PROMISE

Participative Research labOratory for Multimedia and Multilingual Information Systems Evaluation

FP7 ICT 2009.4.3, Intelligent Information Management

Deliverable 3.5

Final Prototype of the Evaluation Infrastructure with the Distributed Evaluation Protocol

Version 1.00, 27 September 2013

Network of Excellence co-funded by the 7th Framework Program of the European Commission, grant agreement no. 258191

Document Information

Deliverable number	3.5
Deliverable title	Final Prototype of the Evaluation Infrastructure with the Distributed Evaluation Protocol
Delivery date	27 September 2013
Lead contractor for this deliverable	HES-SO
Author(s)	Maristella Agosti, Georgeta Bordea, Nicola Ferro, Antonio Foncubierta, Melanie Imhof, Birger Larsen, Ivano Masiero, Simone Peruzzo, and Gianmaria Silvello
Participant(s)	DERI, HES-SO, RSLIS, UNIPD, ZHAW
Workpackage	WP3
Workpackage title	Evaluation Infrastructure
Workpackage leader	UNIPD
Dissemination Level	PU – Public
Version	1.00
Keywords	Evaluation Infrastructure, Prototype, Design, Development, Continuous Evaluation, Component-based Evaluation

History of Versions

Version	Date	Status	Author	Description
0.10	2012-10-02	Draft	UNIPD	Initial scheleton
0.11	2012-11-23	Draft	UNIPD	Updated after DERI exchange on semantic enrichment
0.12	2012-11-30	Draft	UNIPD	Updated after ZHAW exchange on guerrilla experiments and best practices
0.13	2012-12-13	Draft	UNIPD	Updated after RSLIS exchange on bibliometrics and impact analysis
0.20	2013-03-21	Draft	HES-SO	Initial contribution for component-based evaluation
0.25	2013-06-17	Draft	HES-SO	Revised contribution for component-based evaluation
0.30	2013-07-08	Draft	UNIPD	Revised schema and first RDF model
0.40	2013-08-05	Draft	UNIPD	First version circulated to all partners
0.50	2013-08-29	Draft	UNIPD	Revised version after partners comments
1.00	2013-09-27	Final	UNIPD	Final version

Abstract

This deliverable describes the specification and implementation of the PROMISE evaluation infrastructure. It builds on previous D3.3 and adds the specification for the bibliometrics, expert profiling, and topic identification for scientific contributions. It also describes the mapping of the resources to RDF and linked data as well as the final re-design of the overall conceptual model. Finally, it discusses alternatives for component-based evaluation.

Contents

Executive Summary

One of the continued objectives of PROMISE is to bring automation into the evaluation process and to foster access, exploitation, and re-use of the experimental data. This objective is pursued via the design and development of the evaluation infrastructure which acts as backbone for many of the PROMISE activities. The first specification of the *Distributed Information Retrieval Evaluation Campaign Tool (DIRECT)* evaluation infrastructure is reported in D3.3 [Agosti et al., 2012] and this deliverable builds upon and extends it.

Indeed, the goals of automation and exploitation of the experimental data have evolved during the life span of PROMISE and this deliverable reports the final version of the specification of the DIRECT evaluation infrastructure, describing how it has grown and matured to embrace new needs and more sophisticated requirements.

In particular, the current trends in semantic representation and enrichment of digital resources led to extensions of DIRECT with a *Resource Description Framework (RDF)* [W3C, 2004] model of the managed resources in order to expose them as linked data [Bizer et al., 2009; Heath and Bizer, 2011].

This RDF model played a pivotal role for extending the DIRECT conceptual model with the support of the semantic enrichment of the scientific literature produced by the evaluation activities throughout automatic expert profiling and topic identification, which are fully described in D3.6 [Bordea et al., 2013]. The RDF model also served the purpose of supporting the introduction of bibliometrics and the impact analysis conducted on the CLEF scientific production, which are reported in detail in D6.4 [Tsikrika et al., 2013].

Moreover, the possibility for component-based evaluation at different levels of granularity, i.e. ranging from sub-components or modules of an IR system to complex search applications based on Web services, has been explored and considered and the specification of the evaluation infrastructure now encompasses the *Coordinated Information Retrieval Components Orchestration (CIRCO)* framework [Ferro and Harman, 2010] for the asynchronous and XML-based evaluation of sub-components of IR systems.

Finally, the DIRECT infrastructure improved its support to the *Visual Analytics (VA)* environment which led both to a revision and enrichment of the tools to conduct the analysis of the experimental results, as reported in D5.4 [Angelini and Santucci, 2013], and to the introduction of the innovative *Visual Analytics Tool for Experimental Evaluation (VATE^2)* system for performance, failure, and what-if analysis, reported in D4.5 [Angelini et al., 2013].

1 Introduction

This deliverable provides a detailed description and specification of the PROMISE evaluation infrastructure and complements the previous specification of it, reported in D3.3 [Agosti et al., 2012].

In particular, several new aspects are covered in the deliverable:

1. it describes the alternatives for the component-based evaluation and extends the conceptual model to embed the CIRCO framework for asynchronous and XML-based evaluation;

2. it introduces the support for the semantic enrichment of experimental data via expertise profiling and topic identification;

3. it adds the support for bibliometrics and impact analysis;

4. it reports a brand new RDF model for exposing the managed resources as linked data.

Besides these bigger achievements, the deliverable details the final re-design and tuning of the DIRECT conceptual model, of the *REpresentational State Transfer (REST)* API to access the resources, and the indexes for the advanced search functionalities.

The deliverable is organized as follows: Section 2 details the alternatives for the component-based evaluation; Section 3 describes the final re-designed conceptual schema and its several extensions; finally, Section 4 describes the newly introduced RDF models and provides examples of instantiations of it. Appendix A reports the XML schemas corresponding to the DIRECT conceptual model while Appendix B lists the RDF model corresponding to the managed resources;Appendix C specifies the REST API for managing and accessing the available resources as well as their representation in XML and JSON formats; Appendix D describes the query language derived from the search model previously described and details all the indexes that can be used for searching for resources.

2 Component-based Evaluation

Experimental evaluation, a key element of scientific endeavour, seeks to provide answers to research questions by obtaining, through objective measurement and systematic analysis, empirical evidence that support or falsify research hypotheses derived from theories, models, and methods put forward to address these questions. Experimentation under controlled conditions is thus integral to driving progress in science, particularly in disciplines of highly applied nature. Information retrieval is undeniably such a field, since it is geared towards the development of multimedia and multilingual systems that aim to meet the requirements of users in situations of information need, provide the desired performance in terms of effectiveness and efficiency, guarantee the required robustness and reliability, and operate with the necessary scalability; as such it has a rich tradition in experimental evaluation.

The Cranfield tests [Cleverdon, 1967] established the fundamental information retrieval evaluation paradigm: the comparative, effectiveness-oriented, laboratory-based evaluation of different

approaches to a given retrieval task. Cranfield-2, in particular, laid down the core principles for conducting such comparative evaluations by describing a methodology and introducing the necessary resources. In this archetype, (i) the design of the **experiment** is based on the *decomposition* of information retrieval systems in terms of performance factors, and, in particular, into *components* performing specific operations and into *features* (or *devices* [Cleverdon, 1967]) realising various retrieval methods within such components, so that the effect of each on performance, and in comparison against appropriate *baselines*, is clear, (ii) **measurement** is performed with the use of *test collections* and suitable *evaluation measures*, and (iii) rigorous **analysis** of experimental results requires macro and micro analysis, investigation of the effect of varying parameter values, failure analysis, and statistical significance testing.

Test collection-based evaluation remains prevalent today, despite its limitations [Ingwersen and Järvelin, 2005] and the criticism it has met. It is also the predominant paradigm in evaluation campaigns, including the following major international initiatives: TREC[1], CLEF[2], INEX[3], NTCIR[4], and FIRE[5]. This has motivated a considerable amount of research towards the issue of measurement in information retrieval evaluation, including the creation of reliable and reusable test collections for comparative evaluation and the development of appropriate evaluation measures [Müller et al., 2010; Voorhees and Harman, 2005]. Much less attention has though been paid to the other methodological issues, and to the experimental design in particular, [Metzler and Kurland, 2012; Moffat and Zobel, 2004; Robertson, 1981; Tague-Sutcliffe, 1997] being notable exceptions.

This section focuses on the issues arising from the adoption of the decompositional approach to information retrieval experimentation. This paradigm ensures a well-motivated comparative evaluation by (i) specifying and implementing the components concerning each retrieval method to be evaluated, (ii) formulating research hypotheses on the basis of methods viewed as alternatives to a particular retrieval operation, and (iii) testing these hypotheses by measuring the performance of complete systems with each of the alternative components embedded. This requirement of *system-level* experimentation for performing *component-level* evaluation may appear paradoxical, but it can actually be attributed to the long-standing inability of the field to establish criteria and identify variables at the *component level* that might correlate well with the overall performance at the *system level*, and, thus, be able to explain or predict it. Even if such criteria and variables were determined, the validation of the assumptions underlying any observed correlations would remain a challenge [Robertson, 1981]. This is due to the complex interactions among components that may result in non-additive effects on performance [Armstrong et al., 2009], whereby combinations of optimal components leads to sub-optimal results, and vice versa.

As a result, information retrieval experimentation currently requires to build a whole system even when the goal is to evaluate a single component; this is a severe constraint for a multiplicity of reasons. The most significant is the complexity of today's information retrieval systems. These systems have progressively become more and more complicated since they have to manage increasing amounts of heterogeneous information and carry out retrieval tasks that cross media and language

[1] Text REtrieval Conference (http://trec.nist.gov/)
[2] Cross–Language Evaluation Forum (http://www.clef-initiative.eu/)
[3] INitiative for the Evaluation of XML retrieval (http://inex.mmci.uni-saarland.de/)
[4] NTCIR Evaluation of Information Access Technologies (http://ntcir.nii.ac.jp/)
[5] Forum for Information Retrieval Evaluation (http://www.isical.ac.in/~clia/)

barriers. Their design and development is thus challenging for the majority of researchers, since it requires the integration of components and technologies coming from different areas and domains and the availability of multidisciplinary competencies, which are rarely present within a single research group. The proliferation of open source information retrieval systems [Trotman et al., 2012] has greatly ameliorated this situation and has allowed many research groups to carry out large scale evaluation experiments, provided that they have access to sufficient computing resources and to specific configurations of computing environments. On the other hand, the broad range of retrieval methods of interest together with the continuous evolution of state-of-the-art make it difficult for such systems to both consider the whole spectrum of desired components, particularly those required in multimedia and multilingual settings, while also continuously integrating the state-of-the-art of their existing components. Efforts to address this limitation typically involve requests to the research community for the contribution of extensions and improvements. The modular architecture of most such systems make this practice possible, but the extent to which it has led to an increase in the supported retrieval functionalities is rather limited.

These difficulties in fulfilling the requirements for component-level evaluation have affected the way experimentation is being carried out by individual researchers and research groups and have had important ramifications for information retrieval research. The most grave has been the adoption of weak baselines based on the view that it is sufficient for researchers to demonstrate the effectiveness of their newly devised retrieval methods through improvements over simple baselines, rather than having to integrate the components that implement them in a state-of-the-art system, a costly and complex endeavour. This widespread practice is based on the assumption that improvements by components in isolation would be additive in combination. Research [Armstrong et al., 2009] using TREC data has shown though that this assumption does not always hold, casting doubts over the reliabilty of research conducted on such grounds. It has also laid bare the need within the information retrieval community for tools and frameworks that would support experimentation against the constantly evolving state-of-the-art, while individual researchers and research groups could focus only on the development of the components of interest to them.

2.1 Granularity aspects

As shown in Figures 5 and 11 in Section 3.5, `components` in an information retrieval system can be understood at various granularities, since they can belong one to another. In this case, three granularity levels are defined:

- `Component-level components`. These are the finest grained components. They provide one single feature, they perform one single action on the `Information Units`. They are normally run once per corpus. Examples are: tokenizers, stemmers, indexers.

- `System-level components`. These components use none, one or many of the component–level components and manage their output to perform a complex task. They can operate on a per corpus or per query basis.

- `Application-level components`. These components manage system–level and component–level components, and provide the final results to the `User`. They perform a task on a per query

basis. Examples are components that perform ranking and fusion of results.

The key factor for the analysis of component granularity is to determine whether they operate on a per corpus or a per query basis, since this will have an impact on the evaluation possibilities for each of them.

2.2 Approaches to Component Based Evaluation and related costs

Following the ideas from [Hanbury and Müller, 2010], two main approches can be considered for component–based evaluation of information retrieval systems: intermediate output (*offline approach*) and webservices (*online approach*).

2.2.1 Use of intermediate output

Intermediate output requires a solid specification of the data format, for example the one described in the CIRCO, which is described in detail below. Each of the components of the IR pipeline provides an *eXtensible Markup Language (XML)*–based stream. These files ca be reused by any of the components that follow in the pipeline, enabling a loosely–coupled, distributed, asynchronous evaluation of the components. The strengths of this approach lie first on its simplicity, since the only requirement is to convert the output to a given specification. Secondly, for the finest grained components, that act on a corpus basis, this is the only way of obtaining interoperability, since online computation on a whole corpus is not feasible. The most important drawback is that data storage costs grow rapidly with the number of steps in the pipeline and the number of users involved. A replication rate can be defined, considering all the possible combinations of all components at all steps of the pipeline:

$$R = \prod_{s=1}^{S} C_s$$

where the pipeline consists of S steps with C_s alternative components for each step. Even without considering the XML overheads, this introduces a non–negligible replication of the corpus. However, if this problem is managed, then no further computation is required.

The objective of the CIRCO framework [Ferro and Harman, 2010] is to allow for a *distributed, loosely-coupled, and asynchronous* experimental evaluation of *Information Retrieval (IR)* systems where:

- *distributed* highlights that different stakeholders can take part to the experimentation each one providing one or more components of the whole IR system to be evaluated;
- *loosely-coupled* points out that minimal integration among the different components is required to carry out the experimentation;
- *asynchronous* underlines that no synchronization among the different components is required to carry out the experimentation.

The CIRCO framework allows different research groups and industrial parties, each one with their own areas of expertise, to take part in the creation of *collaborative experiments*. This is a radical departure from today's IR evaluation practice where each stakeholder has to develop (or integrate components to build) an entire IR system to be able to run a single experiment.

The base idea – and assumption – behind CIRCO to streamline the architecture of an IR system and represent it as a *pipeline* of components chained together. The processing proceeds by passing the results of the computations of a component as input to the next component in the pipeline without branches, i.e. no alternative paths are allowed in the chain.

To get an intuitive idea of the overall approach adopted in CIRCO, consider the example pipeline shown in Figure 1.

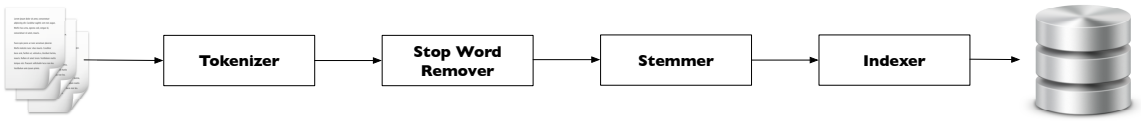

Figure 1: An example pipeline for an IR system.

The example IR system is constituted by the following components:

- *tokenizer*: breaks the input documents into a sequence of tokens;
- *stop word remover*: removes stop words from the sequence of tokens;
- *stemmer*: stems the tokens;
- *indexer*: weights the tokens and stores them and the related information in an index.

Instead of directly feeding the next component as usually happens in an IR system, CIRCO operates by requiring each component to input and output from/to XML [W3C, 2008] files in a well-defined format, as shown in Figure 2.

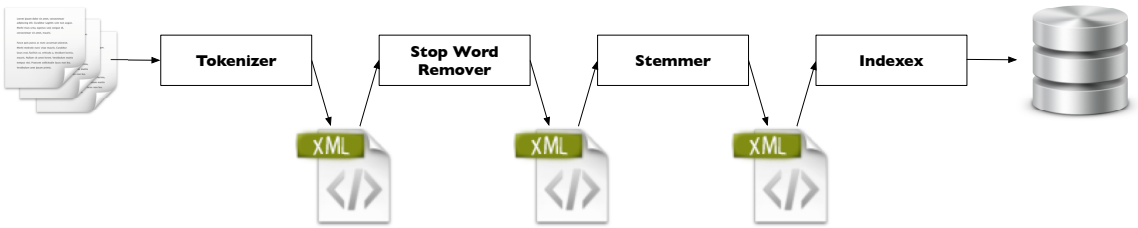

Figure 2: An example of CIRCO pipeline for an IR system.

These XML files can then be exchanged among the different stakeholders that are involved in the evaluation, allowing for an experimentation that is:

- *distributed* since different stakeholders can take part in the same experiment, each one providing his own component(s);

- *loosely-coupled* since the different components do not need to be integrated into a whole and running IR system but only need to communicate by means of a well-defined XML format;
- *asynchronous* since the different components do not need to operate all at the same time or immediately after the previous one but can exchange and process the XML files at different rates.

The choice of using an XML-based exchange format is due to the fact that the main other possibility, i.e. to develop a common *Application Program Interface (API)* IR systems have to comply with, presents some issues:

- the experimentation would not be *loosely-coupled*, since all the IR systems would have to be coded with respect to the same API;
- much more complicated solutions would be required for allowing the *distributed* and *asynchronous* running of the experiments, since you would need some kind of middleware for process orchestration and message delivery;
- multiple versions of the API in different languages should be provided to take into account the different technologies used to develop IR system;
- the integration with legacy code could be problematic and require a lot of effort;
- overall, stakeholders would be distracted from their main objective, which is running an experiment and evaluating a system.

2.2.2 Use of webservices

The use of webservices solves the data replication problem at the cost of computation replication. It also requires a specification of the message exchange format. Each of the components of the information retrieval system would be exposed through a webservice interface to other components.

Combination of various components can therefore be performed almost on the fly, with very quick set up. This is the optimal approach for all components that act on a query basis, since the data is not replicated and is accessed only when needed by each of the web services. The most important drawback is that data can be computed several times, one per each component accessing the webservice. The computation replication rate is equivalent to the data replication rate. However, if the number of components accessing each webservice can be estimated, this allows balancing storage and computation adding persistence layers to some webservices.

2.3 Evaluation protocol

As discussed in section 2.2, the costs of performing an exhaustive evaluation of all components grows rapidly with the complexity of the information retrieval system pipelines and the number of options for a given step, which is also related to the number of actors in the evaluation campaign.

However, this complexity can be reduced if we consider the following simplification to the general case: each information retrieval system to be evaluated can be described in terms of a pipeline

of various components, regardless of the actual implementation of these components. As a consequence, various information retrieval systems may share the pipeline specification although the implementation might difer. From now on, we will refer to each of the various specifications with the term *system families*. If in addition to this, a *baseline implementation* of each of the steps in a pipeline specification can be defined, the component–based evaluation is reduced to: (1) evaluating the impact of the various components of the same type in a given system family and also (2) evaluating the impact of the system family in the component performance.

The first case is represented in Figure 3. In this situation, the components are evaluated attending to how they affect the performance of the given system. As a result of this evaluation, the best components can be found for each of the pipeline positions of a given system family.

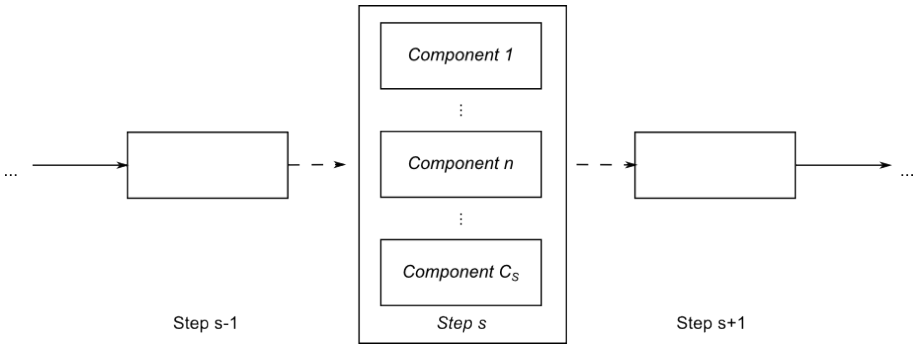

Figure 3: Evaluation of all components of the same type for a given system family

The second case deals with evaluating how a given component is affected by the pipeline specification. In this situation, a specific component is evaluated by testing its performance in all the system families that include a component of the same type. As a result of this evaluation the best system family can be found for a given component. This case is shown in Figure 4.

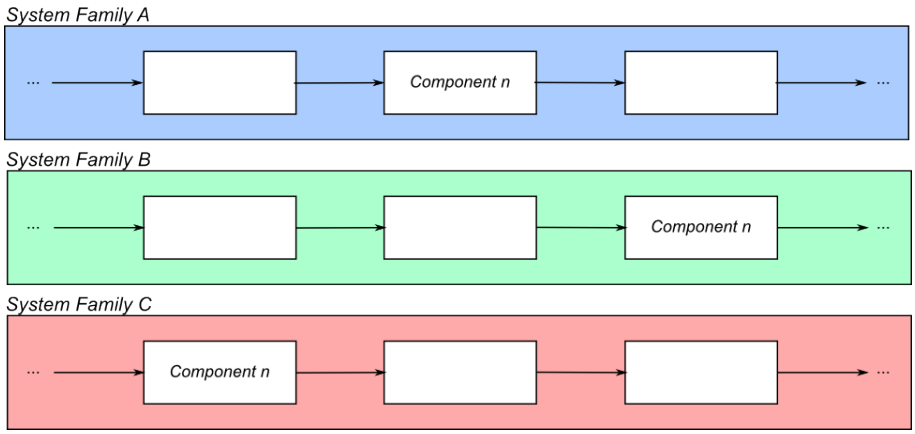

Figure 4: Evaluation of all the system families with respect to a given component

From the discussion above, we can define an evaluation protocol for component–based evalua-

tion:

1. According to a defined vocabulary, participants can register their pipeline specifications and their individual implementations for each of the steps.

2. For each of the component types present in all the registered pipelines, a baseline implementation is chosen. These implementations should be the simplest forms of *dummy* components.

3. Two different evaluations are run:

   Full System Evaluation. The full systems are evaluated with all the proposed implementations of the components. This evaluation does not change anything of the existing infrastructure, systems are evaluated according to the result lists for a set of experiments or queries. However, since systems are classified in families according to the component–based specifications, it will provide a ranked list of implementations for each of the system families, allowing fair comparison among systems of the same family, and providing insight on how the presence of certain components can modify the performance of the system.

   Component Based Evaluation. Each of the components registered by participants is evaluated in all system families that contain a component of the same type, but using the baseline implementation for the rest of the components. This addresses the two cases for component based evaluation discussed above: (1) by comparing all components of the same type in a system family and (2) by comparing the relative performance of the same component when it is included in different system specifications.

This protocol is based on the existing Conceptual Schema defined in Section 3. Therefore, the changes in the infrastructure are minimal. For instance, the pipeline specification or and the system families would be part of the `Configuration` concept, which needs to support the family concept. The evaluation is based on `Experiments`, however, the users are now required to submit `Experiments` using the existing *baseline implementations* of the components as explained in the evaluation protocol if they want to participate in the component–based evaluation. Components, including baseline implementations, can provided either with intermediate output for offline steps or with webservices for online steps.

