



Digital Library Conformance Checklist

www.dlorg.eu



Digital Library Conformance Checklist

DL.org Digital Library Conformance Checklist

This booklet is abstracted and abridged from “The Digital Library Reference Model”, D3.2b DL.org Project Deliverable, April 2011

www.dlorg.eu

Authors

S. Ross¹, D. Castelli², Y. Ioannidis³, G. Vullo¹, P. Innocenti¹, L. Candela², A. Nika³, K. El Raheb³, A. Katifori³

¹ HATII, University of Glasgow

² ISTI-CNR, National Research Council of Italy

³ University of Athens

⁴ University of Toronto

Acknowledgements

This work has been partially supported by DL.org (December 2008-February 2011), a Coordination and support action, received funding from the Commission of the European Union (EC) under the 7th Framework Programme ICT Thematic Area “Digital libraries and technology-enhanced learning” through the EC’s Cultural Heritage and Technology Enhanced Learning Unit.

Disclaimer

The content of this booklet is the sole responsibility of the DL.org Consortium and does not reflect the views of the European Commission. The DL.org Consortium is not responsible for any use that might be made of the information herein.

Design and editorial work by Trust-IT Services

Printed by Osmotica



Introduction

Digital libraries are ubiquitous. They present themselves in a diversity of forms, offer a variety of services, and hold many different types of digital materials (e.g. publications, data, images). Digital libraries are complex entities. Indeed, the heterogeneous character, purpose, and functionality of digital libraries are reflected in the variance in definitions of them. They require the integration and application of wide range of methods and disciplines data management, information retrieval, library and information sciences, human-computer interaction, and digital curation (Innocenti, Vullo, Ross, 2010). They all share certain essential characteristics, although the specific ones may vary from digital library (DL) to DL.

The DELOS Network of Excellence[1], which worked from 2004 to 2008, made significant strides in defining the essential DL concepts and relationships and presented the results of this research in the first DL reference framework: the Digital Library Reference Model (Candela et al., 2007). It provided a common vocabulary to facilitate communication between researchers, users, and designers of digital libraries. It also laid out the digital library concepts in a clear and structured way. The model was heavily revised with the guidance and contributions the international members of a range of DL working groups during the DL.org project (Candela et al., 2011).

Since its release the DL Reference Model has become increasingly recognised as the lingua franca of digital library researchers, designers, and practitioners. Yet there was no established definition of “Reference Model compliance”, nor a tool by which a researcher, librarian, or user (whether an end user or a depositor) could check existing systems against the Reference Model in a structured, consistent, repeatable, and managed way. The DL.org research team responded by developing the DL Reference Model Checklist, a tool to check whether or not a digital library is compliant with the Digital Library Reference Model and to assess its level of compliance. This booklet presents the structure of the Digital Library Reference Model Conformance Checklist, and introduces the audit process according to its main phases.

References:

Innocenti P., Vullo G., Ross S., Towards a Digital Library Policy and Quality Interoperability Framework: the DL.org Project, New Review of Information Networking, 2010, 15(1), 29-53, ISSN 1361-4576

Candela L., Castelli D., Ferro N., Ioannidis Y., Koutrika G., Meghini C., Pagano P., Ross S., Soergel D., Agosti M., Dobрева M., Katifori V., Schuldt H.: The DELOS Digital Library Reference Model. Foundations for Digital Libraries, version 0.98, DELOS: A Network of Excellence on Digital Libraries (December 2007) - Project no. 507618

Candela L., Athanasopoulos G., Castelli D., El Raheb K., Innocenti P., Ioannidis Y., Katifori A., Nika A., Vullo G., & Ross S. (2011). The Digital Library Reference Model. DL.org Project Deliverable.

[1] DELOS URL – <http://www.delos.info/>

[2] DL.org URL – <http://www.dlorg.eu/>



Scope of the Conformance Checklist

In a wide range of domains from aviation to construction and from healthcare to project management checklists are increasingly common as a mechanism to control process quality (e.g. by reducing errors), to ensure compliance with performance guidelines, to provide transparent mechanisms for understanding and using complex systems, and to facilitate consistency of action between practitioners. They enable audit consistency, and provide a method for understanding complex systems. The DL.org project has elaborated this Digital Library Reference Model Conformance Checklist to provide a set of statements that will enable assessors to determine whether or not their library is compliant with the Digital Library Reference Model, to enable those designing a new digital library to determine whether or not their planned library application is compliant with the Digital Library Reference Model, and to make it feasible for those who would like to use a digital library to hold their content, as a resource, or for any other purpose to establish its compliance. The structured nature of the checklist reduces ambiguity, a common aspect of assessments of this kind. Within the realm of digital libraries, The *Digital Library Reference Model* delivers a common vocabulary and model for communication on digital libraries and their characteristics. The DL.org Checklist supports assessment of compliance of digital libraries and systems with the model and comparisons between different digital libraries.

