchâtel. **Website**: *http://www.nb.admin.ch/slb/index.html?lang=en*

TrebleCLEF supports the development and consolidation of expertise in the multi-disciplinary research area of multilingual information access (MLIA) and disseminates this know-how to the application communities through a set of complementary activities. *Website: www.trebleclef.eu*

How to Get Involved with DL.org

For more information & to get involved with DL.org and its Working Groups:

DL.org website: *http://www.dlorg.eu/*

Working Groups home page:

https://workinggroups.wiki.dlorg.eu/index.php/Main_Page

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