The decision of using baseline components reduces the number of evaluations to perform, which would otherwise be unfeasible. This allows a research group to focus on one component, while being able to test the full pipeline using the existing baseline implementations for the rest of the components. Component–based evaluation would allow fair comparison of the various implementations of the same type, thanks to having standarized not only the retrieval corpus but also the baseline techniques for the rest of components.

3 Conceptual Schema Design

The first version of the conceptual schema of the PROMISE evaluation infrastructure has been extensively described in [Agosti et al., 2011] and its first consistent revision has been reported in [Agosti et al., 2012]. This section describes the final version of the conceptual schema which has been extensively re-designed along with the collaboration of all the PROMISE partners. This schema allows for a deep integration of the DIRECT infrastructure with the several needs of the PROMISE project (e.g. impact analysis, information extraction and enrichment, best practices, evaluation in the wild).

3.1 Resource Area

In the PROMISE infrastructure the term "resource" refers to a generic entity that concerns evaluation activities and with which a user or a group of users can interact. Resources can be actual data adopted in or produced by these activities (e.g. experimental collections or experiment results), as well as the evaluation activities and tasks carried out within them.
The Resource area has the following entities:

- `Resource`: it is the relationship that involves many resources of a generic evaluation activity. Every Resource entity has an attribute called scope that defines the extent of the resource taken into account; it is a controlled vocabulary: PUBLIC, PRIVATE, SHARED.
- `Namespace`: refers to a logical grouping of identifiers and allows the disambiguation of homonym identifiers belonging to different namespaces.
- `User`: a generic user of the infrastructure.
- `Role`: it indicates the role a user can assume in the evaluation infrastructure.
- `Group`: it is a set of users grouped together.
- `Concept`: a `Concept` is viewed as an idea or notion, a unit of thought. It can be used to define the type of relationships in a semantic environment or to create a taxonomy (for instance a taxonomy of metrics, or statistical tests, and so on).

The most important change in the Resource Area consists in the creation of the `Concept` entity, which groups together many previous entities present in D3.2 [Agosti et al., 2011] and serves the purpose of managing typed relationships between entities, e.g. to build taxonomies of terms, and, in some sense, resembles the idea of concept introduced by *Simple Knowledge Organization System (SKOS)* [W3C, 2009a,b].

As shown in Figure 5, a recursive relationship (i.e. `Organizes`) allows to link a `Concept` to another `Concept`, and also to create typed links. This relationship has an attribute called `score` which allows us to set the relationship strength among two resources. It is also important to underline that is linked with a high number of other entities from many other areas (examples will be provided in the next subsections).

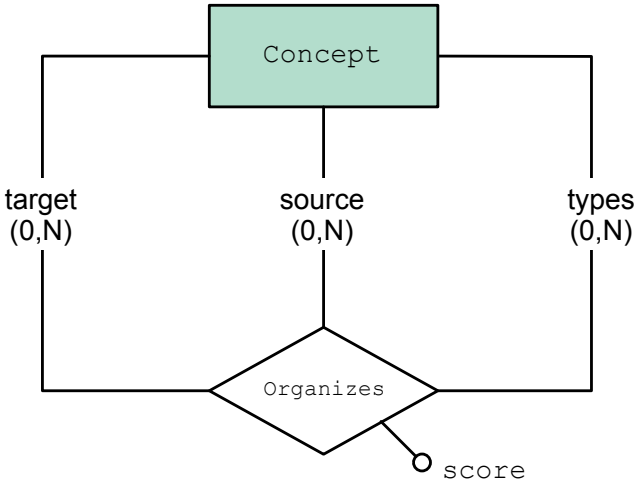

Figure 5: The Concept entity ternary relationship

The relationships between the `Group`, `User` and `Role` entities of this area (Figure 6) remain unchanged. A `User` can `play` none, one or more `Role`(s): for instance, a user can be both an organizer of an evaluation activity and a researcher that carries out the activity, i.e. a participant to the evaluation activity. A `Role` can be `played` by none, one or more users; for instance, an evaluation activity can have one or more participants, e.g. the researchers that are carrying out the experiments for writing a paper. A `User` can `belong` to none, one or more `Groups`; a `Group` does not necessarily contain a `User`.

Figure 6 reports also on the relationships between the `User` and the `Concept` resources. The `Profiles` relationship allows us to establish a relation between a user and a concept putting a score and a backward score on it. The relation between a user and a concept means that a user is "expert in" a specific concept (feature) and the strength of this relation is defined by the score (a double in the range $[0, 1]$); the relation between a concept and a user means that a concept has an expert (a user) and the strength of this relation is defined by the backward score. This lets us define user profiles; for instance, we can say that "user A is an expert in information retrieval" where "user A" is a `User` and "information retrieval" is a `Concept`. The `Profiles` relationship has two attributes: `score` which allows us to represent the strength of the relation between a user and a concept, and `backward score` which allows us to represent the strength of the relation between a concept and a user. This means that the relationship between `User` and `Concept` is not symmetric; for instance, we can say that "User A" is an expert in "information retrieval" with `score` 0.9 and this would mean that information retrieval is the main area of expertise for User A. On the other hand, there are people much more expert in information retrieval than User A, so the `backward score` could be only 0.1, and this would mean that User A is just one of the experts in information retrieval and that we expect to be able to find out other users with a higher expertise level (`backward score`) in the considered topic.

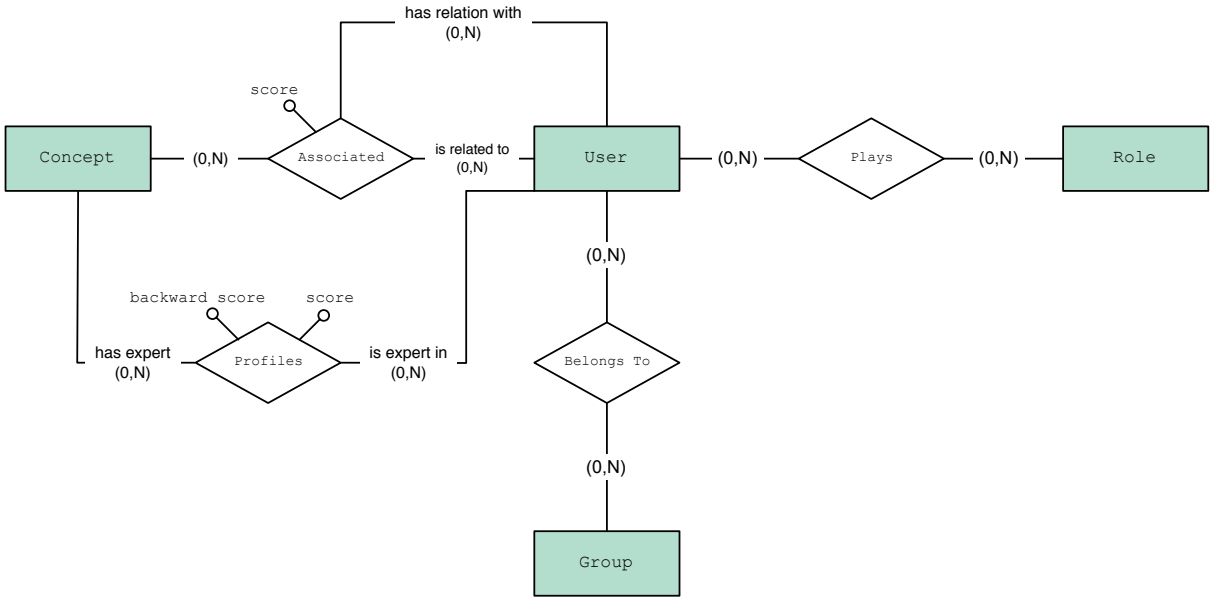

Figure 6: Resource Area relationships

The `associated` ternary relationship allows us to define typed relationships between the users in the system. The `score` attribute defines the strength of the relationship between users. Furthermore, we can define a *typed* relationship because `associated` is connected to `Concept`. For instance, throughout the `associated` relationship we can say that "User A has similar expertise than User B", where "has similar expertise than" is a concept defining the relationship type between the users.

3.2 Metadata Area

The Metadata area has two entities:

- `Metadata`: metadata is usually defined as "data over data" and it is used to describe the resources of the evaluation infrastructure. Metadata is itself a resource of the infrastructure and thus it can be recursively described by another metadata; this fact is modelled by means of the recursive relationship `Relates` on the `Metadata` entity, as shown in Figure 7.
- `Metadata Set`: it is a logical grouping of `Metadata`. The recursive relationship allows to create hierarchies of metadata sets.

This area keeps its two entities, `Metadata` and `Metadata Set`, and each one of them still has the same recursive relationship it had in the previous version of this work. The relationship between the two entities changes, though, from `Owns` to `Is Stored As`.

3.3 Evaluation Activity Area

The entities of this area are:

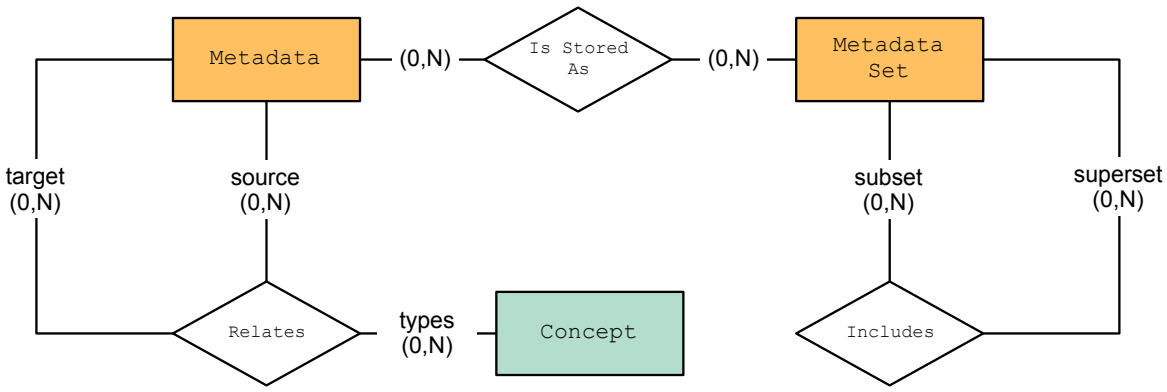

Figure 7: Metadata Area relationships

- `Evaluation Activity`: it is any type of activity that aims at the evaluation of applications, systems, and methodologies for multimodal and multimedia information access and retrieval.

- `Campaign`: it represents the different aspects of an evaluation forum, such as the different campaigns and the different editions of each campaign, the tracks along which the campaign is organized and the tasks in which each track is divided. `Campaign` is a public and shared activity that may be undertaken by, say, academic, commercial and governmental groups that are interested in the activity organized and structured by a third-party body. Participating groups share the data on which evaluation is based and the evaluation metrics, thus allowing comparison across the techniques adopted by the diverse groups

- `Trial`: it identifies an evaluation activity that may be actively run by, for example, a research group, a person or a corporate body for their own interest. It does not have a standard organization like the `Campaign` activity and the body that undertakes the activity defines its organization. In the evaluation infrastructure we assume that a `Trial` activity has to be organized in tasks. In a `Trial` activity there is room for defining heterogeneous organizations as well as new types of evaluation activities that may arise in the course of time.

- `Education`: allows us to envision evaluation activities carried out for educational purposes.

- `Task`: a `Task` refers to a specific piece of work that is undertaken within the evaluation activity and aims at testing a specific (research) hypothesis. An example is the ad-hoc task in an evaluation campaign, e.g. TREC or CLEF; the aim of the ad-hoc task is to test the ability of retrieval systems to retrieve accurate and complete ranked list of documents (i.e. information units in the DIRECT system) in response to a set of information need statements [Voorhees and Harman 2005]. The research hypothesis does not necessarily refer to the effectiveness of a retrieval technique, but it may concern the effect of a pooling strategy or a user-centric analysis of an application. e.g. a web portal, where the retrieval system may be only one of the constituting blocks. The definition of the Task entity is therefore more general than the

one adopted in traditional campaigns since the infrastructure aims at retaining and sharing information on a generic evaluation activity.

- `Track`: `Tasks` carried out within a campaign are grouped into `Tracks`.

The three former subclasses `Campaign`, `Education` and `Trial`, that were specializations of the `Evaluation Activity` entity, have now become three independent entities, linked to `Evaluation Activity` through `Is a` relationships. The `Series` entity has been removed and replaced by the `Concept` entity.

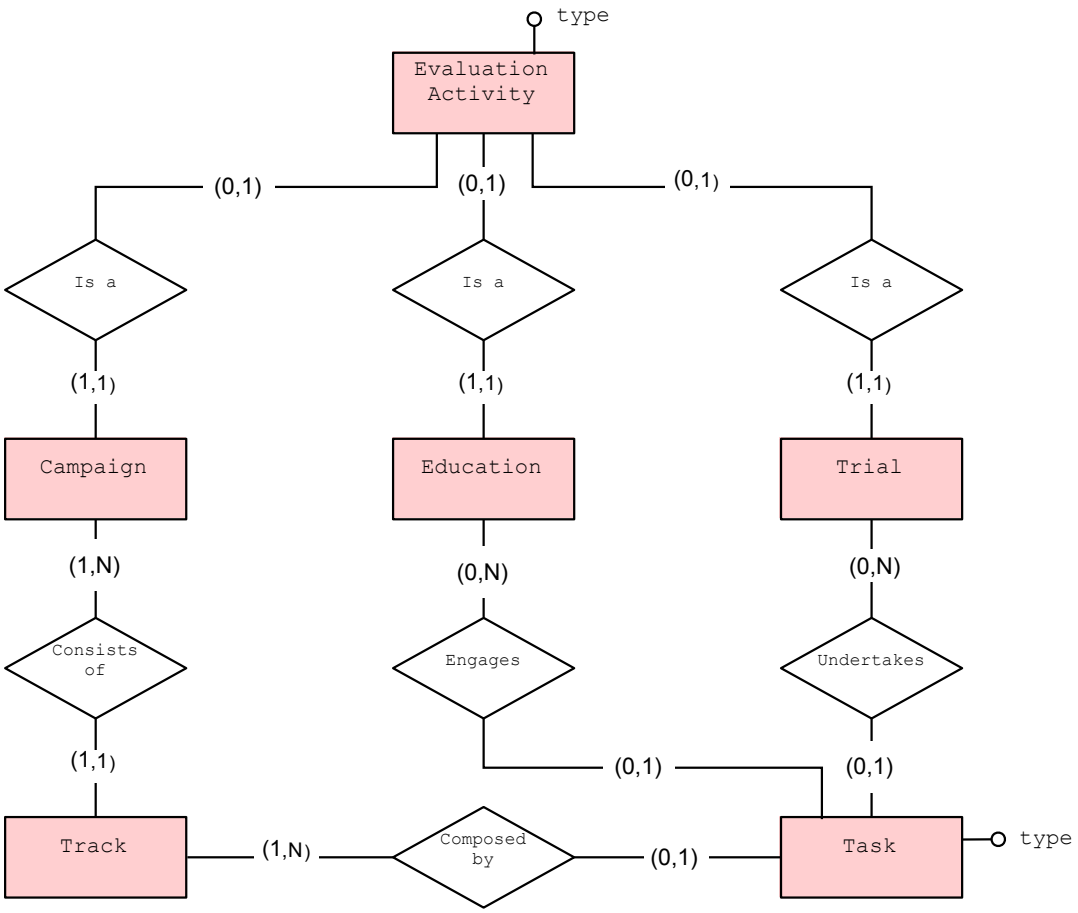

Figure 8: Evaluation Activity Area relationships

3.4 Experimental Collection Area

This area has the following entities:

- `Corpus`: is a set of informative resources, which allows us to perform a series of investigations in a research area; thus, a `Corpus` is composed by one or more `Information Unit`(s).

- `Ground Truth`: it is a general entity referring to a container of assessments. It can be the container of assessments obtained through new techniques different than traditional pooling.
- `Information Unit`: the `Information Unit` is the object on which the evaluated system acts, e.g. the object which is retrieved by the system under evaluation.
- `Pool Item`: this entity refers to relevance judgements, which are provided on an `Information Unit` in the `Pool` for a given `Topic`.
- `Topic`: this entity represents the materialization of an information need.
- `Topic Content`: it represents the actual content of a topic; it can have multiple languages and multiple media types.

The number of entities has decreased, if compared with the last version of this work. The entities that have been removed are: `Experimental Collection` which was a mere container of Topics, Corpora and Ground Truth, `Topic Field`, `Topic Type`, `Relation`, `Relevance`, and `Pool`. It is also useful to show the `Concept` entity in this schema, since the `Relevance` is included in it.
The entity formerly named `Document` is now `Information Unit` because it is a more general concept which can be employed to envision wider representation of information; it is not connected to `Corpus` anymore.
Another difference between this version of the conceptual schema and the former one is the cardinality between some of the entities, especially between `Experimental Collection` and, respectively, `Topic Group`, `Corpus` and `Ground Truth` [6].

3.5 Experiment Area

The Experiment area entities are:

- `Experiment`: an `Experiment` is part of the data produced by a system under evaluation.
- `Run`: a `Run` is defined as a ranked list of information units for each topic in the experimental collection.
- `Guerrilla`: a `Guerrilla` experiment identifies an evaluation activity performed on corporate IR systems (e.g. a custom search engine integrated in a corporate Web site). In this case, the evaluation process is defined by a set of experimental activities aimed at assessing different aspects of the application such as the completeness of the index of an ad-hoc search engine or the effectiveness of the multilingual support. For this reason the evaluation metrics can differ from those used during a `Run` experiment, such as precision.
- `Living`: this entity deals with the specific experimental data resulting from the Living Retrieval Laboratories defined in Task 4.4, which will examine the use of operational systems as experimental platform on which to conduct user-based experiments to scale.

[6] It can be stated that the `Ground Truth` entity, although absent in the former version of the schema, has taken the place of `Pool`, being linked to `Experimental Activity` through the same relationship `Employs`.

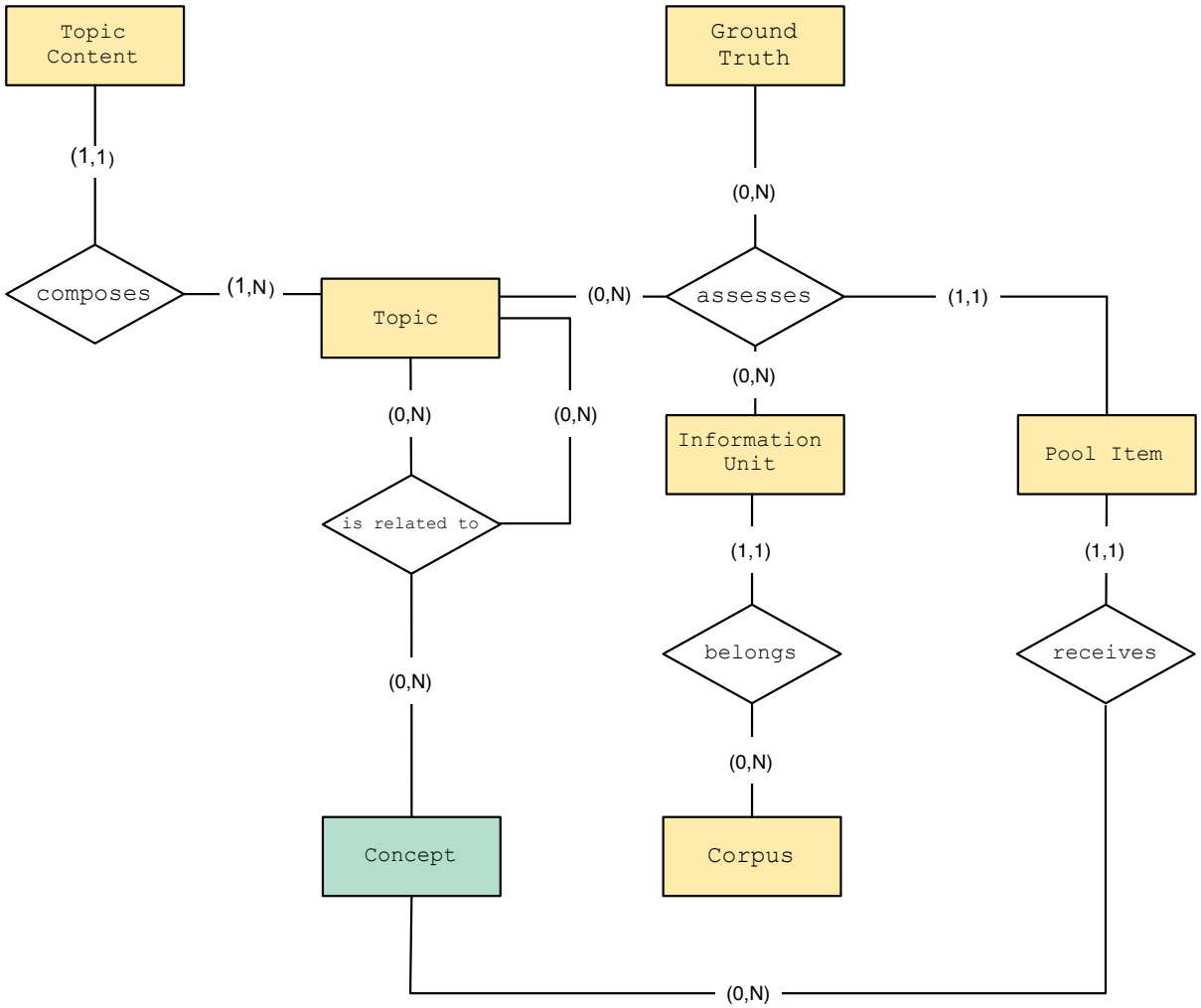

Figure 9: Experimental Collection Area relationships

- `Component`: it is a building block of a running system. Each component may be composed by other components and the relationships between components are typed (see `relates`). It must be noted that the relationships between the components are defined in the context of a specific `configuration`.
- `Configuration`: the `Configuration` entity identifies the configuration of an `Experiment`. Each experiment may specify its configuration which is constituted by a list of components which can be related one to the other.

`Experiment`, `Run` and `Guerrilla`, formerly specifications of the `Experiment` entity, are proper entities, and each one of them is connected to `Experiment` through an `Is a` relationship.
Figure 10 shows the relationships between entities in this area.