This checklist has been designed to be used by assessors, from a system designer to a digital librarian or from a funder to a digital library content contributor who seeks to determine whether or not their digital library, or a specific digital library service or system, conforms to the Digital Library Reference Model. It will help DL designers involved in building new digital library services or systems to assess whether or not their design will deliver a digital library management system that conforms to the Digital Library Reference Model. The checklist will allow an auditor (or researcher) to internally or externally assess information systems, which claim to be digital libraries, for conformance with the Digital Library Reference Model. Digital Library depositors and users will be able to make their own assessments with the checklist. It is expected that these roles overlap. While we intend that the users of the checklist should be varied, we recognise that only staff (or auditors) with broad access to the digital library at several core levels will be able to complete all the checklist sections, and that a complete assessment will require the participation of more than one Digital Library actor.

There will be many ways to use the results of applying the checklist. For instance, a registry of assessed digital libraries might be created and maintained to make available the conformance



checklist results; such a registry would help policy makers and Digital Library managers to identify the key steps towards the implementation or development of a digital library, or even specific components or services to strengthen and innovate. Alternatively, Digital Library Designers might use the Check list in an inspirational way to test whether or not the Digital Library that they are proposing to develop conforms to the model.

The checklist – in conjunction with the Digital Library Reference Model – can also be used as an educational tool; the process of employing the Digital Library Reference Model requires the user to ask questions and to develop an appreciation of the Reference Model's attributes and subtleties. With the checklist in place, teachers will be able to use it in conjunction with the Digital Library Reference Model to enable students to study different digital libraries and to develop an understanding of their attributes and their processes.

The following set of criteria results from an analysis of the Digital Library Reference Model concepts and relationships. These criteria have been selected because of their discriminating power with respect to defining whether a 'digital library' conforms to the characterisation of such systems as envisaged by the Digital Library Reference Model. The presentation of the criteria is structured according to the six domains characterising the digital library service (Content, User, Functionality, Policy, Quality and Architecture) for the sake of usability and interoperability between the Checklist and the model.

Moreover, criteria are classified as (a) mandatory, i.e. features that a 'digital library' must have; (b) recommended, i.e. features that characterize "good" 'digital libraries'; or (c) optional, i.e. features that can distinguish a 'digital library' from another one.



Content-oriented Criteria

The following criteria have been selected to verify whether or not the 'digital library' conforms to the Digital Library Reference Model from the Content domain point of view.

MANDATORY

Regardless of the type of Content a 'digital library' was conceived to hold, it must meet at least the following criteria:

- » The Digital Library must manage a set of **Information Objects** and the set cannot be empty. By definition the purpose of a digital library is to collect, manage and preserve in perpetuity digital content.
- » Every **Information Object** must have (**identifiedBy**) a unique identifier (**Resource Identifier**). This guarantees that each Information Object managed by the 'digital library' is distinguishable from the remaining ones in the context of the same 'digital library'.
- » Every **Information Object** must have at least one element of **Metadata (hasMetadata)** associated with it. This ensures that each Information Object is equipped with data supporting its management and use.
- » Every **Information Object** must belong (**belongTo**) to at least one **Collection**. This guarantees that the overall set of Information Objects managed by the 'digital library' pertains to an organized body.
- » Every **Collection** must have (**identifiedBy**) a unique identifier (**Resource Identifier**). This establishes that each Collection managed by the Digital Library is distinguishable from any others in the context of the same Digital Library.
- » Every **Collection** must have at least one element of **Metadata (hasMetadata)** associated with it. This asserts that each Collection is equipped with data supporting its management and use.

RECOMMENDED

Additional desired properties of a 'digital library' are:

- Every **Information Object** should conform to (**hasFormat**) an explicit and known format (**Resource Format**).
- This guarantees that the system is aware of the "structure" each Information Object



conforms to and that this structure is publicly declared thus making the Information Object usable by third party actors whether human or machine. The notion of Resource Format is wide and might range from an abstract one (e.g. “enhanced publication”) to a concrete one (e.g. PDF).

- Every **Metadata** should conform to (**hasFormat**) an explicit and known format (**Resource Format**).
- This criterion – a specialization of the previous one – ensures that the system is aware of the “structure” the metadata object conforms to and that this structure is publicly declared so that it can be used by third party actors whether human or machine. In this case the notion of Resource Format corresponds to the notion of metadata schema.
- Every **Annotation** should conform to (**hasFormat**) an explicit and known format (**Resource Format**).
- This criterion guarantees that the system is aware of the particular “structure” to which the annotation object conforms. Being publicly declared, this structure can be used by third party actors whether human or machine.
- Every **Collection** should have a well-defined intension, i.e., the set of criteria characterising **Collection** membership (**hasIntension**), and should have a well-defined extension, i.e., the set of **Information Objects** belonging to the collection (**hasExtension**).
- The collection concept is fundamental to keep the set of Information Objects organised. Because of this, it is recommended that both the set of Information Objects belonging to a collection and the criteria driving the membership of an information object into a collection are clearly defined.
- Every **Information Object** should be regulated (**regulatedBy**) by **Policies**.
- Policies are essential to establish conditions, rules, terms or regulations governing the management of information objects.