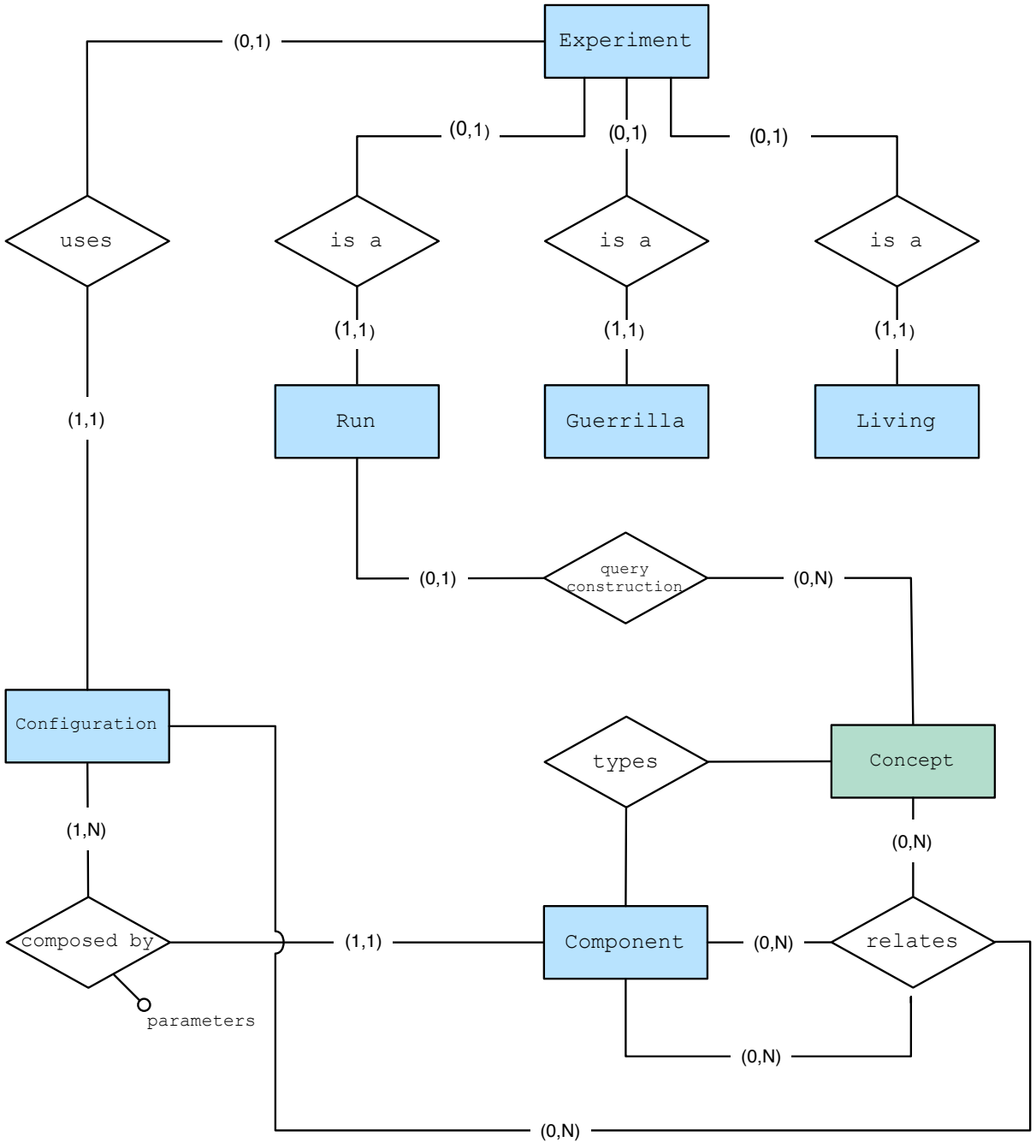

Figure 10: Experiment Area relationships

It is possible to point-out the work-flow in the experimental area for what it is concerned with the configuration:

- create a configuration;
- add the components to the configuration passing also the parameters (the setting) of the component in the context of the specific configuration;
- nest the components defining their relationships. it is important to notice that we can nest only the components previously added to the configuration;
- attach the configuration to the current experiment.

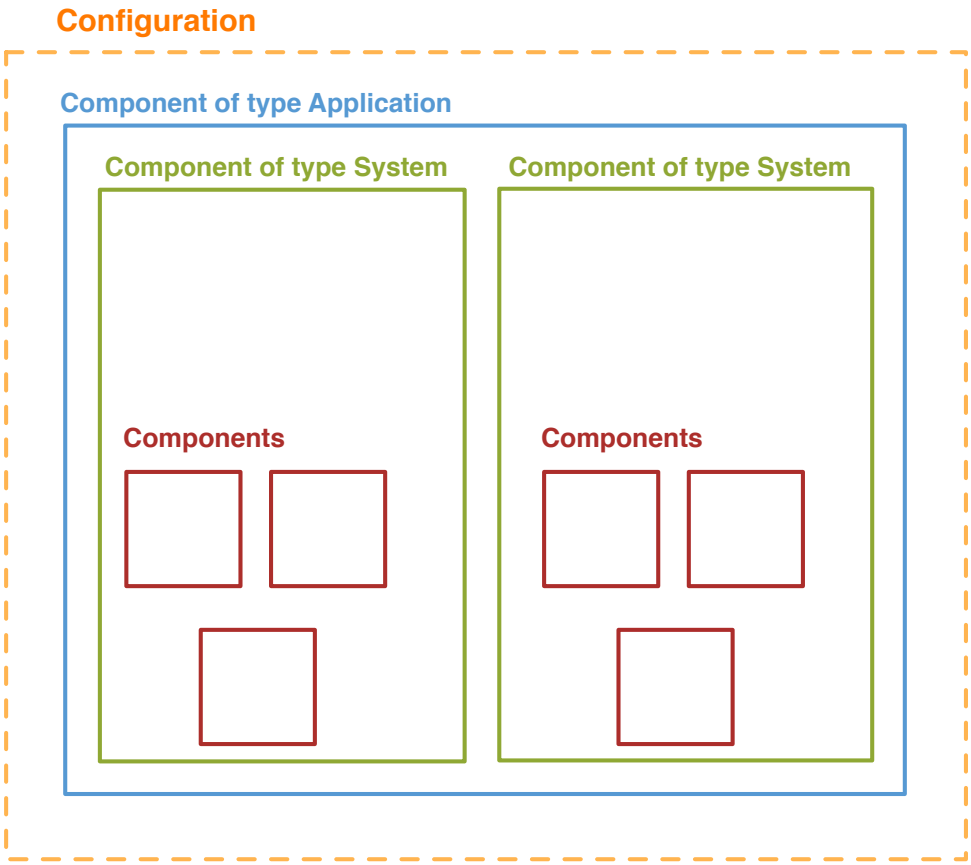

Figure 11: An example of nesting between components of different types (e.g. Application, Systems).

In this context a `component` may be either an application or a system. In Figure 11 we can see a possible organization of components into a configuration of an experiment.

3.6 Measurement Area

The Measurement area entities are:

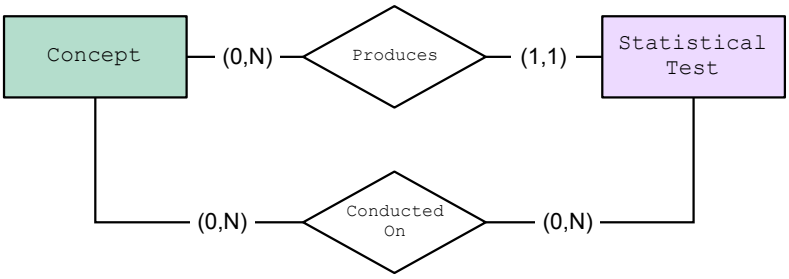

Figure 12: Measurement Area relationships

- `Statistical Test`: it provides a mechanism for making quantitative decisions about a process or processes. A `Statistical Test` in the evaluation infrastructure represents an example of statistical analysis which can be carried out on the available data.
- `Measure`: it represents the value of a metric calculated on some `Experiments` handled by the infrastructure.
- `Estimate`: it represents the estimated numerical value of a descriptive statistic calculated by the infrastructure.

The `Metric`, `Statistical Analysis` and `Descriptive Statistics` entities are now comprised and represented by the `Concept` entity, thus they no longer appear among the Measurement area entities.
Also, it is not possible to describe `Statistical Test` through `Metadata` anymore. Figure 12 depicts how `Statistical Test` is now connected to `Concept`.

3.7 Visual Analytics Area

The entities included in this area are:

- `Visualization`: it refers to the information used by the infrastructure to store and recover whichever visualization of the data that the users do.
- `Snapshot`: it stores the snapshots of a visualization.

The `Visualization Type` entity is now included in the `Concept` entity. Figure 13 shows the relationships that link the two entities of this area and the `Concept` entity.

3.8 Bibliographical Area

Since the `Venue` entity has been removed, the Bibliographical area has only one entity left: `Contribution` (see Figure 14). The `Contribution` entity refers to a piece of writing submitted for a publication. A

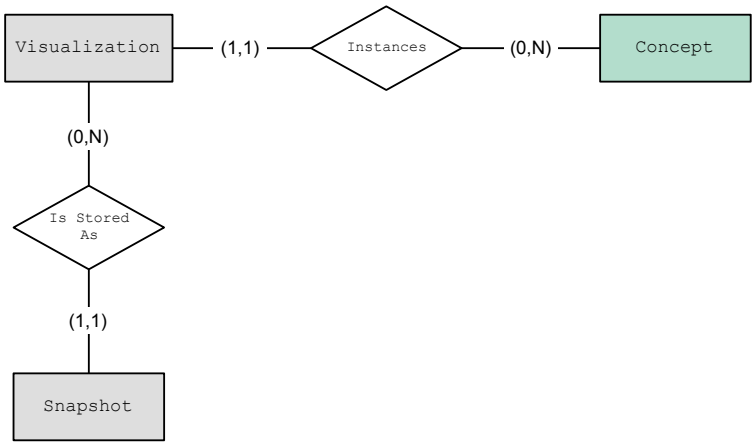

Figure 13: Visual Analytics Area relationships

conference or a workshop paper, a journal article, a book, a technical report, a thesis or a manual are examples of contributions.

In Figure 14 we can see that `Contribution` is associated to a `Concept` that defines its type; e.g. a `Contribution` can be a generic `Publication`, a `Working Note`, or a `Journal`.

Every `Contribution` is associated to no, one or more authors (i.e. `User`) via the `Author` relationship and can be described by no, one or more `Metadata` via the `describe` relationship.

The relationship `feature` relates a `Contribution` to a `Concept` which defines its topic; for instance a `Contribution` can feature a `Concept` such as "Information retrieval", this means that the given `Contribution` is about "Information retrieval" with a certain relevance score. This allows us to determine the topics of a `Contribution` and its relevance for a given topic. The relationship `is related to` allows for relating a `Contribution` to another `Contribution` with a typed relationship. This means that we can say that "Contribution A `cites` Contribution B" where `cites` is a `Concept` relating "Contribution A" with "Contribution B".

The relationship `bibliometric` relates a `Contribution` to a `Concept` and a `Metric`. This allows us to say that "Contribution A has `impact factor 1.3`"; `impact factor` is defined as a `Concept` and `1.3` as the value of a `Measure`. The relationship `bibliometric user` has the same purpose but oriented to `User` (i.e. author); indeed, through this relationship we can express something like "User A has `h-index 3`", where `h-index` is a `Concept` and `3` is the value of a `Measure`.

3.9 Component-based Evaluation Area

The conceptual model for the component-based evaluation is depicted in Figure 15. We rely on the notion of component `Component` introduced in Section 3.5. The basic idea is that a `Component` receives a sequence of objects, called `Stream`, as `Input`, elaborates and processes it, and produces another sequence of objects, as `Output`. The serialization to XML of this abstract notion of `Stream` is what will be actually exchanged among `Components`, according to what is shown in Figure 2.

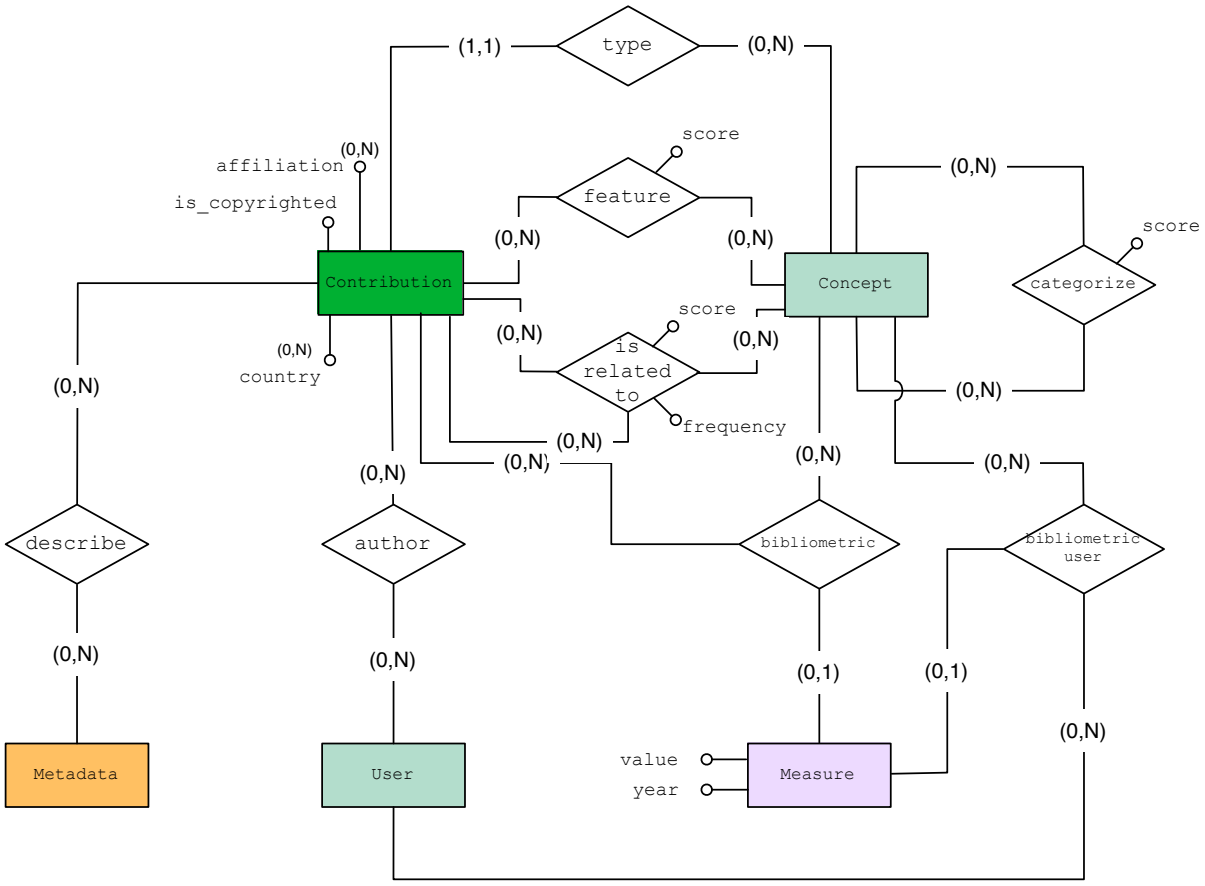

Figure 14: Bibliographical Area relationships

More precisely, a `Stream` is a sequence of information `Information Unitss`, as introduces in Section 3.4. It can be used as `Input` for zero or more `Components` and it must be produced as `Output` by exactly one `Component`. In turn, a `Component` can have zero or more `Streams` as `Input` and produce zero or more `Streams` as `Output`. Note that this does not mean that a `Component` can process multiple `Input Streams` and produce multiple `Output Streams` at the same time. Indeed, the assumption of pipelining the architecture of an IR system without branches requires to process and produce only one `Stream` at time for each `Component`. The possibility of having more than one `Stream` for each `Component` is related to the fact that a `Component` can be `Chained` in different IR systems, i.e. the same `Component` can be re-used several times to build different systems. Therefore, in each system, the `Component` will process and produce a `Stream`, but always one at time.

When it comes to the processing of `Streams` and their XML serialization, we need to consider that the size of the produced XML files can become huge, even exceeding the maximum dimension for a file allowed by the file system. Therefore, we need to provide a mechanism for splitting a `Stream` into several pieces, that we call *chunks* according to the terminology adopted in the *HyperText*

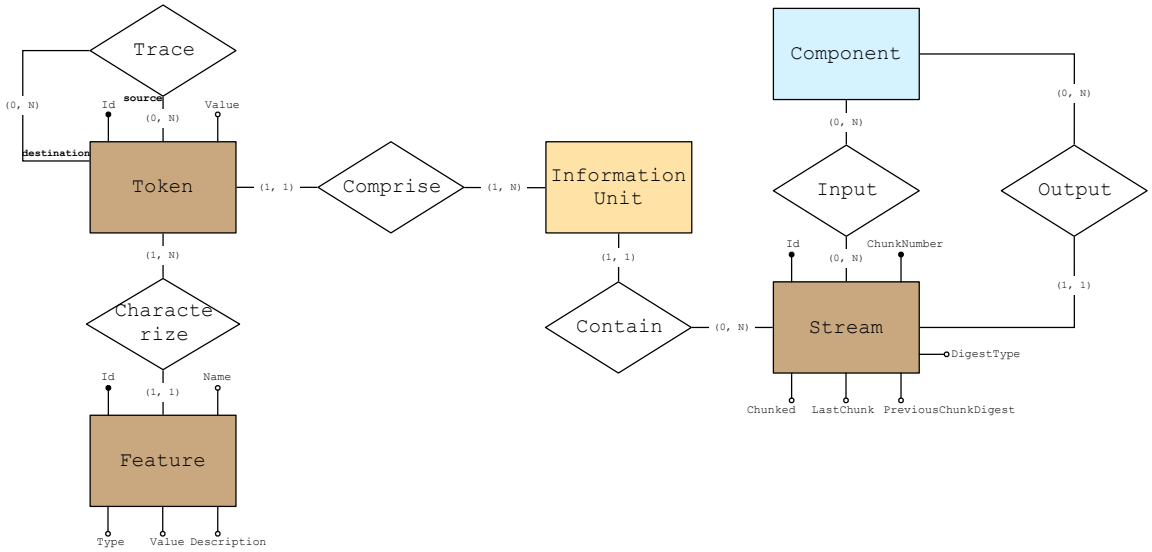

Figure 15: Conceptual model for the CIRCO framework.

Transfer Protocol (HTTP) protocol [Fielding et al., 1999] about the *chunked transfer encoding* used when huge amounts of information have to be exchanged.

Therefore, the `Stream` entity is characterized by the following attributes: `Id` is the unique identifier of the `Stream`; `ChunkNumber` is the number of the current chunk in a chunked `Stream` or 0 for a `Stream` that is not chunked; `Chunked` indicates whether the `Stream` is split into chunks or not; `LastChunk` indicates whether the current one is the last chunk of a chunked `Stream`; `PreviousChunkDigest` is the message digest of the previous chunk in a chunked `Stream` computed with the digest algorithm specified by `DigestType`. Typical digest algorithms are SHA-1 [Eastlake and Jones, 2001] and MD5 [Rivest, 1992].

As you can note, the attributes of the `Stream` entity are chosen so that you do not need to know in advance how many chunks will constitute a `Stream` but this can be incrementally handled while the processing goes on. The `ChunkNumber` attribute allows for re-ordering of the various `Stream` chunks; the `PreviousChunkDigest` and `DigestType` allow for checking the correctness and integrity of the previous `Stream` chunk upon receiving the next one; the `LastChunk` attribute indicates the end of a chunked `Stream`.

As anticipated above, the `Information Unit` entity represents a generic digital object that is being processed by a `Component`. Examples of `Information Units` are textual documents, images, audio files, and so on. An `Information Unit` is uniquely identified by its `Id` attribute and the `Stream` it belongs to, since the same `Information Unit`, i.e. the same digital object, in two different `Streams` will have different contents due to the different processing applied in each `Stream`. The `MimeType` attribute specifies the *Multipurpose Internet Mail Extensions (MIME)* media type [Freed and Borenstein, 1996a,b] of the `Information Unit`; this allows us to deal with multimedia resources in general, going beyond simple textual documents.

A `Stream Contains` zero or more `Information Units` while an `Information Unit` must be

Contained exactly into one Stream. As introduced above, this does not mean that a given Information Unit – for example, a textual document with identifier doc153 – cannot be processed into different Streams; on the contrary, it means that we distinguish when the same Information Unit takes part to different Streams – for example, doc153 in Stream stream10 is regarded as different from doc153 in Stream stream37 because it underwent two different kinds of processing, for example, stemming in stream10 and word de-compounding in stream37.

A Token represents an atom of information in an Information Unit. For example, in the case of textual documents, it can be a word or a noun phrase. A Token is identified by a unique identifier Id, while the Value attribute is the string representation of the Token. For example, in the case of textual documents, the Value of a Token can be the work the Token represents but, in the case of an image, it could be the string representation of bin of a color histogram, and so on.

On the Token entity, there is a recursive relationship, called Trace, whose purpose is allowing us to keep trace of previous versions of a given Token so that it is possible to re-construct the history of the different processing it has undergone. In this way, if a Component is not able to process the current form of a Token, it may try to fall-back to a previous form contained in the Trace; moreover, this could also be useful for debugging purposes to see how a token is modified as the processing goes on. Note that Trace is a many–to-many relationship since, in general, a Token can be originated by one or more Tokens, as in the case of two separate words that are merged into a noun phrase; in a similar way, a Token can originate one or more Tokens, as in the case of a compound word which generates a Token for each of its constituents words.

A Feature represents a characteristic or a property of a Token. Indeed, a Token is Characterized by one or more Features while each Feature must Characterize just one Token.

The Feature entity is qualified by the following attributes: a unique identifier called Id; a Name which defines the kind of Feature we are dealing with; a short Description providing additional information about the Feature; a Type which represents the data type of the Value of the Feature, e.g. string, number, date.

3.10 Inter-area Relationships

Aim of this subsection is to show how the different areas, that until now have been examined separately, interact.

Figure 16 shows the relationships between entities in the Evaluation Activity and Experimental Collection areas. Originally, in [Agosti et al., 2011], also the Resource area was included, but since the relationship that linked the User entity to Evaluation Activity and Task were removed, Figure 16 depicts entities coming from only two areas.
According to the Is Used By relationship between Task and Experimental Collection a task may or may not use an experimental collection; this allows us to consider tasks where the activity is not based on an experimental test collection (e.g. a task of a trial evaluation activity that is connected to a guerrilla experiment type). Moreover, a task performed within an evaluation activity can exploit more than one experimental collection; for instance, this is the case of a trial evaluation activity where the same weighting scheme or the same methodology is tested across different experimental collections, e.g. TREC 7 and TREC 8 Ad-hoc Test Collection, and TREC2001 Web Track Ad-hoc

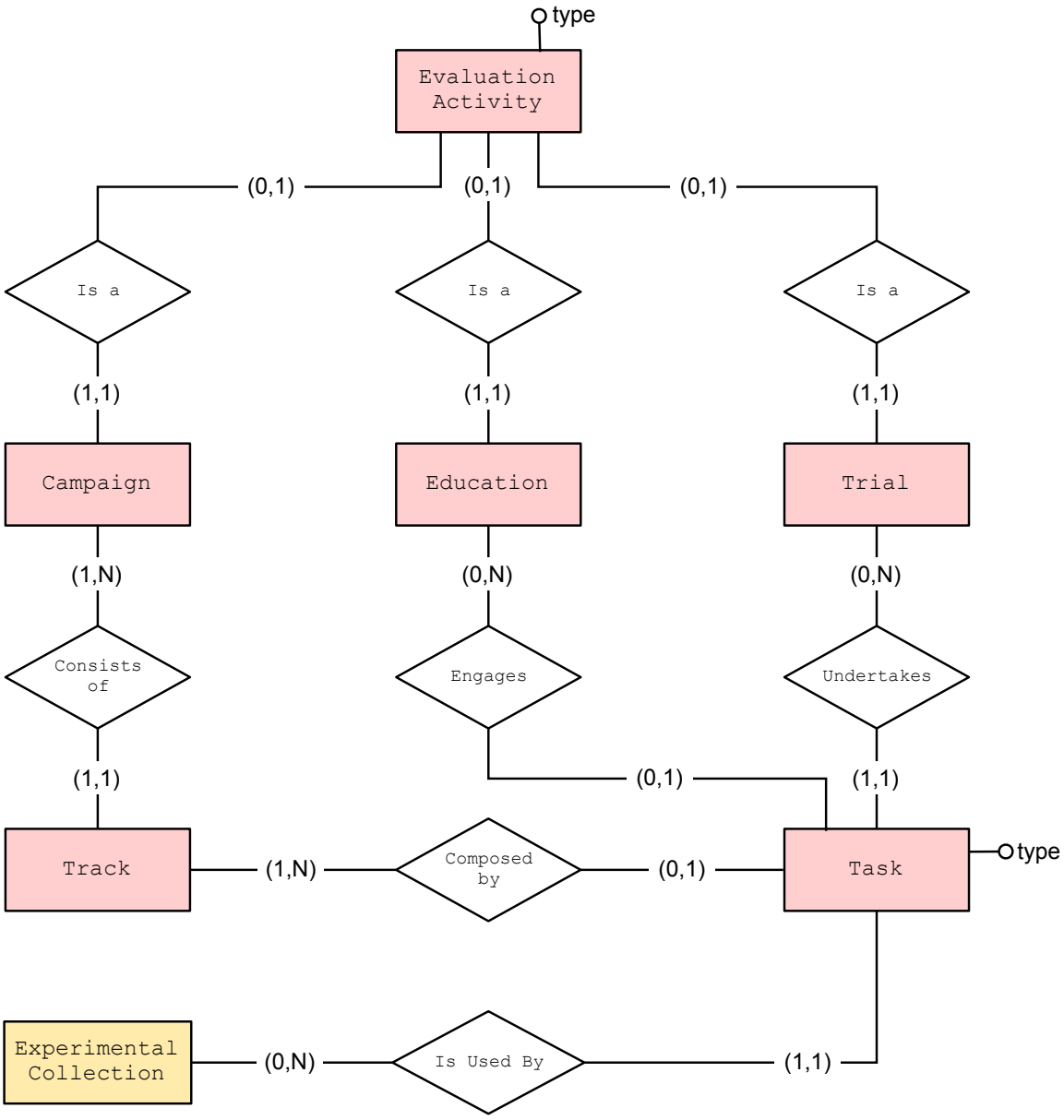

Figure 16: Relationships between entities in the Resource, Evaluation Activity and Experimental Collection Areas

Test Collection. For tasks that involve a training phase and a test phase (e.g. the CLEF-IP Patent Classification task) the two phases are considered as distinct tasks.