OPTIONAL

Finally, a ‘digital library’ may also meet the following set of criteria:

- * An **Information Object** may have multiple **Editions** (**hasEdition**) each represented by a different related **Information Object**.
- * A ‘digital library’ might be employed to manage multiple editions of the same work. In these cases it is important to deal effectively with the edition concept.
- * An **Information Object** may have multiple **Views** (**hasView**) each represented by a different related **Information Object**.



- * A 'digital library' might be called to manage multiple "views"/"expressions" of the same conceptual work. In these cases it is important to properly deal with the view concept.
- * An **Information Object** may have multiple **Manifestations (hasManifestation)** each represented by a different related **Information Object**.
- * A 'digital library' might be called to manage multiple "items" of the same conceptual work or view. In these cases it is important to properly deal with the manifestation concept.
- * An **Information Object** may be compound (**hasPart**), i.e., it may consist of multiple **Information Objects**.
- * Modern 'digital libraries' are usually expected to deal with emerging forms of "documents". Very often such a "documents" consists of aggregates of other objects (of different media).
- * An **Information Object** may be associated (**associatedWith**) with other **Information Objects** for a certain **Purpose**.
- * Managing compound objects may require links other objects. The motivations leading to linking are diverse and context specific, e.g., citation and lineage.
- * An **Information Object** may have multiple elements of **Metadata (hasMetadata)** associated with it.
- * Metadata are a type of Information Object intended to support the management and use of the Information Objects to which they are attached. Different metadata can be conceived to support diverse needs. The majority of 'digital libraries' tend to deal with a single metadata format.
- * An **Information Object** may be associated with multiple **Annotations (hasAnnotation)**.
- * Annotations are kinds of Information Objects that are attached to existing Information Objects for various purposes including objects enrichment and cooperative working.
- * A **Collection** may be associated with multiple **Metadata (hasMetadata)**.
- * According to the Reference Model, Collections are a type of Information Object. Because of this, they inherit all the features of Information Objects and benefit of multiple metadata.
- * A **Collections** may be associated with multiple **Annotations (hasAnnotation)**.
- * According to the Reference Model, Collections are a type of Information Object. Because of this, they inherit all the features of Information Objects and benefits of multiple annotations.



User-oriented Criteria

The following criteria have been selected to verify whether or not the 'digital library' conforms to the Digital Library Reference Model from the User domain point of view.

MANDATORY

Regardless of the type of Users a 'digital library' is conceived for, it must meet at least the following criteria:

- » The Digital Library must serve a clearly identified set of **Actors** and *this can not be an empty set*. Actors represent the entities that interact with any digital library 'system', i.e., humans and inanimate entities such as software programs or physical instruments. This guarantees that they exist, i.e., there is no 'digital library' without users interacting with it.
- » Every **Actor** must have (**identifiedBy**) a unique **Resource Identifier**. This guarantees that every Actor is distinguishable from other Actors in the context of the same 'digital library'.
- » Every **Actor** must be described (**model**) by at least one **Actor Profile**. This guarantees that every Actor uses the 'digital library' and interacts with it as well as with other Actors in a personalised and codified way.
- » Every **Actor** must act (**play**) with at least one **Role**. This guarantees that an Actor cannot interact with a Digital Library if its role is not specified.
- » The set of managed **Roles** must include the **DL Manager Role**. DL Managers are Actors that exploit DLMS facilities to define, customise, and maintain the DL service.
- » The set of managed **Roles** must include the **DL Software Developer Role**. DL Software Developers exploit Digital Library Management System facilities to create and customise the constituents of the Digital Library Systems.
- » The set of managed **Roles** must include the **End-user Role**. This guarantees that the digital library supports at least typical end-user roles, like content consumers, content creators or digital librarians.

RECOMMENDED

Additionally, a Digital Library should meet the following criteria:

- Every **Actor** should perform (**perform**) **Actions** that apply (**apply**) **Functions** and concern (**concern**) **Resources**. Every Actor that interacts with a digital library should be able to perform certain Actions that involve the application of Functions and specific Resources.



OPTIONAL

Finally, a Digital Library may meet the following criteria:

- * **Actors** may belong to (**belongTo**) more than one **Group**.
- * During the interaction of an Actor with a Digital Library, the Actor may communicate or collaborate with other Actors that belong to various Groups; thus, the specific Actor may participate in different Groups. The concept of Group in the User domain has commonalities with the concept of Collection in the Content domain, it is a mechanism to organise Actors.

Functionality-oriented Criteria

The following criteria have been selected to verify whether or not the 'digital library' conforms to the Digital Library Reference Model from the Functionality domain point of view.

MANDATORY

Regardless of the type of Functionality a 'digital library' is conceived for, it meets at least the following criteria:

The Digital Library must offer a clearly identified set of **Functions** and this can not be an empty set.

- » The purpose of the DL is to offer functions, i.e., a particular processing task that can be realised on a Resource or a Resource Set as the result of an Action of a particular Actor.
- » Every **Function** must have (**identifiedBy**) a unique identifier (**Resource Identifier**). A Function is a Resource, thus it must be identified by a persistent identifier if it is to be distinguished from other Functions managed by the DL.
- » Every **Function** must be performed (**perform**) by **Actors**. DL Functions are the implementations of functions and services enabling Actors to interact with the DL.
- » Every **Actor** must be provided with (**perform**) **Functions** to **Access Resources**. The DL must implement functions to enable actors to access, e.g., discover, acquire and visualize, all types of Resources (Information Objects, Actors Profiles).
- » Every **Actor** must be provided with (**perform**) **Functions** to **Discover Resources**. Actors must be able to find the desired Information Objects, search and access not only the DL Content, but also other Actors or Functions.
- » Every **DL System Administrator** must be provided with (**perform**) **Functions** to **Manage & Configure DLS**. DL must implement functions for handling the DLS and configuring its settings.



RECOMMENDED

Additionally, a Digital Library should meet the following criteria:

- Every **Function** should be able to interact with (**intertactWith**) other **Functions**.
- DL functions should exchange information with other functions regulating their behaviour and performance.
- **Functions** to **Acquire (actOn) Resources** should be provided. DL functionality should enable Actors to retain Resources e.g., Information Objects and Actor Profiles, in existence past their interaction with the Digital Library System.
- **Functions** to **Browse (actOn) the Resources** should be provided. DL should implement services enabling Actors (virtual or real) to browse the available DL content, user profiles, policies, etc.
- **Functions** to **Search (actOn) the Resources** should be provided. Actors should be able to look for specific objects held within the DL by expressing queries and by entering specific keywords and constraints.
- **Functions** to **Visualize (actOn) the Actor's requested Resources** should be provided. A DL should deliver to Actor the requested information using the appropriate visualizations to produce comprehensive and well-presented objects, lists and query result sets.
- **Functions** to **Manage Information Object(s) (actOn)** should be provided. A DL should implement functions to handle, i.e., disseminate, publish, process, analyze and transform, the Content of the DL, i.e., Information Objects.
- **Functions** to **Manage Actor(s) (actOn)** should be provided. A DL should implement Functions to establish registered actors, personalize their preference and apply user profiles.
- **Functions** to **Manage DL** specific domains in a large scale should be provided. The DL should implement services and mechanisms to handle DL domains as a whole, e.g., Manage (import, export) all the Content of DL rather than handling each Information Object individually.

OPTIONAL

Finally, a Digital Library may meet the following criteria:

- * **Functions** may depend on (**influencedBy**) the **Actor's Profile** who invokes them.
- * DL Functions that are offered to the Actor(s) may be customized according to his/her profile, DLS role and rights and /or personal preferences.
- * **Functions** may consist of other parts (**hasPart**), i.e., sub-functions.
- * Functions may be organized in arbitrarily complex workflows, based on composition and linking facilities.
- * **Functions** may be enriched with **Metadata (hasMetadata)** and **Annotation (hasAnnotation)**.



- * DL Functions may have a description, which tells what the function does and how a system or human can interact with it.
- * **Functions** may enable (**actOn**) **Actors** (virtual or real) to **Collaborate** with each other.
- * Actors (virtual or real) may act as peers who are able to communicate, share and exchange information collaboratively.

Policy-oriented Criteria

The following criteria have been selected to verify whether or not the 'digital library' conforms to the Digital Library Reference Model from the Policy domain point of view.

MANDATORY

Regardless of the type of Policy a 'digital library' is conceived for, it must meet at least the following criteria:

- » The Digital Library must be regulated by (**regulatedBy**) a clearly defined set of **Policies** and this can not be an empty set. Policies are set of conditions, rules, terms or regulations governing the operation of the DL;
- » **Access Policies** must regulate (**regulatedBy**) the use of the Digital Library by **Actors**. Access Policies are essential to establish conditions, rules, terms or regulations governing the interactions between the Digital Library and Actors.
- » Every **Policy** must be addressed (**govern**) at least to an **Actor (regulatedBy)**. Defining the recipients of a Policy ensures the interaction between the Digital Library and its Actor(s).
- » Every **Policy** must have clearly defined scope(s) and characteristics (**Policy Quality Parameter**). A Policy must have defined objectives and consequences affecting the DL system as a whole, a certain domain, a specific task or entity.

RECOMMENDED

Additional desired properties of 'digital library' policies are:

- Every **Policy** should be expressed by (**expressedBy**) an **Information Object**. The digital representation of a Policy ensures its controlled description, management and use within the Digital Library. This representation enables automatic enforcing. Moreover, it is a prerequisite for a series of other automatic actions including policy comparison, policy reconciliation and policy interoperability.
- Every **Policy** should have (**identifiedBy**) a unique identifier (**Resource Identifier**). The use



of a persistent identifier ensures that each DL Policy is distinguishable from the others in the context of the same Digital Library.