Figure 17 shows the interactions between Evaluation Activity, Experimental Collection, Experiment and Resource areas. Each experiment refers to one and only one user-task pair. A task can use no, one or more topic fields, where some of the adopted fields can be mandatory: this is modelled by the attribute mandatory of relationship `Uses Topic Field` that involves the `Task` and the `Topic Field` entity.
A run `Comprises` at least one `Run Item`, where each `Run Item` refers to a specific run/topic/information unit triple; an information unit as well as a topic can be related to no, one or more run items through the `Comprises` relationship. Some of the runs retained in the infrastructure are adopted to constitute the pool: a run is pooled in no, one or more pools, while a pool is constituted by run items in at least one run. Lastly, the Is `Assessor` relationship states that a user can be an assessor for no, one or more pools, and that a pool must have at least one assessor.

Figure 18 concerns entities in the Measurement area and their relationship with entities of other areas, i.e. Evaluation Activity area, Experimental Collection area and Experiment area.

Figure 19, depicting relationships between entities in the Evaluation Activity, Experimental Collection, Measurement and Resource areas, is not very different from its former version. The only differences are caused by the substitutions of `Statistical Analysis` with `Concept` and of `Pool` with `Ground Truth`.
A statistical analysis (`Concept` entity) can produce a value for a specific statistical test; the `Statistical Test` value can be `Elaborated From` data in no, one or more `Ground Truths`, or `Calculated From` data from no, one or more `Tasks`, or `Computed From` an `Experiment`. Lastly, a `Statistical Test` value can be obtained by the test `Conducted` on no, one or more `Measures`.

Figure 20 depicts the relationship between the `Visualization` entity and entities in the Evaluation Activity, the Experimental Collection, the Experiment and the Measurement area. Every visualization can be related to no, one or more `Tasks` (see relationship `ViTa`), to no, one or more `Pools` (see relationship `ViPo`), to no, one or more `Experiments` (see relationship `ViEx`), to no, one or more `Statistical Tests` (see relationship `ViSt`). In this latest version of this work, `Visualization` has two more relationships: one with `Measure` (`ViMe`) and one with `Estimate` (`ViEs`).

Figure 21 depicts the relationship between the `Contribution` entity and the entities in the Evaluation Activity, the Experimental Collection, and the Experiment area. The basic rationale behind the introduction of these relationships is that a contribution can refer to data stored in the infrastructure: besides experimental collections and its constituting components (i.e. corpus, pool and topic group) a contribution can refer to no, one or more experiments, evaluation activities, tracks and tasks. That allows us to measure the impact of the PROMISE project both in terms of citations to papers on PROMISE related evaluation activities and citations on data that has resulted from such activities, e.g. experiments and experimental collections. Moreover, that can help identify previous works that exploit the same experimental collection or their constituting component, or concern similar tasks (i.e. experimental hypotheses to be tested).

With respect to the previous version of the conceptual model, `Contribution` now is related also to `Concept` by means of the `labels` association. This association allows us to associate a contribution with a topic of interest. `labels` has a score attribute that defines the weight of a contribution w.r.t. a given topic.

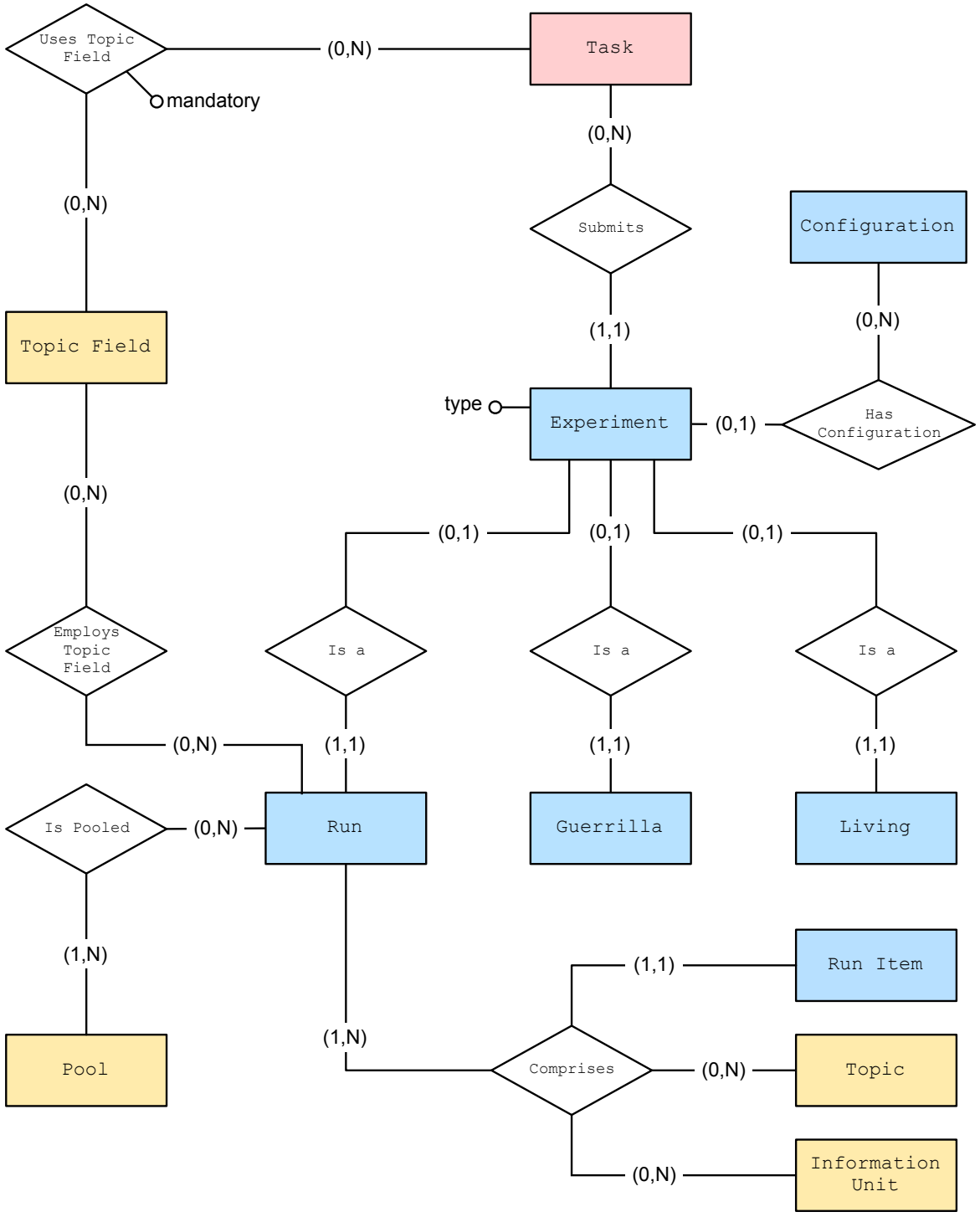

Figure 17: Relationships between entities in the Evaluation Activity, Experimental Collection, Experiment and Resource Areas

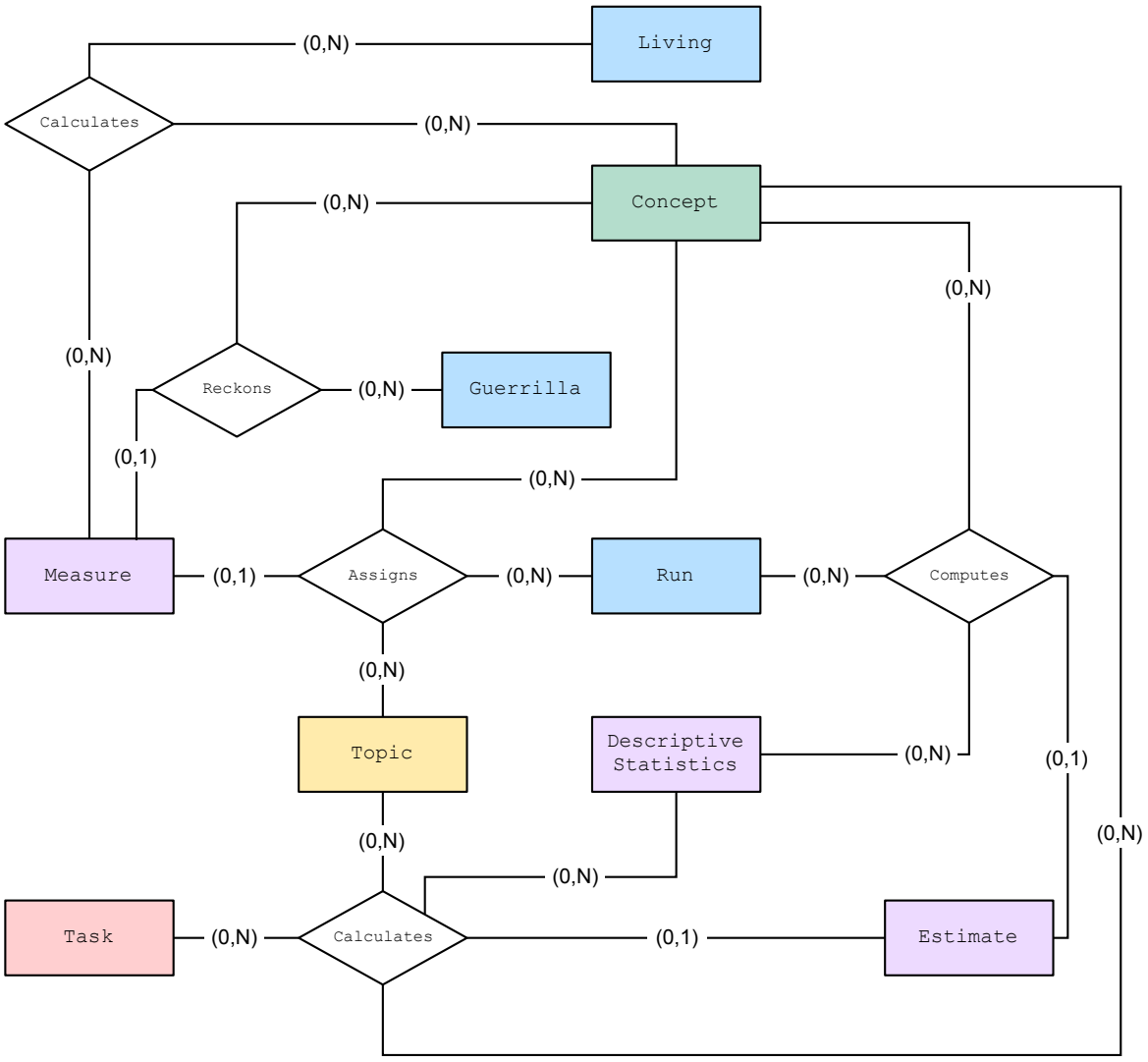

Figure 18: Relationships between entities in the Resource, Evaluation Activity, Experimental Collection, Experiment and Measurement Areas

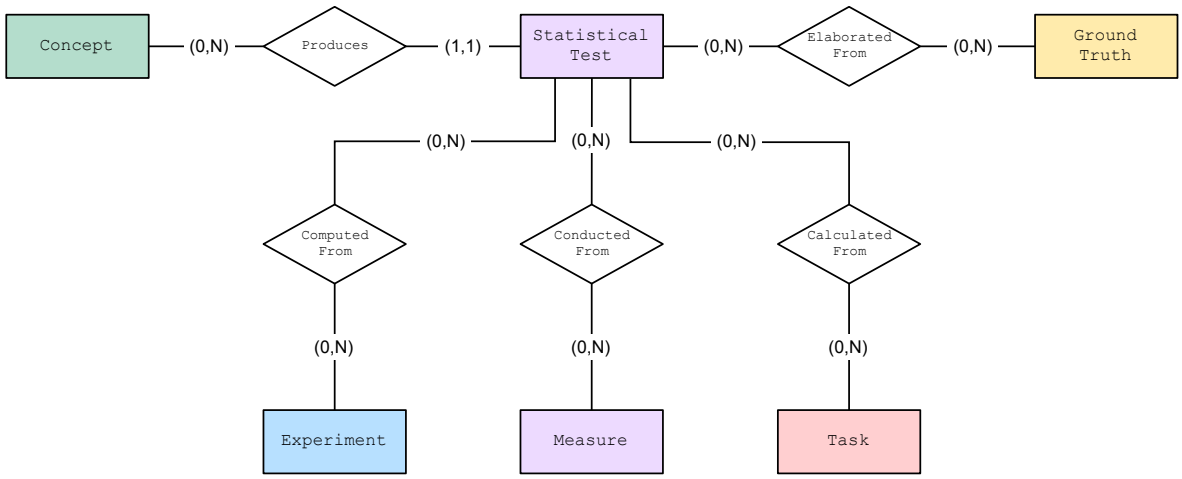

Figure 19: Relationships between entities in the Evaluation Activity, Experimental Collection, Measurement and Resource Areas

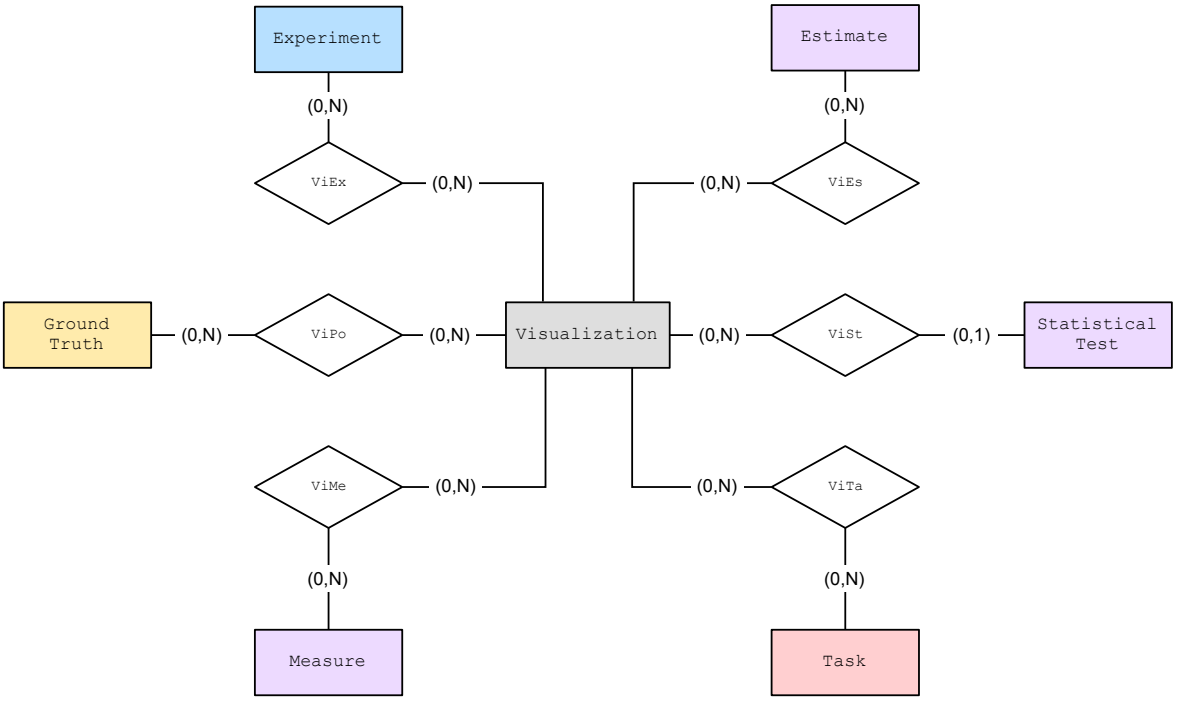

Figure 20: Relationships between the Visualization entity and entities in the Evaluation Activity, Experimental Collection, Experiment and Measurement Areas

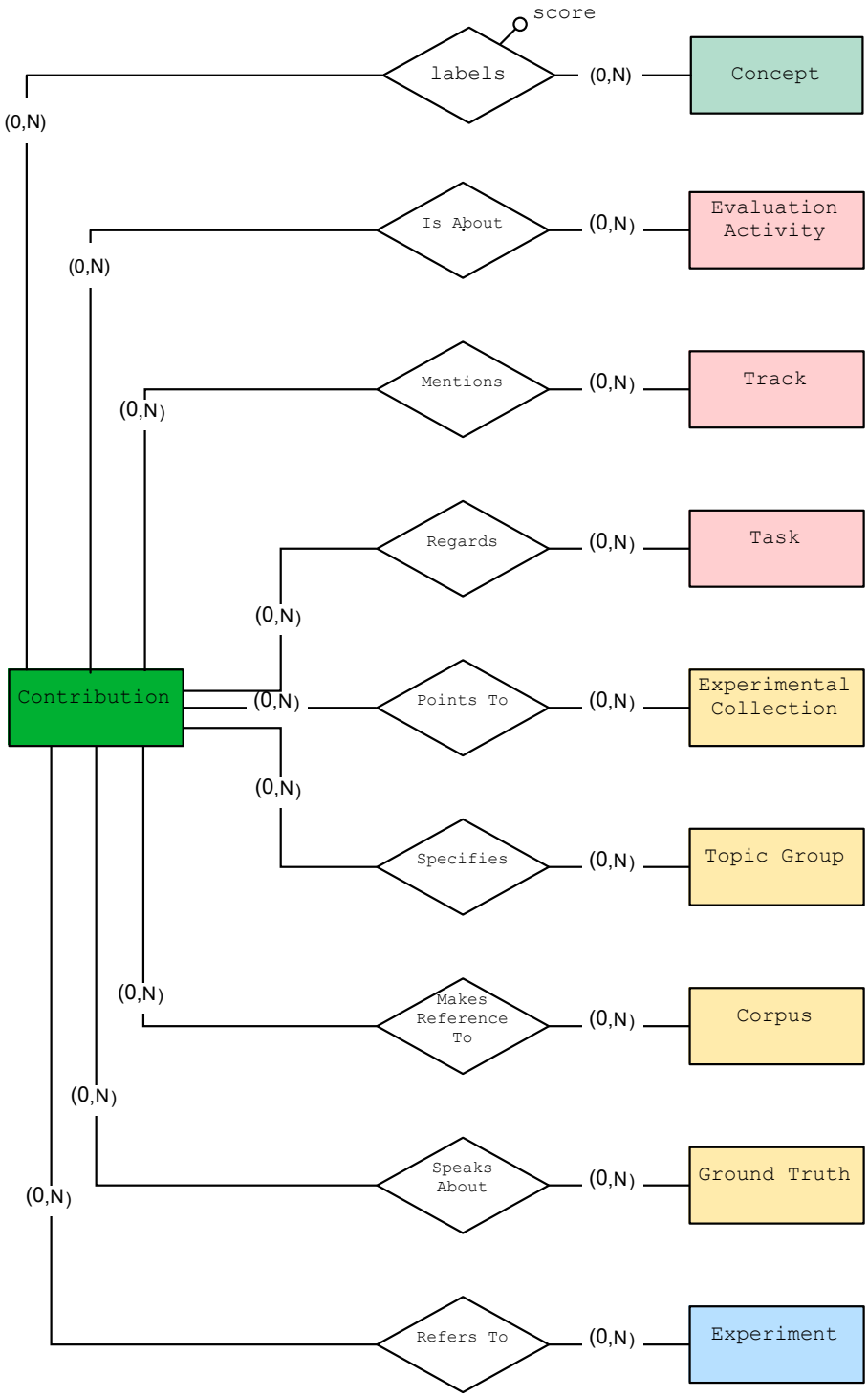

Figure 21: Relationships between the Contribution entity of the Bibliographical area and the entities in the Evaluation Activity, Experimental Collection and Experiment Areas

4 RDF Model for Experimental Evaluation

In order to expose the experimental data handled by DIRECT as Linked Open Data (LOD) and to enrich these data with semantic data available on the Web, we defined an RDF schema modeling the experimental evaluation workflow. In particular, this schema is required to enrich experimental data and to extract relevant information for expert profiling; for this reason it is partially reported also in D3.6[7] [Bordea et al., 2013]. Furthermore, the RDF schema is important for enabling impact analysis over scientific contributions managed by DIRECT as reported in D6.4 [Tsikrika et al., 2013]. As a consequence the most relevant areas covered by this section are the resource area, the measurement area and the bibliographical area described in Section 3.

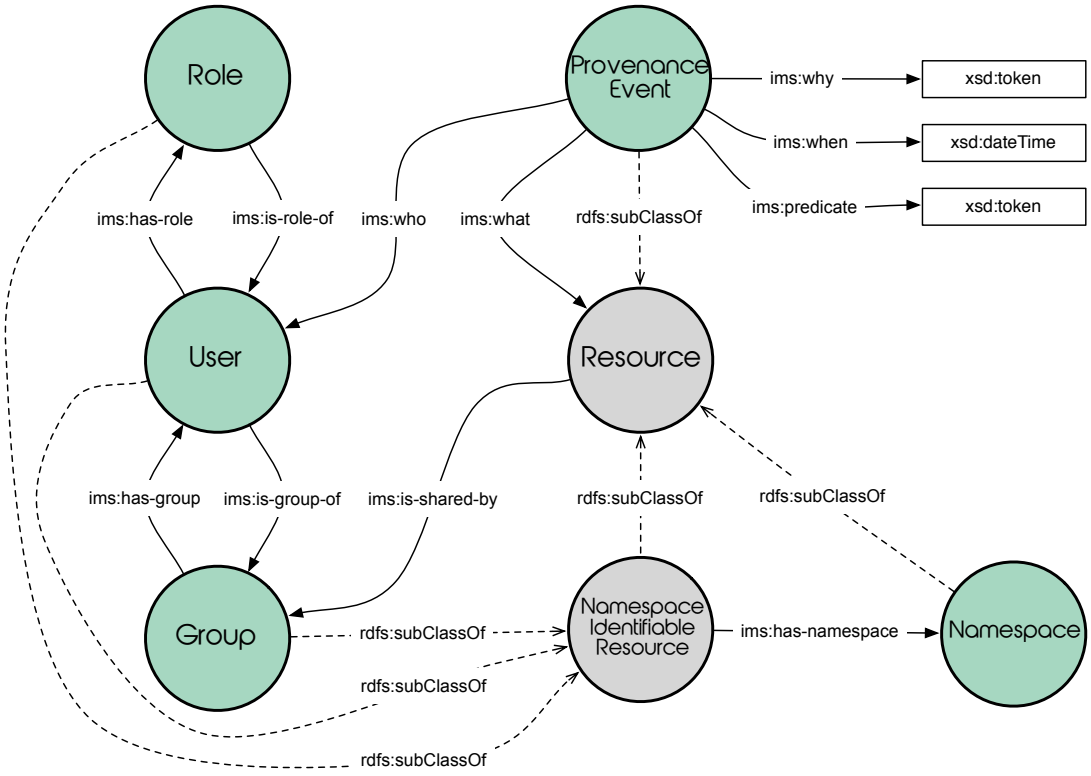

Figure 22: The Resource Management area classes and properties.