- Every **Policy** should have (**hasFormat**) a known format (**Resource Format**). The implementation of a Policy in a known format guarantees that the system is aware of which “structure” each Policy conforms to and that this structure is publicly declared as to be used by third party actors whether human or machine.

OPTIONAL

Finally, a Policy governing a ‘digital library’ may also meet the following criteria:

- * A **Policy** may regulate (**regulatedBy**) the service of the system as a whole (**System Policy**).
- * Generic processes within the ‘digital library’ may be regulated by policies.
- * A **Policy** may regulate (**regulatedBy**) functionalities related to Content (**Content Policy**).
- * A Policy may regulate processes related to the Content domain.
- * A **Policy** may regulate (**regulatedBy**) DL Functions (**Functionality Policy**).
- * DL Functions’ lifetime and behaviour may be governed by specific policies.
- * A **Policy** may regulate (**regulatedBy**) User profiles and behaviour (**User Policy**).
- * A Policy may regulate processes related to the User domain.
- * A **Policy** may be extrinsic (**Extrinsic Policy**).
- * A Policy may be imposed from outside the organisation domain of the ‘digital library’, e.g., by wider organisations regulating the Digital Library itself, by national and international laws, or by customs.
- * A **Policy** may be intrinsic (**Intrinsic Policy**). The Policy governing the Digital Library may be defined and determined by the Digital Library organisation itself. Intrinsic Policy manifests the Policy principles implemented in the DL. A Policy that is defined by the DL or its organisational context that reflects the organisation’s mission and objectives, the intended expectations as to how Actors will interact with the DL, and the expectations of Content Creators as to how their content will be used.
- * A **Policy** may be implicit (**Implicit Policy**). The Policy governing the Digital Library may be inherent by accident or design. Implicit Policies usually arise as a result of ad-hoc decisions taken at system development level or as a consequence of the inadequate testing of a DLS that results in an interaction of Policies leading to unintended policy deployment.
- * A **Policy** may be explicit (**Explicit Policy**). Explicit Policy is a Policy defined by the DL



managing organisation and reflecting the objectives of the DL and how it wishes its users to interact with the DL. The implementation of an Explicit Policy at the Digital Library Management System level corresponds to the definition and Actor expectations.

- * A **Policy** may be prescriptive (**Prescriptive Policy**). The Policy governing the Digital Library may constrain the interactions between DL Actors (virtual or real) and the DL. Prescriptive Policies can cover a broad range of Policies from the kind of Function to which specific types of Actors can have access, to those that govern Collection development.
- * A **Policy** may be descriptive (**Descriptive Policy**). Descriptive Policies are used to present the aspects of a particular Policy in the form of explanation. A Descriptive Policy is a Policy that describe modes of behaviour, expectations of Actor interaction, collecting and use guidelines, but which do not manifest themselves through the automated application of rules, as a Prescriptive Policy does.
- * A **Policy** may be enforced (**Enforced Policy**). The Policy governing the Digital Library may be deployed and strictly applied within the DL. An Enforced Policy is a Policy applied consistently and strictly in the DL. Monitoring and reporting tools are necessary to follow up how the Policy is being applied.
- * A **Policy** may be voluntary (**Voluntary Policy**). The Policy governing the Digital Library may be monitored by an actor (human or machine). Voluntary Policy basically means a Policy that is followed according to the decision of the Actor. This is valid for all Policies for which its application is a matter of choice. In some cases, users may comply with Policies that are not officially communicated.
- * A **Policy** may be compound (**hasPart**).
- * A Policy may be organised in arbitrarily complex and structured forms. A compound policy may be obtained by properly combining constituent Policies.

Quality-oriented Criteria

The following criteria have been selected to verify whether or not the 'digital library' conforms to the Digital Library Reference Model from the Quality domain point of view.

MANDATORY

Regardless of the type of Quality a 'digital library' is conceived for, it must meet at least the following criteria:

- » A Digital Library (actually its **Resource(s)**) must be characterised by a set of **Quality parameter(s) (hasQuality)** and this can not be an empty set.



- » Any DL can be considered from a quality point of view by a DL Actor. The expression of the Actor's assessment is the Quality Parameter.
- » Every **Quality Parameter** must represent the assessment of a Digital Library **Actor**, whether human or machine, on a **Resource (expressAssessment)**. A Quality Parameter is always the expression of an assessment made by an Actor on a Resource.

RECOMMENDED

Additional desired properties of a 'digital library' are:

- Every **Quality Parameter** should be identified by (**identifiedBy**) a unique identifier (**Resource Identifier**). The use of a persistent identifier ensures that each Quality Parameter is distinguishable from the remaining ones in the context of the same 'digital library'.
- Every **Quality Parameter** should be expressed by (**expressedBy**) an **Information Object**. The digital representation of a Quality Parameter ensures its controlled description, management and use within the Digital Library. This representation is a prerequisite for a series of other automatic actions including the assessment of Digital Library content and services, and quality interoperability.
- Every **Quality Parameter** should be evaluated by (**evaluatedBy**) specific **Measurements**. In accordance with a selected Measurement, a Quality Parameter should have a specific value (e.g. the Measure).
- Every **Quality Parameter** should be measured (**measuredBy**) by a **Measure**. Any Quality Parameter should be managed by the Digital Library according to different Measurements, which provide procedures for assessing different aspects of each Quality Parameter and assigning it a value.
- Every **Quality Parameter** should be specified (**regulatedBy**) by **Policies**. The Digital Library should have policies governing the evaluation and the assessment of its systems and facets.

OPTIONAL

Finally, a 'digital library' may also meet the following set of criteria:

- * A **Quality Parameter** may be compound (**hasPart**).
- * A Quality Parameter may be organised in arbitrarily complex and structured forms, e.g. a Quality Parameter may be the compound of other specific Quality Parameters.
- * A **Quality Parameter** may be evaluated by (**evaluatedBy**) a **Quantitative Measurement**.
- * Quantitative Measurements are based on collecting and interpreting ordinal data.
- * A **Quality Parameter** may be evaluated by (**evaluatedBy**) a **Qualitative Measurement**.



- * Qualitative Measurements are applied when the collected data are categorical in nature. Although qualitative data can be encoded numerically and then studied by quantitative analysis methods, qualitative measures are exploratory while quantitative measures usually play a confirmatory role. Methods of Qualitative Measurements that could be applied to a DL are direct observation; participant observation; interviews; auditing; case study; collecting written feedback.
- * A **Quality Parameter** may evaluate (**evaluatedBy**, **hasQuality**) the DL system as a whole (**Generic Quality Parameter**). This is a family of Quality Parameters reflecting the variety of facets that characterise the quality of the 'system' in its entirety, in particular the Digital Library, the Digital Library System and the Digital Library Management System.
- * A **Quality Parameter** may evaluate (**evaluatedBy**, **hasQuality**) the DL Content (**Content Quality Parameter**).
- * A Quality Parameter which reflects the variety of facets that characterise the quality of the Content, in particular Information Objects, in a Digital Library.
- * A **Quality Parameter** may evaluate (**evaluatedBy**, **hasQuality**) the DL Functions (**Functionality Quality Parameter**).
- * A Quality Parameter which reflects the variety of facets that characterise the quality of the Functionality, in particular Functions, of a Digital Library.
- * A **Quality Parameter** may evaluate (**evaluatedBy**, **hasQuality**) the DL User (**User Quality Parameter**).
- * A Quality Parameter may assess Actor profiles and User behaviour of a Digital Library.
- * A **Quality Parameter** may evaluate (**evaluatedBy**, **hasQuality**) the DL Policies (**Policy Quality Parameter**).
- * A Quality Parameter which reflects the variety of facets that characterise the quality of a set of Policies.
- * A **Quality Parameter** may evaluate (**evaluatedBy**, **hasQuality**) the Architecture of the DLS (**Architecture Quality Parameter**).
- * A Quality Parameter may assess the aspects related to the Digital Library System Architecture. The presence of good administration tools is crucial for configuring and monitoring the functioning of complex and distributed systems.



Architecture-oriented Criteria

The following criteria have been selected to verify whether or not the 'digital library' conforms to the Digital Library Reference Model from the Architecture domain point of view.

MANDATORY

Regardless of the content, user, functionality, policy and quality characteristics of the 'digital library', the **Digital Library System** supporting its operation **must meet** at least the following criteria:

- » The **Digital Library System** underlying the 'digital library' must have a well-defined **Software Architecture**. The Software Architecture describes the digital library system enabling software by clearly defining how it is structured in components, i.e. programmes, how they communicate and are interrelated to offer the digital library service.
- » The **Digital Library System** underlying the 'digital library' must have a well-defined **System Architecture**. The System Architecture is the conceptual model that defines the organisation and relations between the Hosting Nodes, i.e. the (virtual) hardware environments hosting and running the Software Components, and the Running Component, i.e. the running instances of a Software Component active on a Hosting Node.
- » Every **Architectural Component** must have a unique identifier (**Resource Identifier, identifiedBy**). The use of a persistent identifier ensures that each DL Architecture Component is distinguishable from the remaining ones in the context of the same Digital Library System.
- » The **Software Architecture** must consist of (**consistOf**) at least one well identified **Software Architecture Component**. The Software Architecture must include at least one Component, i.e. a software package, a web service, or a module, with well-defined interfaces, that encapsulates a set of related functions (or data).
- » The **System Architecture** must consist of (**consistOf**) at least one **Hosting Node** and one **Running Component**. The System Architecture of a DLS is implemented by a set of components (System Component) running on servers which act as Hosting Nodes. The resulting system organisation (i.e., Software Components used and resulting Running Components and Hosting Nodes) can evolve over the time. A single Running Component hosted by a single Hosting Node corresponds to the minimal System Architecture structure.