The names of classes and properties defined in the RDF schema are consisted with the names used in the conceptual model; for this reason we defined all the term in a common IMS namespace reported in Table 2. On the other hand, it is important to relate DIRECT terms with already existing

[7]The RDF model concerning the resource area is reported also in D3.6 since it is needed to make that deliverable self-contained. However, in D3.6 it is further specialized to support the different kinds of links between contributions, authors and topics while here in D3.5 we stay at a more general level in this respect. Moreover, the description of the RDF model reported here in D3.5 covers also the measurement and bibliometrics areas which are not reported elsewhere, as well as it provides examples of instantiations.

Table 1: Main datatype properties of the resource management and contribution area classes reported in Figures 22 and 23. `Namespace` `Identifiable` `Resource`, `Concept`, `Group`, and `Role` are not reported because they have no additional datatype properties w.r.t. `Resource`. "ims" is the prefix for `http://ims.dei.unipd.it/data/rdf/` pointing to DIRECT vocabulary terms.

Class	OWL Datatype Properties
`Contribution`	ims:affiliation, ims:title, ims:pages, ims:additional-information, ims:year, ims:link, ims:copyrighted
`Link`	ims:score, ims:backward-score, ims:frequency
`Namespace`	ims:prefix
`Provenance-Event`	ims:when, ims:why, ims:predicate
`Resource`	ims:identifier, ims:created, ims:last-modified, ims:description, ims:name, ims:content, ims:content-transfer-encoding, ims:language, ims:country
`User`	ims:password, ims:first-name, ims:last-name, ims:affiliation, ims:e-mail, ims:birth-date, ims:gender, ims:address, ims:city, ims:state, ims:zip, ims:phone, ims:facsimile, ims:mobile, ims:voip-caller-id, ims:homepage

vocabularies in order to allow for our model to be discovered and used by third party actors; to this end, many terms in the IMS namespace are related to other terms in external vocabularies by means of the `owl:sameAs` property[8]. This approach allows us to be consistent with the model defined for the existing infrastructure and to be able to enrich our resources with third party semantics.

In the RDF schema (which is reported in the Appendix B) we consider a `Resource` as a generic class sharing the same meaning of resource in RDF [W3C, 2004] where "*all things described by RDF are called resources. [...] the class of everything.*" In DIRECT a `Resource` represents the class of everything that exists in the IR experimental evaluation.

The resource management area models the more general and thick-grained resources involved in the evaluation workflow – i.e. users, groups, roles, namespaces, and concepts – and the relationships among them. Furthermore, it handles the provenance (by means of the so-called `Provenance-Event` class) of the data. All the classes of this area are defined as subclasses of the general `Resource` class and they are represented in Figure 22 along the properties connecting them; for sake of readability we omitted from the figure the datatype properties, reported in Table 1, which are non-essential for the comprehension of the model.

The `User` class represents the actors involved in the evaluation activities such as researchers conducting experiments, organizers of a campaign, assessors, data scientists, and authors of a scientific contributions. The function of a user in the evaluation workflow is defined by the `Role` class; moreover, the users can be grouped together via the `Group` class. A user can play none, one or more roles: for instance, a user can be both an organizer of a campaign and a researcher submitting experiments, i.e. a participant to the campaign. On the other hand, there are roles

[8] http://www.w3.org/TR/owl-ref/

played by more then one user; for instance, a campaign can have one or more participants, e.g. the researchers that are carrying out the experiments for writing a paper. A group is a resource that arrange together users with some common characteristics; for instance, there could be a group formed by all the users belonging to a certain research group.

The `Namespace` class refers to a logical grouping of identifiers and allows the disambiguation of homonym identifiers belonging to different namespaces. For instance, users are associated with a namespace which in the case of researchers allows us to classify them on an affiliation basis or the terms of an ontology are associated to a namespace allowing us to disambiguate with homonym terms of another ontology. In the RDF model of DIRECT along with the general `Resource` we described above, there is another general class called `Namespace Identifiable Resource` as we can see in Figure 22; this is a subclass of `Resource` always associated to a namespace. Thus, in the RDF model of DIRECT there are two kinds of general resources, the first which has no namespace and the second which has one. Thus, in Figure 22 we can see that `User`, `Group` and `Role` have a namespace, whereas the `Namespace` itself and `Provenance-Event` classes have no namespace.

The `Provenance-Event` class is not related to a namespace because it does not need to be disambiguated given that it exists only in the context of DIRECT. Indeed, a provenance event keeps track of the full lineage of each resource managed by DIRECT since its first creation, allowing granted users to reconstruct its full history and modifications over time. As shown in Figure 22, `Provenance-Event` is a subclass of `Resource` and it is composed by two object properties and three datatype properties, where:

- **who**, is the property associating the provenance event with the user who caused the event;
- **what**, is the property associating the provenance event with the specific resource originated by the event – please note that every resource in the model can be related to a provenance event;
- **when**, is the datatype property associating the provenance event with the timestamp at which the event occurred;
- **why**, is the datatype property associating the provenance event with the motivation that originated the event, i.e. the operation performed by the system that led to a modification of the resource;
- **predicate**, is the datatype property associating the provenance event with the action carried out in the event, i.e. CREATED, READ, or DELETED.

Modeling provenance is central for the definition of expert profiles and topic extraction because it allows for guaranteeing the quality and integrity of the data produced by the evaluation workflow [Buneman, 2013]. As we discussed above, the data produced by experimental evaluation are not raw data, but they are the product of a series of transformations which involve inputs from scientists and experts of the field. Keeping what was done with the data is crucial if we want to verify the quality or if we want to reproduce the experiments [Buneman, 2013]; moreover, these data are used for scientific production which in turn are exploited for expert profiling, two activities that must rely

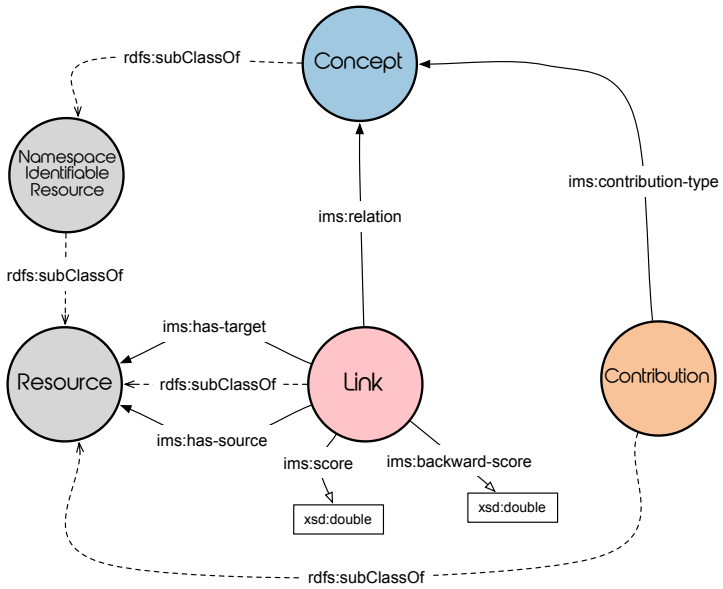

Figure 23: The Scientific Production area classes and properties.

on high quality data. The `Provenance-Event` class allows us to record the five aspects (i.e. who, what, when, why and predicate) required for keeping the lineage of data [Cheney et al., 2009] and, consequently, the reliability of the information we extract and infer from these data.

In Figure 23 we can see the classes and the properties of the scientific production area. This part of the RDF model is central for the expert profiling activity because it handles scientific contributions, their relations with scientists and authors, and the scientific topics that can be extracted or inferred from them. In Figure 23 there are three main classes which are `Concept`, `Contribution` and `Link`.

`Concept` is defined as an idea or notion, a unit of thought; it is used to define the type of relationships in a semantic environment or to create a vocabulary (e.g. contribution types) and, in some sense, resembles the idea of concept introduced by SKOS [W3C, 2009a,b]. `Concept` is a subclass of `Namespace Identifiable Resource` and thus every instance of it has a namespace. In DIRECT every vocabulary we create or import is handled via the `Concept` class.

In Table 2 we can see all the vocabularies adopted in DIRECT for the Resource Management and the Scientific Production areas.

The `Contribution` class represents every publication concerning the scientific production phase of the evaluation workflow. We can see that it is related to `Concept` via the `ims:contribution-type` property.

The `Link` class connects two resources via the `ims: has-source` and `ims:has-target` properties with a typed relationship realized throughout a concept connected to the link via the `ims:relation` property. This allows us for creating a typed relationship between two generic resources involved in the evaluation workflow.

`Link` has two datatype properties: `ims:score` and `ims:backward-score`, which allow us to add weights on any typed relationship; both score and backward score are `xsd:double` in the interval

Table 2: Namespaces and Prefixes of the vocabularies adopted in DIRECT for the Resource Management and the Scientific Production areas.

Prefix	Namespace	Description
aktors	http://www.aktors.org/ontology/portal#	Advanced Knowledge Technology reference ontology
bibo	http://purl.org/ontology/bibo/	Bibliographic ontology
dcterms	http://purl.org/dc/terms/	Dublin Core terms
foaf	http://xmlns.com/foaf/0.1/	Friend of a friend
gn	http://www.geonames.org/ontology#	GeoNames Ontology
ims	http://ims.dei.unipd.it/data/rdf/	DIRECT vocabulary terms
owl	http://www.w3.org/2002/07/owl#	OWL vocabulary terms
prov	http://www.w3.org/ns/prov#	The ontology supporting the interchange of provenance on the web
rdf	http://www.w3.org/1999/02/22-rdf-syntax-ns#	RDF vocabulary terms
rdfs	http://www.w3.org/2000/01/rdf-schema#	RDF Schema
swrc	http://swrc.ontoware.org/ontology#	Semantic Web for Research Communities ontology
vann	http://purl.org/vocab/vann/	Vocabulary for annotating descriptions of vocabularies
vcard	http://www.w3.org/2006/vcard/ns#	vCard electronic business card profile defined by RFC 2426
xsd	http://www.w3.org/2001/XMLSchema#	XML Schema

$[0, 1]$. Indeed, we can establish a relation between user and concept with two scores on it in order to say that a user is expert in a given scientific topic. This lets us define expert profiles; for instance, we can say that "userY is an expert in Information Retrieval" where "userY" is an instance of the `User` class and "information retrieval" is a term defined as an instance of `Concept`; the score represents the strength of the relation between a user and a concept, and the backward score represents the strength of the relation between a concept and a user. This means that the relationship between `User` and `Concept` is not symmetric; for instance, we can say that "UserY" is an expert in "Information Retrieval" with score 0.9 and this means that information retrieval is the main area of expertise for the user. On the other hand, there are people more expert in information retrieval than "UserY", so the backward score can be set to be only 0.1, and this would mean that "UserY" is just one of the experts in "Information Retrieval" and that we expect to find out other users with a higher expertise level (backward score) in the considered topic.

In Figure 24 we can see the RDF graph of the measurement area which allows us to model the metrics related to the users (such as the h-index of the authors of scientific contributions), experiments (e.g. precision and recall), contributions (e.g. bibliometrics like impact factor of a journal). Furthermore, this area is important for conducting impact analysis.

We can see that a `Metric` is a sub-class of `Concept` and that the specific class `Bibliometric` is a sub-class of `Metric`. A descriptive `Statistic` is associated to a `Concept` and a `Metric` respectively via the `has-descriptive-statistic` and `ims:has-metric` properties.

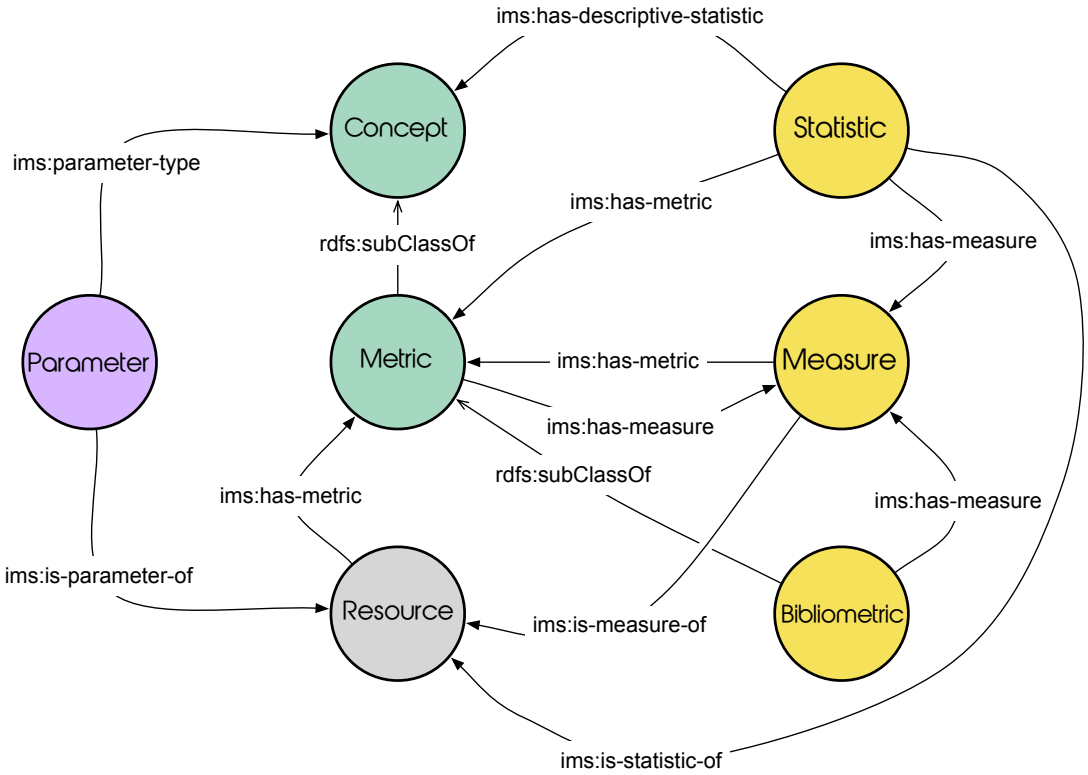

Figure 24: The RDF graph of Measure, Metric and Bibliometric resources.

4.1 Examples of RDF Resources

The architecture of the infrastructure has been extended in order to return the resources also in RDF/XML[9], Turtle[10] and N3[11] formats.

In this section we do not report the RDF serialization of all the resources handled by DIRECT, but we show a couple of examples of relevant resources adopted for the impact analysis reported in Deliverable 6.4: a sample contribution and a sample bibliometric resource. For each resource we report bith the RDF/XML and the Turtle serialization.

In the following we show a sample contribution resource represented in RDF/XML and Turtle format.

```
1 RDF/XML Representation of a sample Contribution
2
3 <rdf:RDF
4     xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
5     xmlns:bibo="http://purl.org/ontology/bibo/"
6     xmlns:foaf="http://xmlns.com/foaf/0.1/"
7     xmlns:owl="http://www.w3.org/2002/07/owl#"
```

[9] http://www.w3.org/TR/REC-rdf-syntax/
[10] http://www.w3.org/TeamSubmission/turtle/
[11] http://www.w3.org/TeamSubmission/n3/

```
8     xmlns:dc="http://purl.org/dc/terms/"
9     xmlns:ims="http://ims.dei.unipd.it/data/rdf/"
10    xmlns:aktors="http://www.aktors.org/ontology/portal#"
11    xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
12    xmlns:swrc="http://swrc.ontoware.org/ontology#" >
13  <rdf:Description rdf:about="http://localhost:8080/ici/user/author-2;http%3A%2F%2Fims.
        dei.unipd.it%2F">
14    <ims:file-metadata rdf:nodeID="A0"/>
15    <ims:has-namespace rdf:resource="http://localhost:8080/ici/namespace/http%3A%2F%2Fims
          .dei.unipd.it%2F"/>
16    <ims:identifier>author-2</ims:identifier>
17  </rdf:Description>
18  <rdf:Description rdf:about="http://localhost:8080/ici/user/user-1;http%3A%2F%2Fims.dei.
        unipd.it%2F">
19    <ims:file-metadata rdf:nodeID="A0"/>
20    <ims:has-namespace rdf:resource="http://localhost:8080/ici/namespace/http%3A%2F%2Fims
          .dei.unipd.it%2F"/>
21    <ims:identifier>user-1</ims:identifier>
22  </rdf:Description>
23  <rdf:Description rdf:about="http://localhost:8080/ici/user/publisher-1;http%3A%2F%2Fims
        .dei.unipd.it%2F">
24    <ims:file-metadata rdf:nodeID="A0"/>
25    <ims:has-namespace rdf:resource="http://localhost:8080/ici/namespace/http%3A%2F%2Fims
          .dei.unipd.it%2F"/>
26    <ims:identifier>publisher-1</ims:identifier>
27  </rdf:Description>
28  <rdf:Description rdf:about="http://localhost:8080/ici/group/group-2;http%3A%2F%2Fims.
        dei.unipd.it%2F">
29    <ims:file-metadata rdf:nodeID="A0"/>
30    <ims:has-namespace rdf:resource="http://localhost:8080/ici/namespace/http%3A%2F%2Fims
          .dei.unipd.it%2F"/>
31    <ims:identifier>group-2</ims:identifier>
32  </rdf:Description>
33  <rdf:Description rdf:about="http://localhost:8080/ici/user/author-1;http%3A%2F%2Fims.
        dei.unipd.it%2F">
34    <ims:file-metadata rdf:nodeID="A0"/>
35    <ims:has-namespace rdf:resource="http://localhost:8080/ici/namespace/http%3A%2F%2Fims
          .dei.unipd.it%2F"/>
36    <ims:identifier>author-1</ims:identifier>
37  </rdf:Description>
38  <rdf:Description rdf:about="http://localhost:8080/ici/contribution/c1">
39    <ims:affiliation>Affiliation 2</ims:affiliation>
40    <ims:pages>103-114</ims:pages>
41    <ims:link>http%3A%2F%2Fims.dei.unipd.it%2F</ims:link>
42    <ims:is-shared_by rdf:resource="http://localhost:8080/ici/group/group-3;http%3A%2F%2
          Fims.dei.unipd.it%2F"/>
43    <ims:owner rdf:resource="http://localhost:8080/ici/user/user-1;http%3A%2F%2Fims.dei.
          unipd.it%2F"/>
44    <ims:last-modified>2013-09-27T18:49:14.215+02:00</ims:last-modified>
45    <ims:publisher rdf:resource="http://localhost:8080/ici/user/publisher-1;http%3A%2F%2
          Fims.dei.unipd.it%2F"/>
46    <ims:created>2013-09-27T18:49:14.215+02:00</ims:created>
47    <ims:is-shared_by rdf:resource="http://localhost:8080/ici/group/group-1;http%3A%2F%2
          Fims.dei.unipd.it%2F"/>
48    <ims:is-shared_by rdf:resource="http://localhost:8080/ici/group/group-2;http%3A%2F%2
          Fims.dei.unipd.it%2F"/>
49    <ims:file-metadata rdf:nodeID="A0"/>
50    <ims:additional-information>2nd edition</ims:additional-information>
51    <ims:title>the first contribution</ims:title>
52    <ims:affiliation>Affiliation 1</ims:affiliation>
```

```
53      <swrc:has-author rdf:resource="http://localhost:8080/ici/user/author-2;http%3A%2F%2
            Fims.dei.unipd.it%2F"/>
54      <ims:copyrighted>false</ims:copyrighted>
55      <swrc:has-author rdf:resource="http://localhost:8080/ici/user/author-3;http%3A%2F%2
            Fims.dei.unipd.it%2F"/>
56      <swrc:has-author rdf:resource="http://localhost:8080/ici/user/author-1;http%3A%2F%2
            Fims.dei.unipd.it%2F"/>
57      <ims:country>BRA</ims:country>
58      <ims:country>ITA</ims:country>
59      <ims:country>USA</ims:country>
60      <ims:affiliation>Affiliation 3</ims:affiliation>
61      <ims:content>&lt;pippo&gt;try&lt;/pippo&gt;</ims:content>
62      <ims:contribution-type rdf:resource="http://localhost:8080/ici/concept/article;http%3
            A%2F%2Fims.dei.unipd.it%2F"/>
63    </rdf:Description>
64    <rdf:Description rdf:about="http://localhost:8080/ici/group/group-1;http%3A%2F%2Fims.
          dei.unipd.it%2F">
65      <ims:file-metadata rdf:nodeID="A0"/>
66      <ims:has-namespace rdf:resource="http://localhost:8080/ici/namespace/http%3A%2F%2Fims
            .dei.unipd.it%2F"/>
67      <ims:identifier>group-1</ims:identifier>
68    </rdf:Description>
69    <rdf:Description rdf:nodeID="A0">
70      <dc:created>2013-09-27T18:49:14.966+02:00</dc:created>
71      <dc:rights>Copyright (c) 2006-2013 - Information Management Systems (IMS) Research
            Group (http://ims.dei.unipd.it/) - Department of Information Engineering (http://
            www.dei.unipd.it/) - University of Padua (http://www.unipd.it/)</dc:rights>
72      <dc:creator>IMS Component Integrator (ICI) - Version 3.10</dc:creator>
73    </rdf:Description>
74    <rdf:Description rdf:about="http://localhost:8080/ici/group/group-3;http%3A%2F%2Fims.
          dei.unipd.it%2F">
75      <ims:file-metadata rdf:nodeID="A0"/>
76      <ims:has-namespace rdf:resource="http://localhost:8080/ici/namespace/http%3A%2F%2Fims
            .dei.unipd.it%2F"/>
77      <ims:identifier>group-3</ims:identifier>
78    </rdf:Description>
79    <rdf:Description rdf:about="http://localhost:8080/ici/user/author-3;http%3A%2F%2Fims.
          dei.unipd.it%2F">
80      <ims:file-metadata rdf:nodeID="A0"/>
81      <ims:has-namespace rdf:resource="http://localhost:8080/ici/namespace/http%3A%2F%2Fims
            .dei.unipd.it%2F"/>
82      <ims:identifier>author-3</ims:identifier>
83    </rdf:Description>
84    <rdf:Description rdf:about="http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.
          unipd.it%2F">
85      <ims:file-metadata rdf:nodeID="A0"/>
86      <ims:prefix>ims</ims:prefix>
87      <ims:identifier>http%3A%2F%2Fims.dei.unipd.it%2F</ims:identifier>
88    </rdf:Description>
89    <rdf:Description rdf:about="http://localhost:8080/ici/concept/article;http%3A%2F%2Fims.
          dei.unipd.it%2F">
90      <ims:file-metadata rdf:nodeID="A0"/>
91      <ims:has-namespace rdf:resource="http://localhost:8080/ici/namespace/http%3A%2F%2Fims
            .dei.unipd.it%2F"/>
92      <ims:identifier>article</ims:identifier>
93    </rdf:Description>
94  </rdf:RDF>
95
96  RDF Turtle Representation of a sample Contribution
97
```

```
@prefix dc:     <http://purl.org/dc/terms/> .
@prefix rdfs:   <http://www.w3.org/2000/01/rdf-schema#> .
@prefix aktors: <http://www.aktors.org/ontology/portal#> .
@prefix foaf:   <http://xmlns.com/foaf/0.1/> .
@prefix ims:    <http://ims.dei.unipd.it/data/rdf/> .
@prefix bibo:   <http://purl.org/ontology/bibo/> .
@prefix owl:    <http://www.w3.org/2002/07/owl#> .
@prefix rdf:    <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix swrc:   <http://swrc.ontoware.org/ontology#> .

<http://localhost:8080/ici/group/group-2;http%3A%2F%2Fims.dei.unipd.it%2F>
        ims:file-metadata   _:b0 ;
        ims:has-namespace   <http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.
            unipd.it%2F> ;
        ims:identifier      "group-2" .

<http://localhost:8080/ici/user/publisher-1;http%3A%2F%2Fims.dei.unipd.it%2F>
        ims:file-metadata   _:b0 ;
        ims:has-namespace   <http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.
            unipd.it%2F> ;
        ims:identifier      "publisher-1" .

<http://localhost:8080/ici/user/user-1;http%3A%2F%2Fims.dei.unipd.it%2F>
        ims:file-metadata   _:b0 ;
        ims:has-namespace   <http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.
            unipd.it%2F> ;
        ims:identifier      "user-1" .

<http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.unipd.it%2F>
        ims:file-metadata   _:b0 ;
        ims:identifier      "http%3A%2F%2Fims.dei.unipd.it%2F" ;
        ims:prefix          "ims" .

<http://localhost:8080/ici/group/group-1;http%3A%2F%2Fims.dei.unipd.it%2F>
        ims:file-metadata   _:b0 ;
        ims:has-namespace   <http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.
            unipd.it%2F> ;
        ims:identifier      "group-1" .

<http://localhost:8080/ici/user/author-3;http%3A%2F%2Fims.dei.unipd.it%2F>
        ims:file-metadata   _:b0 ;
        ims:has-namespace   <http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.
            unipd.it%2F> ;
        ims:identifier      "author-3" .

<http://localhost:8080/ici/user/author-2;http%3A%2F%2Fims.dei.unipd.it%2F>
        ims:file-metadata   _:b0 ;
        ims:has-namespace   <http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.
            unipd.it%2F> ;
        ims:identifier      "author-2" .

<http://localhost:8080/ici/contribution/c1>
        ims:additional-information  "2nd edition" ;
        ims:affiliation             "Affiliation 2" , "Affiliation 1" , "Affiliation 3" ;
        ims:content                 "<pippo>try</pippo>" ;
        ims:contribution-type       <http://localhost:8080/ici/concept/article;http%3A%2F
            %2Fims.dei.unipd.it%2F> ;
        ims:copyrighted             "false" ;
        ims:country                 "BRA" , "ITA" , "USA" ;
        ims:created                 "2013-09-27T18:49:14.215+02:00" ;
```

```
151         ims:file-metadata                   _:b0 ;
152         ims:is-shared_by                    <http://localhost:8080/ici/group/group-3;http%3A%2F%2
                Fims.dei.unipd.it%2F> , <http://localhost:8080/ici/group/group-1;http%3A%2F%2
                Fims.dei.unipd.it%2F> , <http://localhost:8080/ici/group/group-2;http%3A%2F%2
                Fims.dei.unipd.it%2F> ;
153         ims:last-modified                   "2013-09-27T18:49:14.215+02:00" ;
154         ims:link                            "http%3A%2F%2Fims.dei.unipd.it%2F" ;
155         ims:owner                           <http://localhost:8080/ici/user/user-1;http%3A%2F%2
                Fims.dei.unipd.it%2F> ;
156         ims:pages                           "103-114" ;
157         ims:publisher                       <http://localhost:8080/ici/user/publisher-1;http%3A%2
                F%2Fims.dei.unipd.it%2F> ;
158         ims:title                           "the first contribution" ;
159         swrc:has-author                     <http://localhost:8080/ici/user/author-2;http%3A%2F%2
                Fims.dei.unipd.it%2F> , <http://localhost:8080/ici/user/author-3;http%3A%2F%2
                Fims.dei.unipd.it%2F> , <http://localhost:8080/ici/user/author-1;http%3A%2F%2
                Fims.dei.unipd.it%2F> .
160
161 <http://localhost:8080/ici/concept/article;http%3A%2F%2Fims.dei.unipd.it%2F>
162         ims:file-metadata   _:b0 ;
163         ims:has-namespace   <http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.
                unipd.it%2F> ;
164         ims:identifier      "article" .
165
166 _:b0    dc:created   "2013-09-27T18:49:15.047+02:00" ;
167         dc:creator   "IMS Component Integrator (ICI) - Version 3.10" ;
168         dc:rights    "Copyright (c) 2006-2013 - Information Management Systems (IMS)
                Research Group (http://ims.dei.unipd.it/) - Department of Information
                Engineering (http://www.dei.unipd.it/) - University of Padua (http://www.
                unipd.it/)" .
169
170 <http://localhost:8080/ici/group/group-3;http%3A%2F%2Fims.dei.unipd.it%2F>
171         ims:file-metadata   _:b0 ;
172         ims:has-namespace   <http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.
                unipd.it%2F> ;
173         ims:identifier      "group-3" .
174
175 <http://localhost:8080/ici/user/author-1;http%3A%2F%2Fims.dei.unipd.it%2F>
176         ims:file-metadata   _:b0 ;
177         ims:has-namespace   <http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.
                unipd.it%2F> ;
178         ims:identifier      "author-1" .
```