RECOMMENDED

Additional desired properties of a 'digital library' (its Digital Library System) are:

- The 'digital library' service is deployed and operated by means of a **Digital Library**



Management System. The Digital Library Management System facilitates the set up and maintenance of DL Systems by offering facilities for their production and administration. These facilities also assure a well-defined Quality of Service for the managed DL Systems.

- Every **Software Component** should be regulated by (**regulatedBy**) a **Licence**. The Licence is particular policy which specifies the permission on use, re-use and modification of the Software Component.
- The **Software Architecture** should be composed of more than one identifiable **Software Architecture Components**. A component-oriented approach for digital library systems offers many advantages with respect to system building, openness, and evolution, and it is thus preferable to other solutions especially for large systems.
- The **System Architecture** should be composed of more than one identifiable **System Architecture Components**. A System Architecture based on a number of running components distributed on different hosting nodes offers many advantages with respect to system building, openness, and evolution, and it is thus preferable to other monolithic solutions especially when dealing with large systems.
- Every **Architectural Component** should conform to (**conformTo**) a **Framework Specification**. Architectural Components should interact through a Framework Specification. The Framework Specification prescribes the set of Interfaces to be implemented by the components and the protocols governing how components interact with each other. In so doing, it facilitates components composition and interoperability.

OPTIONAL

Finally, a 'digital library' (its Digital Library System) may also meet the following set of criteria:

- Every **Architectural Component**, be it a **Software Architecture Component** or a **System Architecture Component**, may exploit (**use**) one or more other not conflicting (**conflictWith**) **Architectural Components**. The exploitation of functionality offered by other components is a very common practice in software engineering. It reduces the complexity of the problem to be dealt with and favour reusability.



Digital Library Conformance Checklist

DL.org (www.dlorg.eu) has mobilised professionals, educationalists and students at various stages in their academic careers mainly from Computer Science and Library and Information Science domains, to promote knowledge in digital library interoperability, best practices and modelling foundations.

DL.org Experts

Kevin Ashley (Digital Curation Centre, UK), Detlev Balzer (Independent Consultant, Germany), Tiziana Catarci (University of Rome “La Sapienza”, Italy), Vassilis Christophides (University of Crete, Greece), Genevieve Clavel-Merrin (Swiss National Library, Switzerland), Antonella De Robbio (University of Padua, Italy), John Faundeen (U.S. Geological Survey Centre, U.S.), Nicola Ferro (University of Padua, Italy), Ed Fox (Virginia Tech, U.S.), Stefan Gradmann (Humboldt University, Germany), C.H.J.P. (Kees) Hendrick (Naturalis - National Museum of Natural History, The Netherlands), Sarah Higgins (Aberystwyth University, Wales, UK), René van Horik (Data Archiving and Networked Services, The Netherlands), Wolfram Horstmann (Bielefeld University Library, Germany), George Kakaletis (University of Athens, Greece), Sarantos Kapidakis (Ionian University of Corfu, Greece), Georgia Koutrika (Stanford University, U.S.), Paolo Manghi (National Research Council, Italy), Natalia Manola (University of Athens, Greece), Carlo Meghini (National Research Council, Italy), Jan Molendijk (National Library of the Netherlands, The Netherlands), Luc Moreau (University of Southampton, UK), Andreas Nürnberger (University Magdeburg, Germany), Pasquale Pagano (National Research Council, Italy), Hans Pfeiffenberger (Alfred Wegener Institute, Germany), Axel Pogné (Fraunhofer Institute Intelligent Analysis and Information Systems, Germany), Pavlos Polydoros (UBITECH, Greece), Andreas Rauber (TU-Wien, Austria), Dirk Roorda (Royal Netherlands Academy of Science, Netherlands), Robert Sanderson (Los Alamos National Laboratory, U.S.), Tefko Saracevic (Rutgers University, U.S.), MacKenzie Smith (MIT Libraries, U.S.), Thornton Staples (Smithsonian Institution, U.S.), Dagobert Soergel (University at Buffalo, U.S.), Manfred Thaller (University of Cologne, Germany), Bram van der Werf (Independent Consultant, Netherlands), René van Horik (Royal Netherlands Academy of Science, Netherlands).

DL.org Liaison Group Members

Tobias Blanke (King's College London, UK), Peter Brantley (Access for the Internet Archive, U.S.), Schubert Foo (Nanyang Technological University, Singapore), Jane Hunter (University of Queensland, Australia), Joan K. Lippincott (Coalition for Networked Information, U.S.), Clifford A. Lynch (Coalition for Networked Information, U.S.), Leonid Kalinichenko (Russian Academy of Science, Russia), Dean B. Krafft (Cornell University Library, U.S.), Carl Lagoze (Cornell University, U.S.), Ronald L. Larsen (University of Pittsburgh, U.S.), Andrea Mulrenin (Salzburg Research, Austria), Erich J. Neuhold (University of Vienna, Austria), Areti Ramachandra Durga Prasad (Indian Statistical Institute Bangalore, India), Jela Steinerová (Comenius University Bratislava, Slovakia), Shigeo Sugimoto (University of Tsukuba, Japan), Herbert Van de Sompel (Los Alamos National Laboratory, U.S.), Jens Vigen (European Organization for Nuclear Research, Switzerland), Andrew Wilson (National Archives of Australia, Australia).