In the following we show a sample bibliometric resource represented in RDF/XML and Turtle format.

```
1  RDF\XML Turtle Representation of a sample Bibliometric resurce
2
3  <rdf:RDF
4      xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
5      xmlns:bibo="http://purl.org/ontology/bibo/"
6      xmlns:foaf="http://xmlns.com/foaf/0.1/"
7      xmlns:owl="http://www.w3.org/2002/07/owl#"
8      xmlns:dc="http://purl.org/dc/terms/"
9      xmlns:ims="http://ims.dei.unipd.it/data/rdf/"
10     xmlns:aktors="http://www.aktors.org/ontology/portal#"
11     xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
12     xmlns:swrc="http://swrc.ontoware.org/ontology#" >
13   <rdf:Description rdf:about="http://localhost:8080/ici/measure/m1">
14     <ims:file-metadata rdf:nodeID="A0"/>
```

```
15      <ims:has-metric rdf:resource="http://localhost:8080/ici/concept/metric-1;http%3A%2F%2
            Fims.dei.unipd.it%2F"/>
16      <ims:is-measure-of rdf:resource="http://localhost:8080/ici/namespace/http%3A%2F%2Fims
            .dei.unipd.it%2F"/>
17      <ims:year>2012</ims:year>
18      <ims:value>1.2352809154E-1</ims:value>
19      <ims:created>2013-09-27T18:41:57.757+02:00</ims:created>
20      <ims:identifier>m1</ims:identifier>
21    </rdf:Description>
22    <rdf:Description rdf:nodeID="A0">
23      <dc:created>2013-09-27T18:41:59.434+02:00</dc:created>
24      <dc:rights>Copyright (c) 2006-2013 - Information Management Systems (IMS) Research
            Group (http://ims.dei.unipd.it/) - Department of Information Engineering (http://
            www.dei.unipd.it/) - University of Padua (http://www.unipd.it/)</dc:rights>
25      <dc:creator>IMS Component Integrator (ICI) - Version 3.10</dc:creator>
26    </rdf:Description>
27    <rdf:Description rdf:about="http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.
          unipd.it%2F">
28      <ims:file-metadata rdf:nodeID="A0"/>
29      <ims:identifier>http%3A%2F%2Fims.dei.unipd.it%2F</ims:identifier>
30      <ims:prefix>ims</ims:prefix>
31    </rdf:Description>
32    <rdf:Description rdf:about="http://localhost:8080/ici/concept/metric-1;http%3A%2F%2Fims
          .dei.unipd.it%2F">
33      <ims:file-metadata rdf:nodeID="A0"/>
34      <ims:has-namespace rdf:resource="http://localhost:8080/ici/namespace/http%3A%2F%2Fims
            .dei.unipd.it%2F"/>
35      <ims:identifier>metric-1</ims:identifier>
36    </rdf:Description>
37  </rdf:RDF>
```

```
1  RDF Turtle Representation
2
3  @prefix dc:    <http://purl.org/dc/terms/> .
4  @prefix rdfs:  <http://www.w3.org/2000/01/rdf-schema#> .
5  @prefix aktors: <http://www.aktors.org/ontology/portal#> .
6  @prefix foaf:  <http://xmlns.com/foaf/0.1/> .
7  @prefix ims:   <http://ims.dei.unipd.it/data/rdf/> .
8  @prefix bibo:  <http://purl.org/ontology/bibo/> .
9  @prefix owl:   <http://www.w3.org/2002/07/owl#> .
10 @prefix rdf:   <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
11 @prefix swrc:  <http://swrc.ontoware.org/ontology#> .
12
13 _:b0    dc:created  "2013-09-27T18:41:59.533+02:00" ;
14         dc:creator  "IMS Component Integrator (ICI) - Version 3.10" ;
15         dc:rights   "Copyright (c) 2006-2013 - Information Management Systems (IMS)
               Research Group (http://ims.dei.unipd.it/) - Department of Information
               Engineering (http://www.dei.unipd.it/) - University of Padua (http://www.
               unipd.it/)" .
16
17 <http://localhost:8080/ici/measure/m1>
18         ims:created        "2013-09-27T18:41:57.757+02:00" ;
19         ims:file-metadata  _:b0 ;
20         ims:has-metric     <http://localhost:8080/ici/concept/metric-1;http%3A%2F%2Fims.
               dei.unipd.it%2F> ;
21         ims:identifier     "m1" ;
22         ims:is-measure-of  <http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.
               unipd.it%2F> ;
23         ims:value          "1.2352809154E-1" ;
24         ims:year           "2012" .
```

```
25
26 <http://localhost:8080/ici/concept/metric-1;http%3A%2F%2Fims.dei.unipd.it%2F>
27         ims:file-metadata   _:b0 ;
28         ims:has-namespace   <http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.
               unipd.it%2F> ;
29         ims:identifier      "metric-1" .
30
31 <http://localhost:8080/ici/namespace/http%3A%2F%2Fims.dei.unipd.it%2F>
32         ims:file-metadata   _:b0 ;
33         ims:identifier      "http%3A%2F%2Fims.dei.unipd.it%2F" ;
34         ims:prefix          "ims" .
```

A XML Schemas

This appendix reports the XML schemas of the different managed resources.

The XML schema of DIRECT[12], reported in Section A.1, relies on the XML schema of the ***ICI! (ICI!)***[13] library, reported in Section A.2, for the definition of some common resources.

A.1 DIRECT XML Schema

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <!-- edited with XMLSpy v2011 (x64) (http://www.altova.com) by UniversitÃ  degli Studi di
      Padova (UniversitÃ  degli Studi di Padova) -->
3 <xs:schema xmlns:ims="http://ims.dei.unipd.it/" xmlns:xs="http://www.w3.org/2001/
     XMLSchema" xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:xcql="http://docs.oasis-
     open.org/ns/search-ws/xcql" targetNamespace="http://ims.dei.unipd.it/"
     elementFormDefault="qualified" attributeFormDefault="qualified" version="3.00" xml:
     lang="en">
4   <xs:annotation>
5     <xs:documentation xml:lang="en">This schema provides the base elements and types used
       by the Distributed Information Retrieval Evaluation Campaign Tool (DIRECT).</xs:
       documentation>
6     <xs:documentation xml:lang="en">Version 3.00.</xs:documentation>
7     <xs:documentation xml:lang="en">Created on 2005-10-05</xs:documentation>
8     <xs:documentation xml:lang="en">Last modified on 2012-11-21</xs:documentation>
9     <xs:documentation xml:lang="en">Authored by Nicola Ferro (ferro@dei.unipd.it)</xs:
       documentation>
10    <xs:documentation xml:lang="en">Authored by Ivano Masiero (masieroi@dei.unipd.it)</xs
       :documentation>
11    <xs:documentation xml:lang="en">Authored by Simone Peruzzo (peruzzos@dei.unipd.it)</
       xs:documentation>
12    <xs:documentation xml:lang="en">Authored by Gianmaria Silvello (silvello@dei.unipd.it
       )</xs:documentation>
13    <xs:documentation xml:lang="en">Copyright (c) 2005-2012 - Information Management
       Systems (IMS) Research Group (http://ims.dei.unipd.it/) - Department of
       Information Engineering (http://www.dei.unipd.it/) - University of Padua (http://
       www.unipd.it/)</xs:documentation>
14  </xs:annotation>
15  <xs:include schemaLocation="http://ims.dei.unipd.it/data/xml/ici.3.10.xsd">
16    <xs:annotation>
17      <xs:documentation xml:lang="en">Imports the schema for the IMS Component Integrator
         (ICI) library.</xs:documentation>
18    </xs:annotation>
19  </xs:include>
20  <xs:include schemaLocation="http://ims.dei.unipd.it/data/xml/fast.3.10.xsd">
21    <xs:annotation>
22      <xs:documentation xml:lang="en">Imports the schema for the Flexible Annotation
         Semantic Tool (FAST) service.</xs:documentation>
23    </xs:annotation>
24  </xs:include>
25  <xs:import/>
26  <xs:import/>
27  <xs:element name="task" substitutionGroup="ims:resource">
28    <xs:annotation>
```

[12] http://ims.dei.unipd.it/data/xml/direct.3.00.xsd
[13] http://ims.dei.unipd.it/data/xml/ici.3.10.xsd

```
29        <xs:documentation xml:lang="en">Represents a piece of work that is undertaken
              within an evaluation activity and aims at testing a specific (research)
              hypothesis.</xs:documentation>
30      </xs:annotation>
31      <xs:complexType>
32        <xs:complexContent>
33          <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
                resource-type">
34            <xs:sequence>
35              <xs:element ref="ims:links" minOccurs="0" maxOccurs="1"/>
36              <xs:element ref="ims:experimental-collection" minOccurs="0"/>
37              <xs:element ref="ims:evaluation-activity" minOccurs="0"/>
38              <xs:element ref="ims:track" minOccurs="0"/>
39            </xs:sequence>
40            <xs:attribute ref="ims:description"/>
41            <xs:attribute name="maximum-experiments-allowed" type="xs:int">
42              <xs:annotation>
43                <xs:documentation>The maximum number of experiments that can be submitted
                      per participant for this task.</xs:documentation>
44              </xs:annotation>
45            </xs:attribute>
46          </xs:extension>
47        </xs:complexContent>
48      </xs:complexType>
49    </xs:element>
50    <xs:element name="evaluation-activity" substitutionGroup="ims:resource">
51      <xs:annotation>
52        <xs:documentation xml:lang="en">Represents any type of activity aiming at the
              evaluation of applications, systems, or methodologies for information access.</
              xs:documentation>
53      </xs:annotation>
54      <xs:complexType>
55        <xs:complexContent>
56          <xs:extension base="ims:namespace-identifiable-timestamp-traceable-access-
                controllable-resource-type">
57            <xs:sequence>
58              <xs:element ref="ims:links" minOccurs="0"/>
59            </xs:sequence>
60            <xs:attribute name="name">
61              <xs:annotation>
62                <xs:documentation xml:lang="en">The name of the evaluation activity.</xs:
                      documentation>
63              </xs:annotation>
64            </xs:attribute>
65            <xs:attribute ref="ims:description"/>
66            <xs:attribute name="start-date" type="xs:date">
67              <xs:annotation>
68                <xs:documentation>The start date of the evaluation activity.</xs:
                      documentation>
69              </xs:annotation>
70            </xs:attribute>
71            <xs:attribute name="end-date" type="xs:date">
72              <xs:annotation>
73                <xs:documentation>The end date of the evaluation activity.</xs:
                      documentation>
74              </xs:annotation>
75            </xs:attribute>
76            <xs:attribute name="type">
77              <xs:annotation>
78                <xs:documentation xml:lang="en">The type of the evaluation activity.</xs:
```

```
                documentation>
79            </xs:annotation>
80            <xs:simpleType>
81              <xs:restriction base="xs:token">
82                <xs:enumeration value="CAMPAIGN">
83                  <xs:annotation>
84                    <xs:documentation xml:lang="en">Represents a public and shared
                          activity conducted in an evaluation forum, such as TREC or CLEF.<
                          /xs:documentation>
85                  </xs:annotation>
86                </xs:enumeration>
87                <xs:enumeration value="TRIAL">
88                  <xs:annotation>
89                    <xs:documentation xml:lang="en">Represents an activity run by a
                          person, a research group, or a corporate body for their own
                          interests and not necessarily public or shared.</xs:documentation
                          >
90                  </xs:annotation>
91                </xs:enumeration>
92                <xs:enumeration value="EDUCATION">
93                  <xs:annotation>
94                    <xs:documentation xml:lang="en">Represents an activity which is
                          carried out for educational purposes.</xs:documentation>
95                  </xs:annotation>
96                </xs:enumeration>
97                <xs:enumeration value="EVALUATION_ACTIVITY"/>
98                <xs:enumeration value=""/>
99              </xs:restriction>
100           </xs:simpleType>
101         </xs:attribute>
102       </xs:extension>
103     </xs:complexContent>
104   </xs:complexType>
105 </xs:element>
106 <xs:element name="track" substitutionGroup="ims:resource">
107   <xs:annotation>
108     <xs:documentation xml:lang="en">Represents a group of tasks carried within an
          evaluation activity of type campaign.</xs:documentation>
109   </xs:annotation>
110   <xs:complexType>
111     <xs:complexContent>
112       <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
            resource-type">
113         <xs:sequence>
114           <xs:element ref="ims:links" minOccurs="0" maxOccurs="unbounded"/>
115           <xs:element ref="ims:evaluation-activity" minOccurs="0"/>
116         </xs:sequence>
117         <xs:attribute ref="ims:description"/>
118         <xs:attribute name="submission-deadline" type="xs:date">
119           <xs:annotation>
120             <xs:documentation>The deadline of the submissions for the track.</xs:
                  documentation>
121           </xs:annotation>
122         </xs:attribute>
123       </xs:extension>
124     </xs:complexContent>
125   </xs:complexType>
126 </xs:element>
127 <xs:element name="direct" type="ims:ici-type">
128   <xs:annotation>
```

```
129       <xs:documentation xml:lang="en">Provides information about one or more resources of
              the DIRECT system.</xs:documentation>
130     </xs:annotation>
131   </xs:element>
132   <xs:element name="application" substitutionGroup="ims:resource">
133     <xs:annotation>
134       <xs:documentation>Represents a running software application evalueted during a
              Guerrilla experiment</xs:documentation>
135     </xs:annotation>
136     <xs:complexType>
137       <xs:complexContent>
138         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
              resource-type">
139           <xs:sequence>
140             <xs:element ref="ims:links" minOccurs="0" maxOccurs="unbounded"/>
141             <xs:element ref="ims:configuration" minOccurs="0" maxOccurs="unbounded"/>
142           </xs:sequence>
143           <xs:attribute ref="ims:name"/>
144           <xs:attribute ref="ims:description"/>
145         </xs:extension>
146       </xs:complexContent>
147     </xs:complexType>
148   </xs:element>
149   <xs:element name="configuration" substitutionGroup="ims:resource">
150     <xs:annotation>
151       <xs:documentation>Represents the configuration of a component, a system or an
              application under evaluation.</xs:documentation>
152     </xs:annotation>
153     <xs:complexType>
154       <xs:complexContent>
155         <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
156           <xs:sequence>
157             <xs:element name="parameters" minOccurs="0">
158               <xs:annotation>
159                 <xs:documentation>The list of parameters associated to this configuration
                      .</xs:documentation>
160               </xs:annotation>
161               <xs:complexType>
162                 <xs:sequence maxOccurs="unbounded">
163                   <xs:element ref="ims:parameter"/>
164                 </xs:sequence>
165               </xs:complexType>
166             </xs:element>
167           </xs:sequence>
168           <xs:attribute ref="ims:description"/>
169         </xs:extension>
170       </xs:complexContent>
171     </xs:complexType>
172   </xs:element>
173   <xs:element name="component" substitutionGroup="ims:resource">
174     <xs:annotation>
175       <xs:documentation>Represents a building block of a running system.</xs:
              documentation>
176     </xs:annotation>
177     <xs:complexType>
178       <xs:complexContent>
179         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
              resource-type">
180           <xs:sequence>
181             <xs:element ref="ims:links" minOccurs="0" maxOccurs="unbounded"/>
```

```
182             <xs:element ref="ims:concept" minOccurs="0"/>
183             <xs:element ref="ims:configuration" minOccurs="0"/>
184           </xs:sequence>
185           <xs:attribute ref="ims:name"/>
186           <xs:attribute ref="ims:description"/>
187         </xs:extension>
188       </xs:complexContent>
189     </xs:complexType>
190   </xs:element>
191   <xs:element name="system" substitutionGroup="ims:resource">
192     <xs:annotation>
193       <xs:documentation>Represents a running software engine, which is under evaluation.<
            /xs:documentation>
194     </xs:annotation>
195     <xs:complexType>
196       <xs:complexContent>
197         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
              resource-type">
198           <xs:sequence>
199             <xs:element ref="ims:links" minOccurs="0" maxOccurs="unbounded"/>
200             <xs:element ref="ims:configuration" minOccurs="0"/>
201           </xs:sequence>
202           <xs:attribute ref="ims:name"/>
203           <xs:attribute ref="ims:description"/>
204         </xs:extension>
205       </xs:complexContent>
206     </xs:complexType>
207   </xs:element>
208   <xs:element name="experiment" substitutionGroup="ims:resource">
209     <xs:annotation>
210       <xs:documentation>Represents part of the data produced by a system under evaluation
            .</xs:documentation>
211     </xs:annotation>
212     <xs:complexType>
213       <xs:complexContent>
214         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
              resource-type">
215           <xs:sequence>
216             <xs:element ref="ims:links" minOccurs="0" maxOccurs="unbounded"/>
217             <xs:element ref="ims:task" minOccurs="0"/>
218             <xs:element ref="ims:configuration" minOccurs="0"/>
219           </xs:sequence>
220           <xs:attribute ref="ims:description"/>
221         </xs:extension>
222       </xs:complexContent>
223     </xs:complexType>
224   </xs:element>
225   <xs:element name="run" substitutionGroup="ims:resource">
226     <xs:annotation>
227       <xs:documentation>Represents a ranked list of documents for each topic in the
            experimental collection.</xs:documentation>
228     </xs:annotation>
229     <xs:complexType>
230       <xs:complexContent>
231         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
              resource-type">
232           <xs:sequence>
233             <xs:element ref="ims:links" minOccurs="0" maxOccurs="unbounded"/>
234             <xs:element ref="ims:task" minOccurs="0"/>
235             <xs:element ref="ims:configuration" minOccurs="0"/>
```

```
236             <xs:element name="topic-fields" minOccurs="0">
237               <xs:annotation>
238                 <xs:documentation>The list of topic fields employed by this run.</xs:
                        documentation>
239               </xs:annotation>
240               <xs:complexType>
241                 <xs:sequence maxOccurs="unbounded">
242                   <xs:element ref="ims:concept"/>
243                 </xs:sequence>
244               </xs:complexType>
245             </xs:element>
246             <xs:element ref="ims:system" minOccurs="0"/>
247           </xs:sequence>
248           <xs:attribute ref="ims:description"/>
249           <xs:attribute name="query-construction"/>
250         </xs:extension>
251       </xs:complexContent>
252     </xs:complexType>
253   </xs:element>
254   <xs:element name="guerrilla" substitutionGroup="ims:resource">
255     <xs:annotation>
256       <xs:documentation>Represents an evaluation activity performed on corporare IR
            systems.</xs:documentation>
257     </xs:annotation>
258     <xs:complexType>
259       <xs:complexContent>
260         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
              resource-type">
261           <xs:sequence>
262             <xs:element ref="ims:links" minOccurs="0" maxOccurs="unbounded"/>
263             <xs:element ref="ims:task" minOccurs="0"/>
264             <xs:element ref="ims:configuration" minOccurs="0"/>
265             <xs:element ref="ims:application" minOccurs="0"/>
266             <xs:element name="metrics" minOccurs="0">
267               <xs:annotation>
268                 <xs:documentation>The list of metrics and the values associated with this
                        guerrilla.</xs:documentation>
269               </xs:annotation>
270               <xs:complexType>
271                 <xs:sequence minOccurs="0" maxOccurs="unbounded">
272                   <xs:element name="metric">
273                     <xs:annotation>
274                       <xs:documentation>A metric and the value associated with this
                              guerrilla.</xs:documentation>
275                     </xs:annotation>
276                     <xs:complexType>
277                       <xs:sequence>
278                         <xs:element ref="ims:concept"/>
279                         <xs:element name="value" type="xs:double">
280                           <xs:annotation>
281                             <xs:documentation>The value of the metric.</xs:documentation>
282                           </xs:annotation>
283                         </xs:element>
284                       </xs:sequence>
285                     </xs:complexType>
286                   </xs:element>
287                 </xs:sequence>
288               </xs:complexType>
289             </xs:element>
290           </xs:sequence>
```

```
291           <xs:attribute ref="ims:description"/>
292         </xs:extension>
293       </xs:complexContent>
294     </xs:complexType>
295   </xs:element>
296   <xs:element name="living" substitutionGroup="ims:resource">
297     <xs:annotation>
298       <xs:documentation>Represents the specific experimental data resulting from the
              Living Retrieval Laboratories.</xs:documentation>
299     </xs:annotation>
300     <xs:complexType>
301       <xs:complexContent>
302         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
              resource-type">
303           <xs:sequence>
304             <xs:element ref="ims:links" minOccurs="0" maxOccurs="unbounded"/>
305           </xs:sequence>
306         </xs:extension>
307       </xs:complexContent>
308     </xs:complexType>
309   </xs:element>
310   <xs:complexType name="identifiable-timestamp-traceable-parameterizable-resource-type">
311     <xs:annotation>
312       <xs:documentation>Represents an entity which is identified by means of a unique
              identifier,  whose creation, last modification, and its parameters, if any .</
              xs:documentation>
313     </xs:annotation>
314     <xs:complexContent>
315       <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
316         <xs:sequence>
317           <xs:element ref="ims:parameter" minOccurs="0"/>
318         </xs:sequence>
319       </xs:extension>
320     </xs:complexContent>
321   </xs:complexType>
322   <xs:element name="parameter" substitutionGroup="ims:resource">
323     <xs:annotation>
324       <xs:documentation>Represents a parameter of a configuration.</xs:documentation>
325     </xs:annotation>
326     <xs:complexType>
327       <xs:complexContent>
328         <xs:extension base="ims:identifiable-resource-type">
329           <xs:sequence>
330             <xs:element ref="ims:concept" minOccurs="0"/>
331             <xs:element name="value" type="xs:string" minOccurs="0">
332               <xs:annotation>
333                 <xs:documentation>The value of the parameter.</xs:documentation>
334               </xs:annotation>
335             </xs:element>
336           </xs:sequence>
337         </xs:extension>
338       </xs:complexContent>
339     </xs:complexType>
340   </xs:element>
341   <xs:element name="experiment-item" substitutionGroup="ims:resource">
342     <xs:annotation>
343       <xs:documentation>Represents an item of an experiment.</xs:documentation>
344     </xs:annotation>
345     <xs:complexType>
346       <xs:complexContent>
```

```
347         <xs:extension base="ims:identifiable-resource-type">
348           <xs:sequence>
349             <xs:element ref="ims:experiment" minOccurs="0"/>
350           </xs:sequence>
351         </xs:extension>
352       </xs:complexContent>
353     </xs:complexType>
354   </xs:element>
355   <xs:element name="run-item" substitutionGroup="ims:resource">
356     <xs:annotation>
357       <xs:documentation>Represents a component of a Run and relates a run with a document
              retrieved for a given topic.</xs:documentation>
358     </xs:annotation>
359     <xs:complexType>
360       <xs:complexContent>
361         <xs:extension base="ims:identifiable-resource-type">
362           <xs:sequence>
363             <xs:element ref="ims:run" minOccurs="0"/>
364             <xs:element ref="ims:topic" minOccurs="0"/>
365             <xs:element ref="ims:information-unit" minOccurs="0"/>
366           </xs:sequence>
367           <xs:attribute name="rank" type="xs:int">
368             <xs:annotation>
369               <xs:documentation>The rank of the document associated to the run item in
                      the ranked list.</xs:documentation>
370             </xs:annotation>
371           </xs:attribute>
372           <xs:attribute name="score" type="xs:double">
373             <xs:annotation>
374               <xs:documentation>The score provided by the system under evaluation to the
                      document corresponding to the run item.</xs:documentation>
375             </xs:annotation>
376           </xs:attribute>
377         </xs:extension>
378       </xs:complexContent>
379     </xs:complexType>
380   </xs:element>
381   <xs:element name="corpus" substitutionGroup="ims:resource">
382     <xs:annotation>
383       <xs:documentation>Represents a set of informative units.</xs:documentation>
384     </xs:annotation>
385     <xs:complexType>
386       <xs:complexContent>
387         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
              resource-type">
388           <xs:sequence>
389             <xs:element ref="ims:links" minOccurs="0" maxOccurs="unbounded"/>
390             <xs:element name="media-types" minOccurs="0" maxOccurs="unbounded">
391               <xs:annotation>
392                 <xs:documentation>The list of media types of the corpus.</xs:
                        documentation>
393               </xs:annotation>
394               <xs:complexType>
395                 <xs:sequence>
396                   <xs:element name="media-type" type="xs:string" minOccurs="0" maxOccurs=
                          "unbounded">
397                     <xs:annotation>
398                       <xs:documentation>The media types of a corpus according to MIME (
                              Multipurpose Internet Mail Extensions) standard.</xs:
                              documentation>
```

```
399                     </xs:annotation>
400                   </xs:element>
401                 </xs:sequence>
402               </xs:complexType>
403             </xs:element>
404             <xs:element name="languages" minOccurs="0" maxOccurs="unbounded">
405               <xs:annotation>
406                 <xs:documentation>The list of languages of the corpus.</xs:documentation>
407               </xs:annotation>
408               <xs:complexType>
409                 <xs:sequence>
410                   <xs:element name="language" type="xs:language" minOccurs="0" maxOccurs=
                          "unbounded">
411                     <xs:annotation>
412                       <xs:documentation>The languages of a corpus.</xs:documentation>
413                     </xs:annotation>
414                   </xs:element>
415                 </xs:sequence>
416               </xs:complexType>
417             </xs:element>
418           </xs:sequence>
419           <xs:attribute ref="ims:description"/>
420         </xs:extension>
421       </xs:complexContent>
422     </xs:complexType>
423   </xs:element>
424   <xs:element name="information-unit" substitutionGroup="ims:resource">
425     <xs:annotation>
426       <xs:documentation>Represents the object on which the evaluated system acts, and
            which is retrieved by the system under evaluation.</xs:documentation>
427     </xs:annotation>
428     <xs:complexType>
429       <xs:complexContent>
430         <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
431           <xs:sequence>
432             <xs:element ref="ims:corpus" minOccurs="0"/>
433             <xs:element ref="ims:content" minOccurs="0"/>
434           </xs:sequence>
435           <xs:attribute ref="ims:language"/>
436           <xs:attribute ref="ims:media-type"/>
437           <xs:attribute name="uri" type="xs:anyURI">
438             <xs:annotation>
439               <xs:documentation>A URI that represents a link to the information unit.</xs
                      :documentation>
440             </xs:annotation>
441           </xs:attribute>
442         </xs:extension>
443       </xs:complexContent>
444     </xs:complexType>
445   </xs:element>
446   <xs:element name="topic" substitutionGroup="ims:resource">
447     <xs:annotation>
448       <xs:documentation>Represents the materialization of an information need.</xs:
            documentation>
449     </xs:annotation>
450     <xs:complexType>
451       <xs:complexContent>
452         <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
453           <xs:sequence>
454             <xs:element name="topic-fields" minOccurs="0" maxOccurs="1">
```

```
455               <xs:annotation>
456                 <xs:documentation>The fields used in this topic.</xs:documentation>
457               </xs:annotation>
458               <xs:complexType>
459                 <xs:sequence maxOccurs="unbounded">
460                   <xs:element name="topic-field">
461                     <xs:annotation>
462                       <xs:documentation>A field used in this topic.</xs:documentation>
463                     </xs:annotation>
464                     <xs:complexType>
465                       <xs:sequence minOccurs="0" maxOccurs="unbounded">
466                         <xs:element ref="ims:concept"/>
467                         <xs:element name="topic-field-contents">
468                           <xs:annotation>
469                             <xs:documentation>The list of contents of the topic field. </
                                  xs:documentation>
470                           </xs:annotation>
471                           <xs:complexType>
472                             <xs:sequence minOccurs="0" maxOccurs="unbounded">
473                               <xs:element name="topic-field-content">
474                                 <xs:annotation>
475                                   <xs:documentation>The content of a topic field.</xs:
                                        documentation>
476                                 </xs:annotation>
477                                 <xs:complexType>
478                                   <xs:sequence minOccurs="0">
479                                     <xs:element ref="ims:content"/>
480                                   </xs:sequence>
481                                   <xs:attribute ref="ims:media-type"/>
482                                   <xs:attribute ref="ims:language"/>
483                                 </xs:complexType>
484                               </xs:element>
485                             </xs:sequence>
486                           </xs:complexType>
487                         </xs:element>
488                       </xs:sequence>
489                     </xs:complexType>
490                   </xs:element>
491                 </xs:sequence>
492               </xs:complexType>
493             </xs:element>
494           </xs:sequence>
495         </xs:extension>
496       </xs:complexContent>
497     </xs:complexType>
498   </xs:element>
499   <xs:attribute name="name" type="xs:string">
500     <xs:annotation>
501       <xs:documentation>The name of the resource.</xs:documentation>
502     </xs:annotation>
503   </xs:attribute>
504   <xs:element name="topic-group" substitutionGroup="ims:resource">
505     <xs:annotation>
506       <xs:documentation>Represents a set of topic, which are grouped together because
            they are used to address a research task carried out in an evaluation activity.
            </xs:documentation>
507     </xs:annotation>
508     <xs:complexType>
509       <xs:complexContent>
510         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
```

```
            resource-type">
511           <xs:sequence>
512             <xs:element ref="ims:links" minOccurs="0" maxOccurs="unbounded"/>
513             <xs:element name="topics" minOccurs="0">
514               <xs:annotation>
515                 <xs:documentation> The list of topics which belongs to the topic group.</
                        xs:documentation>
516               </xs:annotation>
517               <xs:complexType>
518                 <xs:sequence maxOccurs="unbounded">
519                   <xs:element ref="ims:topic"/>
520                 </xs:sequence>
521               </xs:complexType>
522             </xs:element>
523           </xs:sequence>
524           <xs:attribute ref="ims:description"/>
525         </xs:extension>
526       </xs:complexContent>
527     </xs:complexType>
528   </xs:element>
529   <xs:element name="ground-truth" substitutionGroup="ims:resource">
530     <xs:annotation>
531       <xs:documentation>Represents a component of an evaluation collection.</xs:
            documentation>
532     </xs:annotation>
533     <xs:complexType>
534       <xs:complexContent>
535         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
              resource-type">
536           <xs:sequence>
537             <xs:element ref="ims:links" minOccurs="0" maxOccurs="unbounded"/>
538           </xs:sequence>
539           <xs:attribute ref="ims:description"/>
540         </xs:extension>
541       </xs:complexContent>
542     </xs:complexType>
543   </xs:element>
544   <xs:element name="ground-truth-item" substitutionGroup="ims:resource">
545     <xs:annotation>
546       <xs:documentation>Represents an item of a ground truth..</xs:documentation>
547     </xs:annotation>
548     <xs:complexType>
549       <xs:complexContent>
550         <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
551           <xs:sequence>
552             <xs:element ref="ims:ground-truth" minOccurs="0"/>
553             <xs:element ref="ims:user" minOccurs="0"/>
554             <xs:element ref="ims:concept" minOccurs="0"/>
555           </xs:sequence>
556         </xs:extension>
557       </xs:complexContent>
558     </xs:complexType>
559   </xs:element>
560   <xs:element name="experimental-collection" substitutionGroup="ims:resource">
561     <xs:annotation>
562       <xs:documentation>Represents a logical entity that allows us to set up a
            traditional IR evaluation environment.</xs:documentation>
563     </xs:annotation>
564     <xs:complexType>
565       <xs:complexContent>
```

```
566         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
                resource-type">
567           <xs:sequence>
568             <xs:element ref="ims:links" minOccurs="0" maxOccurs="unbounded"/>
569             <xs:element ref="ims:topic-group" minOccurs="0"/>
570             <xs:element name="corpora" minOccurs="0">
571               <xs:annotation>
572                 <xs:documentation>The list of corpus that belongs to the experimental
                        collection.</xs:documentation>
573               </xs:annotation>
574               <xs:complexType>
575                 <xs:sequence>
576                   <xs:element ref="ims:corpus" minOccurs="0" maxOccurs="unbounded"/>
577                 </xs:sequence>
578               </xs:complexType>
579             </xs:element>
580             <xs:element ref="ims:ground-truth" minOccurs="0"/>
581           </xs:sequence>
582           <xs:attribute ref="ims:description"/>
583         </xs:extension>
584       </xs:complexContent>
585     </xs:complexType>
586   </xs:element>
587   <xs:element name="measure" substitutionGroup="ims:resource">
588     <xs:annotation>
589       <xs:documentation>Represents the value of a metric calculated on some experiments
              handled by the infrastructure.</xs:documentation>
590     </xs:annotation>
591     <xs:complexType>
592       <xs:complexContent>
593         <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
594           <xs:sequence>
595             <xs:element ref="ims:concept" minOccurs="0"/>
596             <xs:element ref="ims:experiment" minOccurs="0"/>
597             <xs:element ref="ims:topic" minOccurs="0"/>
598           </xs:sequence>
599           <xs:attribute name="value">
600             <xs:annotation>
601               <xs:documentation>The numerical value of the measure.</xs:documentation>
602             </xs:annotation>
603           </xs:attribute>
604         </xs:extension>
605       </xs:complexContent>
606     </xs:complexType>
607   </xs:element>
608   <xs:element name="pool" substitutionGroup="ims:resource">
609     <xs:annotation>
610       <xs:documentation>Represents a container of assessments obtained trough the pooling
              technique.</xs:documentation>
611     </xs:annotation>
612     <xs:complexType>
613       <xs:complexContent>
614         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
                resource-type">
615           <xs:sequence>
616             <xs:element ref="ims:links" minOccurs="0" maxOccurs="unbounded"/>
617           </xs:sequence>
618           <xs:attribute ref="ims:description"/>
619         </xs:extension>
620       </xs:complexContent>
```

```
621     </xs:complexType>
622   </xs:element>
623   <xs:element name="pool-item" substitutionGroup="ims:resource">
624     <xs:annotation>
625       <xs:documentation>Represents a relevance judgment, which is provided on an
              information unit in the pool for a given topic.</xs:documentation>
626     </xs:annotation>
627     <xs:complexType>
628       <xs:complexContent>
629         <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
630           <xs:sequence>
631             <xs:element ref="ims:pool" minOccurs="0"/>
632             <xs:element ref="ims:user" minOccurs="0"/>
633             <xs:element ref="ims:concept" minOccurs="0"/>
634             <xs:element ref="ims:topic" minOccurs="0"/>
635             <xs:element ref="ims:information-unit" minOccurs="0"/>
636           </xs:sequence>
637         </xs:extension>
638       </xs:complexContent>
639     </xs:complexType>
640   </xs:element>
641   <xs:element name="estimate" substitutionGroup="ims:resource">
642     <xs:annotation>
643       <xs:documentation>Represents the estimated numerical value of a descriptive
              statiistic calculated calculated by the infrastructure.</xs:documentation>
644     </xs:annotation>
645     <xs:complexType>
646       <xs:complexContent>
647         <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
648           <xs:sequence>
649             <xs:element name="metric" minOccurs="0">
650               <xs:annotation>
651                 <xs:documentation>The metric for this estimate.</xs:documentation>
652               </xs:annotation>
653               <xs:complexType>
654                 <xs:sequence>
655                   <xs:element ref="ims:concept" minOccurs="0"/>
656                 </xs:sequence>
657               </xs:complexType>
658             </xs:element>
659             <xs:element name="descriptive-statistic" minOccurs="0" maxOccurs="1">
660               <xs:annotation>
661                 <xs:documentation>The descriptive statistic for this estimate.</xs:
                      documentation>
662               </xs:annotation>
663               <xs:complexType>
664                 <xs:sequence>
665                   <xs:element ref="ims:concept" minOccurs="0"/>
666                 </xs:sequence>
667               </xs:complexType>
668             </xs:element>
669             <xs:element ref="ims:run" minOccurs="0"/>
670             <xs:element ref="ims:task" minOccurs="0"/>
671             <xs:element ref="ims:topic" minOccurs="0"/>
672           </xs:sequence>
673           <xs:attribute name="value" type="xs:double">
674             <xs:annotation>
675               <xs:documentation>The numerical value of the estimate.</xs:documentation>
676             </xs:annotation>
677           </xs:attribute>
```

```
678         </xs:extension>
679       </xs:complexContent>
680     </xs:complexType>
681   </xs:element>
682   <xs:element name="statistical-test" substitutionGroup="ims:resource">
683     <xs:annotation>
684       <xs:documentation>Represents an example of statistical analysis which can be
              carried out on the available data.</xs:documentation>
685     </xs:annotation>
686     <xs:complexType>
687       <xs:complexContent>
688         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
              parameterizable-resource-type">
689           <xs:sequence>
690             <xs:element ref="ims:concept" minOccurs="0"/>
691             <xs:element name="metrics" minOccurs="0">
692               <xs:annotation>
693                 <xs:documentation>The list of metrics used in the statistical test.</xs:
                      documentation>
694               </xs:annotation>
695               <xs:complexType>
696                 <xs:sequence maxOccurs="unbounded">
697                   <xs:element ref="ims:concept"/>
698                 </xs:sequence>
699               </xs:complexType>
700             </xs:element>
701             <xs:element name="ground-truths" minOccurs="0">
702               <xs:annotation>
703                 <xs:documentation>The ground truth objects used to compute the metrics
                      used in this test.</xs:documentation>
704               </xs:annotation>
705               <xs:complexType>
706                 <xs:sequence maxOccurs="unbounded">
707                   <xs:element ref="ims:ground-truth"/>
708                 </xs:sequence>
709               </xs:complexType>
710             </xs:element>
711             <xs:element name="tasks" minOccurs="0">
712               <xs:annotation>
713                 <xs:documentation>The task objects used to compute the metrics used in
                      this test.</xs:documentation>
714               </xs:annotation>
715               <xs:complexType>
716                 <xs:sequence maxOccurs="unbounded">
717                   <xs:element ref="ims:task"/>
718                 </xs:sequence>
719               </xs:complexType>
720             </xs:element>
721             <xs:element name="measures" minOccurs="0">
722               <xs:annotation>
723                 <xs:documentation>The measure objects used to compute the metrics used in
                       this test.</xs:documentation>
724               </xs:annotation>
725               <xs:complexType>
726                 <xs:sequence maxOccurs="unbounded">
727                   <xs:element ref="ims:measure"/>
728                 </xs:sequence>
729               </xs:complexType>
730             </xs:element>
731             <xs:element name="experiments" minOccurs="0">
```

```
732               <xs:annotation>
733                 <xs:documentation>The experiment objects used to compute the metrics used
                        in this test.</xs:documentation>
734               </xs:annotation>
735               <xs:complexType>
736                 <xs:sequence maxOccurs="unbounded">
737                   <xs:element ref="ims:experiment"/>
738                 </xs:sequence>
739               </xs:complexType>
740             </xs:element>
741             <xs:element name="visualizations" minOccurs="0">
742               <xs:annotation>
743                 <xs:documentation>The visualization related to the statistical test.</xs:
                      documentation>
744               </xs:annotation>
745               <xs:complexType>
746                 <xs:sequence maxOccurs="unbounded">
747                   <xs:element ref="ims:visualization"/>
748                 </xs:sequence>
749               </xs:complexType>
750             </xs:element>
751           </xs:sequence>
752         </xs:extension>
753       </xs:complexContent>
754     </xs:complexType>
755   </xs:element>
756   <xs:complexType name="identifiable-timestamp-traceable-access-controllable-
        parameterizable-resource-type">
757     <xs:annotation>
758       <xs:documentation>Represents an entity which is identified by means of a unique
            identifier,  whose creation, last modification, last access events can be
            traced, whose access permissions can be checked and its parameters, if any.</xs
            :documentation>
759     </xs:annotation>
760     <xs:complexContent>
761       <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
            resource-type">
762         <xs:sequence>
763           <xs:element name="parameters" minOccurs="0">
764             <xs:annotation>
765               <xs:documentation>Represents a list of parameters used in a configuration.<
                    /xs:documentation>
766             </xs:annotation>
767             <xs:complexType>
768               <xs:sequence maxOccurs="unbounded">
769                 <xs:element ref="ims:parameter" minOccurs="0"/>
770               </xs:sequence>
771             </xs:complexType>
772           </xs:element>
773         </xs:sequence>
774       </xs:extension>
775     </xs:complexContent>
776   </xs:complexType>
777   <xs:element name="visualization" substitutionGroup="ims:resource">
778     <xs:annotation>
779       <xs:documentation>Represents the information used by the infrastructure to store
            and recover whichever visualization of the data that the users do.</xs:
            documentation>
780     </xs:annotation>
781     <xs:complexType>
```