DL.org Advisory Group Members

Marianne Backes (Virtual Resource Centre for Knowledge about Europe, Luxembourg), Stephen Griffin (National Science Foundation, U.S.), Geneva Henry (Rice University, U.S.).





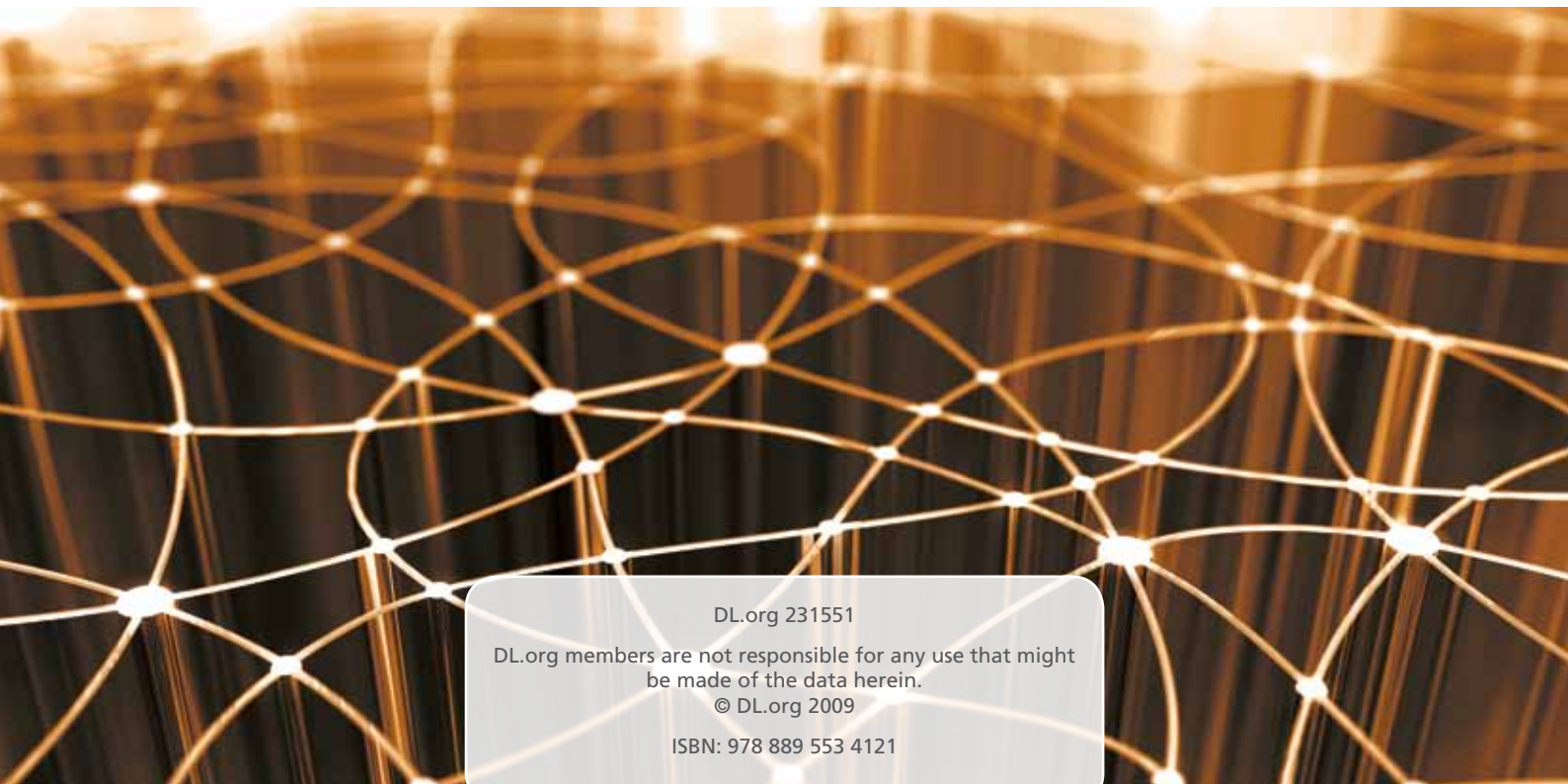
Italian
National
Research
Council



University
of Athens



University of Glasgow | Humanities Advanced Technology
& Information Institute



DL.org 231551

DL.org members are not responsible for any use that might
be made of the data herein.

© DL.org 2009

ISBN: 978 889 553 4121