```
782       <xs:complexContent>
783         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
              parameterizable-resource-type">
784           <xs:sequence>
785             <xs:element ref="ims:concept" minOccurs="0"/>
786             <xs:element name="measures" minOccurs="0">
787               <xs:annotation>
788                 <xs:documentation>The measure objects used to compute the metrics used in
                      this visualization.</xs:documentation>
789               </xs:annotation>
790               <xs:complexType>
791                 <xs:sequence maxOccurs="unbounded">
792                   <xs:element ref="ims:measure"/>
793                 </xs:sequence>
794               </xs:complexType>
795             </xs:element>
796             <xs:element name="estimates" minOccurs="0">
797               <xs:annotation>
798                 <xs:documentation>The estimate objects used to compute the metrics used
                      in this visualization.</xs:documentation>
799               </xs:annotation>
800               <xs:complexType>
801                 <xs:sequence maxOccurs="unbounded">
802                   <xs:element ref="ims:estimate"/>
803                 </xs:sequence>
804               </xs:complexType>
805             </xs:element>
806             <xs:element name="snapshots" minOccurs="0">
807               <xs:annotation>
808                 <xs:documentation>The list of snapshot to which this visualization refers
                      .</xs:documentation>
809               </xs:annotation>
810               <xs:complexType>
811                 <xs:sequence maxOccurs="unbounded">
812                   <xs:element ref="ims:snapshot"/>
813                 </xs:sequence>
814               </xs:complexType>
815             </xs:element>
816             <xs:element name="experiments" minOccurs="0">
817               <xs:annotation>
818                 <xs:documentation>The list of experiment to which this visualization
                      refers.</xs:documentation>
819               </xs:annotation>
820               <xs:complexType>
821                 <xs:sequence maxOccurs="unbounded">
822                   <xs:element ref="ims:experiment"/>
823                 </xs:sequence>
824               </xs:complexType>
825             </xs:element>
826             <xs:element name="ground-truths" minOccurs="0">
827               <xs:annotation>
828                 <xs:documentation>The list of ground truth to which this visualization
                      refers.</xs:documentation>
829               </xs:annotation>
830               <xs:complexType>
831                 <xs:sequence maxOccurs="unbounded">
832                   <xs:element ref="ims:ground-truth"/>
833                 </xs:sequence>
834               </xs:complexType>
835             </xs:element>
```

```
836             <xs:element name="tasks" minOccurs="0">
837               <xs:annotation>
838                 <xs:documentation>The list of task to which this visualization refers.</
                        xs:documentation>
839               </xs:annotation>
840               <xs:complexType>
841                 <xs:sequence maxOccurs="unbounded">
842                   <xs:element ref="ims:task"/>
843                 </xs:sequence>
844               </xs:complexType>
845             </xs:element>
846             <xs:element name="statistical-tests" minOccurs="0">
847               <xs:annotation>
848                 <xs:documentation>The list of statistical test to which this
                        visualization refers.</xs:documentation>
849               </xs:annotation>
850               <xs:complexType>
851                 <xs:sequence maxOccurs="unbounded">
852                   <xs:element ref="ims:statistical-test"/>
853                 </xs:sequence>
854               </xs:complexType>
855             </xs:element>
856           </xs:sequence>
857         </xs:extension>
858       </xs:complexContent>
859     </xs:complexType>
860   </xs:element>
861   <xs:element name="snapshot" substitutionGroup="ims:resource">
862     <xs:annotation>
863       <xs:documentation>Represents the information used by the infrastructure to store
            and recover whichever Snapshot of the data that the users do. </xs:
            documentation>
864     </xs:annotation>
865     <xs:complexType>
866       <xs:complexContent>
867         <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
868           <xs:sequence>
869             <xs:element ref="ims:content" minOccurs="0"/>
870             <xs:element ref="ims:visualization" minOccurs="0"/>
871           </xs:sequence>
872           <xs:attribute ref="ims:media-type"/>
873           <xs:attribute ref="ims:language"/>
874         </xs:extension>
875       </xs:complexContent>
876     </xs:complexType>
877   </xs:element>
878   <xs:element name="contribution" substitutionGroup="ims:resource">
879     <xs:annotation>
880       <xs:documentation> Represents a paper (e.g. a conference paper, a working note, a
            technical
881 report, a journal paper) which has been published or that is publicly
882 available and that its related.</xs:documentation>
883     </xs:annotation>
884     <xs:complexType>
885       <xs:complexContent>
886         <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
887           <xs:sequence>
888             <xs:element name="authors" minOccurs="0">
889               <xs:annotation>
890                 <xs:documentation> The list of users that authors the contribution.</xs:
```

```
                    documentation>
891               </xs:annotation>
892               <xs:complexType>
893                 <xs:sequence maxOccurs="unbounded">
894                   <xs:element ref="ims:user"/>
895                 </xs:sequence>
896               </xs:complexType>
897             </xs:element>
898             <xs:element ref="ims:links" minOccurs="0" maxOccurs="unbounded"/>
899             <xs:element ref="ims:content" minOccurs="0"/>
900           </xs:sequence>
901           <xs:attribute name="title" type="xs:string">
902             <xs:annotation>
903               <xs:documentation>The title of the contribution.</xs:documentation>
904             </xs:annotation>
905           </xs:attribute>
906           <xs:attribute name="year" type="xs:int">
907             <xs:annotation>
908               <xs:documentation>The year of the contribution.</xs:documentation>
909             </xs:annotation>
910           </xs:attribute>
911           <xs:attribute ref="ims:media-type"/>
912           <xs:attribute ref="ims:language"/>
913         </xs:extension>
914       </xs:complexContent>
915     </xs:complexType>
916   </xs:element>
917 </xs:schema>
```

A.2 ICI XML Schema

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <!-- edited with XMLSpy v2012 rel. 2 sp1 (x64) (http://www.altova.com) by UniversitÃà
      degli Studi di Padova (UniversitÃà degli Studi di Padova) -->
3 <xs:schema xmlns:ims="http://ims.dei.unipd.it/" xmlns:xs="http://www.w3.org/2001/
      XMLSchema" xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:xcql="http://docs.oasis-
      open.org/ns/search-ws/xcql" targetNamespace="http://ims.dei.unipd.it/"
      elementFormDefault="qualified" attributeFormDefault="qualified" version="3.10" xml:
      lang="en">
4   <xs:annotation>
5     <xs:documentation xml:lang="en">This schema provides the base elements and types used
           by the IMS Component Integrator (ICI)  library.</xs:documentation>
6     <xs:documentation xml:lang="en">Version 3.10</xs:documentation>
7     <xs:documentation xml:lang="en">Created on 2006-08-02</xs:documentation>
8     <xs:documentation xml:lang="en">Last modified on 2013-09-10</xs:documentation>
9     <xs:documentation xml:lang="en">Authored by Nicola Ferro (ferro@dei.unipd.it)</xs:
          documentation>
10    <xs:documentation xml:lang="en">Copyright (c) 2006-2013 - Information Management
          Systems (IMS) Research Group (http://ims.dei.unipd.it/) - Department of
          Information Engineering (http://www.dei.unipd.it/) - University of Padua (http://
          www.unipd.it/)</xs:documentation>
11  </xs:annotation>
12  <xs:import namespace="http://purl.org/dc/elements/1.1/" schemaLocation="http://www.
      dublincore.org/schemas/xmls/qdc/dc.xsd">
13    <xs:annotation>
14      <xs:documentation xml:lang="en">Imports the schema for the Simple Dublin Core
            standard.</xs:documentation>
15    </xs:annotation>
16  </xs:import>
17  <xs:import namespace="http://docs.oasis-open.org/ns/search-ws/xcql" schemaLocation="
```

```
      xcql.ici.3.10.xsd">
18    <xs:annotation>
19      <xs:documentation xml:lang="en">Imports the schema for modified XCQL.</xs:
            documentation>
20    </xs:annotation>
21  </xs:import>
22  <xs:element name="ici" type="ims:ici-type">
23    <xs:annotation>
24      <xs:documentation xml:lang="en">Provides information about one or more objects of
            the ICI library.</xs:documentation>
25    </xs:annotation>
26  </xs:element>
27  <xs:element name="file-metadata">
28    <xs:annotation>
29      <xs:documentation xml:lang="en">Reports metadata describing the XML document at
            hand.</xs:documentation>
30    </xs:annotation>
31    <xs:complexType>
32      <xs:group ref="dc:elementsGroup"/>
33    </xs:complexType>
34  </xs:element>
35  <xs:element name="thing" type="ims:resource-type">
36    <xs:annotation>
37      <xs:documentation xml:lang="en">Represents a generic entity managed by the system.<
            /xs:documentation>
38    </xs:annotation>
39  </xs:element>
40  <xs:element name="error" substitutionGroup="ims:thing">
41    <xs:annotation>
42      <xs:documentation xml:lang="en">Represents an error occurred in the system.</xs:
            documentation>
43    </xs:annotation>
44    <xs:complexType>
45      <xs:complexContent>
46        <xs:extension base="ims:resource-type">
47          <xs:sequence>
48            <xs:element name="details" minOccurs="0">
49              <xs:annotation>
50                <xs:documentation xml:lang="en">Additional details which describe the
                      occurred error.</xs:documentation>
51              </xs:annotation>
52              <xs:complexType mixed="true">
53                <xs:complexContent>
54                  <xs:restriction base="xs:anyType">
55                    <xs:sequence>
56                      <xs:any processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
57                    </xs:sequence>
58                    <xs:attribute ref="ims:language"/>
59                  </xs:restriction>
60                </xs:complexContent>
61              </xs:complexType>
62            </xs:element>
63            <xs:element name="diagnostic" minOccurs="0">
64              <xs:annotation>
65                <xs:documentation xml:lang="en">Additional diagnostic and debug messages.
                      </xs:documentation>
66              </xs:annotation>
67              <xs:complexType mixed="true">
68                <xs:complexContent>
69                  <xs:restriction base="xs:anyType">
```

```
70                    <xs:sequence>
71                      <xs:any processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
72                    </xs:sequence>
73                  </xs:restriction>
74                </xs:complexContent>
75              </xs:complexType>
76            </xs:element>
77          </xs:sequence>
78          <xs:attribute name="code" type="xs:hexBinary" use="required">
79            <xs:annotation>
80              <xs:documentation xml:lang="en">The unique code of the error.</xs:
                    documentation>
81            </xs:annotation>
82          </xs:attribute>
83          <xs:attribute name="type" type="xs:token" use="required">
84            <xs:annotation>
85              <xs:documentation xml:lang="en">The type of the error.</xs:documentation>
86            </xs:annotation>
87          </xs:attribute>
88          <xs:attribute ref="ims:created"/>
89        </xs:extension>
90      </xs:complexContent>
91    </xs:complexType>
92  </xs:element>
93  <xs:element name="namespace" substitutionGroup="ims:thing">
94    <xs:annotation>
95      <xs:documentation xml:lang="en">Represents a namespace.</xs:documentation>
96    </xs:annotation>
97    <xs:complexType>
98      <xs:complexContent>
99        <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
100         <xs:attribute name="prefix">
101           <xs:annotation>
102             <xs:documentation xml:lang="en">The prefix used for referring to the
                    namespace.</xs:documentation>
103           </xs:annotation>
104         </xs:attribute>
105         <xs:attribute ref="ims:description"/>
106       </xs:extension>
107     </xs:complexContent>
108   </xs:complexType>
109 </xs:element>
110 <xs:element name="user" substitutionGroup="ims:thing">
111   <xs:annotation>
112     <xs:documentation xml:lang="en">Represents a user.</xs:documentation>
113   </xs:annotation>
114   <xs:complexType>
115     <xs:complexContent>
116       <xs:extension base="ims:namespace-identifiable-timestamp-traceable-resource-type"
              >
117         <xs:sequence>
118           <xs:element name="groups" minOccurs="0">
119             <xs:annotation>
120               <xs:documentation xml:lang="en">The groups to which the user belongs.</xs
                      :documentation>
121             </xs:annotation>
122             <xs:complexType>
123               <xs:sequence>
124                 <xs:element ref="ims:group" maxOccurs="unbounded"/>
125               </xs:sequence>
```

```
126               </xs:complexType>
127             </xs:element>
128             <xs:element name="roles" minOccurs="0">
129               <xs:annotation>
130                 <xs:documentation xml:lang="en">The roles the user is acting in.</xs:
                      documentation>
131               </xs:annotation>
132               <xs:complexType>
133                 <xs:sequence>
134                   <xs:element ref="ims:role" maxOccurs="unbounded"/>
135                 </xs:sequence>
136               </xs:complexType>
137             </xs:element>
138           </xs:sequence>
139           <xs:attribute name="password" type="xs:string">
140             <xs:annotation>
141               <xs:documentation xml:lang="en">The password of the user.</xs:documentation
                    >
142             </xs:annotation>
143           </xs:attribute>
144           <xs:attribute name="first-name" type="xs:string">
145             <xs:annotation>
146               <xs:documentation xml:lang="en">The first name of the user.</xs:
                    documentation>
147             </xs:annotation>
148           </xs:attribute>
149           <xs:attribute name="last-name" type="xs:string">
150             <xs:annotation>
151               <xs:documentation xml:lang="en">The last/family name of the user.</xs:
                    documentation>
152             </xs:annotation>
153           </xs:attribute>
154           <xs:attribute name="affiliation" type="xs:string">
155             <xs:annotation>
156               <xs:documentation xml:lang="en">The affiliation of the user.</xs:
                    documentation>
157             </xs:annotation>
158           </xs:attribute>
159           <xs:attribute name="e-mail" type="xs:string">
160             <xs:annotation>
161               <xs:documentation xml:lang="en">The e-mail of the user.</xs:documentation>
162             </xs:annotation>
163           </xs:attribute>
164           <xs:attribute name="birth-date" type="xs:date">
165             <xs:annotation>
166               <xs:documentation xml:lang="en">The birth date of the user.</xs:
                    documentation>
167             </xs:annotation>
168           </xs:attribute>
169           <xs:attribute name="gender">
170             <xs:annotation>
171               <xs:documentation xml:lang="en">The gender of the user.</xs:documentation>
172             </xs:annotation>
173             <xs:simpleType>
174               <xs:restriction base="xs:token">
175                 <xs:enumeration value="MALE">
176                   <xs:annotation>
177                     <xs:documentation xml:lang="en">The male gender.</xs:documentation>
178                   </xs:annotation>
179                 </xs:enumeration>
```

```
180                 <xs:enumeration value="FEMALE">
181                   <xs:annotation>
182                     <xs:documentation xml:lang="en">The female gender.</xs:documentation>
183                   </xs:annotation>
184                 </xs:enumeration>
185               </xs:restriction>
186             </xs:simpleType>
187           </xs:attribute>
188           <xs:attribute ref="ims:language"/>
189           <xs:attribute ref="ims:country"/>
190           <xs:attribute name="address" type="xs:string">
191             <xs:annotation>
192               <xs:documentation xml:lang="en">The address of the user.</xs:documentation>
193             </xs:annotation>
194           </xs:attribute>
195           <xs:attribute name="city" type="xs:string">
196             <xs:annotation>
197               <xs:documentation xml:lang="en">The city of the user.</xs:documentation>
198             </xs:annotation>
199           </xs:attribute>
200           <xs:attribute name="state" type="xs:string">
201             <xs:annotation>
202               <xs:documentation xml:lang="en">The state/province/region of the user.</xs:
                    documentation>
203             </xs:annotation>
204           </xs:attribute>
205           <xs:attribute name="zip" type="xs:string">
206             <xs:annotation>
207               <xs:documentation xml:lang="en">The zip code of the user.</xs:documentation
                    >
208             </xs:annotation>
209           </xs:attribute>
210           <xs:attribute name="phone" type="xs:string">
211             <xs:annotation>
212               <xs:documentation xml:lang="en">The telephone number of the user.</xs:
                    documentation>
213             </xs:annotation>
214           </xs:attribute>
215           <xs:attribute name="facsimile" type="xs:string">
216             <xs:annotation>
217               <xs:documentation xml:lang="en">The facsimile number of the user.</xs:
                    documentation>
218             </xs:annotation>
219           </xs:attribute>
220           <xs:attribute name="mobile" type="xs:string">
221             <xs:annotation>
222               <xs:documentation xml:lang="en">The mobile telephone number of the user.</
                    xs:documentation>
223             </xs:annotation>
224           </xs:attribute>
225           <xs:attribute name="voip-caller-id" type="xs:token">
226             <xs:annotation>
227               <xs:documentation xml:lang="en">The VoIP caller identifier of the user.</xs
                    :documentation>
228             </xs:annotation>
229           </xs:attribute>
230           <xs:attribute name="homepage" type="xs:anyURI">
231             <xs:annotation>
232               <xs:documentation xml:lang="en">The home page of the user.</xs:
                    documentation>
```

```
233             </xs:annotation>
234           </xs:attribute>
235         </xs:extension>
236       </xs:complexContent>
237     </xs:complexType>
238   </xs:element>
239   <xs:element name="role" substitutionGroup="ims:thing">
240     <xs:annotation>
241       <xs:documentation xml:lang="en">Represents a role of users.</xs:documentation>
242     </xs:annotation>
243     <xs:complexType>
244       <xs:complexContent>
245         <xs:extension base="ims:namespace-identifiable-timestamp-traceable-resource-type"
              >
246           <xs:sequence>
247             <xs:element name="users" minOccurs="0">
248               <xs:annotation>
249                 <xs:documentation xml:lang="en">The users acting in this role.</xs:
                      documentation>
250               </xs:annotation>
251               <xs:complexType>
252                 <xs:sequence>
253                   <xs:element ref="ims:user" maxOccurs="unbounded"/>
254                 </xs:sequence>
255               </xs:complexType>
256             </xs:element>
257           </xs:sequence>
258           <xs:attribute ref="ims:description"/>
259         </xs:extension>
260       </xs:complexContent>
261     </xs:complexType>
262   </xs:element>
263   <xs:element name="binary-object" substitutionGroup="ims:thing">
264     <xs:annotation>
265       <xs:documentation xml:lang="en">Represents a binary object.</xs:documentation>
266     </xs:annotation>
267     <xs:complexType>
268       <xs:complexContent>
269         <xs:extension base="ims:namespace-identifiable-timestamp-traceable-access-
              controllable-resource-type">
270           <xs:sequence>
271             <xs:element ref="ims:content" minOccurs="0"/>
272           </xs:sequence>
273           <xs:attribute ref="ims:media-type"/>
274           <xs:attribute ref="ims:language"/>
275           <xs:attribute ref="ims:link"/>
276         </xs:extension>
277       </xs:complexContent>
278     </xs:complexType>
279   </xs:element>
280   <xs:element name="digital-object" substitutionGroup="ims:thing">
281     <xs:annotation>
282       <xs:documentation xml:lang="en">Represents a digital object.</xs:documentation>
283     </xs:annotation>
284     <xs:complexType>
285       <xs:complexContent>
286         <xs:extension base="ims:namespace-identifiable-timestamp-traceable-access-
              controllable-resource-type">
287           <xs:attribute ref="ims:media-type"/>
288           <xs:attribute ref="ims:language"/>
```

```
289           <xs:attribute ref="ims:link"/>
290         </xs:extension>
291       </xs:complexContent>
292     </xs:complexType>
293   </xs:element>
294   <xs:element name="concept" substitutionGroup="ims:thing">
295     <xs:annotation>
296       <xs:documentation xml:lang="en">Represents a concept "viewed as an idea or notion;
              a unit of thought"</xs:documentation>
297     </xs:annotation>
298     <xs:complexType>
299       <xs:complexContent>
300         <xs:extension base="ims:namespace-identifiable-timestamp-traceable-resource-type"
              >
301           <xs:sequence>
302             <xs:element name="description" minOccurs="0">
303               <xs:annotation>
304                 <xs:documentation xml:lang="en">The description of the concept</xs:
                      documentation>
305               </xs:annotation>
306               <xs:complexType mixed="true">
307                 <xs:complexContent>
308                   <xs:restriction base="xs:anyType">
309                     <xs:sequence>
310                       <xs:any processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
311                     </xs:sequence>
312                   </xs:restriction>
313                 </xs:complexContent>
314               </xs:complexType>
315             </xs:element>
316           </xs:sequence>
317         </xs:extension>
318       </xs:complexContent>
319     </xs:complexType>
320   </xs:element>
321   <xs:element name="group" substitutionGroup="ims:thing">
322     <xs:annotation>
323       <xs:documentation xml:lang="en">Represents a group of users.</xs:documentation>
324     </xs:annotation>
325     <xs:complexType>
326       <xs:complexContent>
327         <xs:extension base="ims:namespace-identifiable-timestamp-traceable-resource-type"
              >
328           <xs:sequence>
329             <xs:element name="users" minOccurs="0">
330               <xs:annotation>
331                 <xs:documentation xml:lang="en">The users belonging to the group.</xs:
                      documentation>
332               </xs:annotation>
333               <xs:complexType>
334                 <xs:sequence>
335                   <xs:element ref="ims:user" maxOccurs="unbounded"/>
336                 </xs:sequence>
337               </xs:complexType>
338             </xs:element>
339           </xs:sequence>
340           <xs:attribute ref="ims:description"/>
341         </xs:extension>
342       </xs:complexContent>
343     </xs:complexType>
```

```
344   </xs:element>
345   <xs:element name="result" substitutionGroup="ims:thing">
346     <xs:annotation>
347       <xs:documentation xml:lang="en">Represent the results of a search.</xs:
              documentation>
348     </xs:annotation>
349     <xs:complexType>
350       <xs:complexContent>
351         <xs:extension base="ims:resource-type">
352           <xs:sequence>
353             <xs:element ref="ims:query" minOccurs="0"/>
354             <xs:element ref="ims:resource-class" minOccurs="0"/>
355             <xs:element name="items" minOccurs="0">
356               <xs:annotation>
357                 <xs:documentation xml:lang="en">The items retrieved in these results.</xs
                        :documentation>
358               </xs:annotation>
359               <xs:complexType>
360                 <xs:sequence>
361                   <xs:element name="item" maxOccurs="unbounded">
362                     <xs:annotation>
363                       <xs:documentation xml:lang="en">An item of the results.</xs:
                              documentation>
364                     </xs:annotation>
365                     <xs:complexType>
366                       <xs:attribute ref="ims:identifier" use="required"/>
367                       <xs:attribute ref="ims:namespace"/>
368                       <xs:attribute name="rank" type="xs:nonNegativeInteger" use="
                              required">
369                         <xs:annotation>
370                           <xs:documentation xml:lang="en">The rank of the item.</xs:
                                  documentation>
371                         </xs:annotation>
372                       </xs:attribute>
373                       <xs:attribute name="score" use="required">
374                         <xs:annotation>
375                           <xs:documentation xml:lang="en">The score of the item. It must
                                  be in the [0, 1] interval.</xs:documentation>
376                         </xs:annotation>
377                         <xs:simpleType>
378                           <xs:restriction base="xs:double">
379                             <xs:minInclusive value="0.0"/>
380                             <xs:maxInclusive value="1.0"/>
381                           </xs:restriction>
382                         </xs:simpleType>
383                       </xs:attribute>
384                     </xs:complexType>
385                   </xs:element>
386                 </xs:sequence>
387               </xs:complexType>
388             </xs:element>
389           </xs:sequence>
390           <xs:attribute ref="ims:created"/>
391           <xs:attribute name="size" type="xs:nonNegativeInteger" use="required">
392             <xs:annotation>
393               <xs:documentation xml:lang="en">The size of the results, i.e. the number of
                      items in the results.</xs:documentation>
394             </xs:annotation>
395           </xs:attribute>
396         </xs:extension>
```

```
397       </xs:complexContent>
398     </xs:complexType>
399   </xs:element>
400   <xs:element name="query" substitutionGroup="ims:thing">
401     <xs:annotation>
402       <xs:documentation xml:lang="en">Represents a query to be searched for.</xs:
              documentation>
403     </xs:annotation>
404     <xs:complexType>
405       <xs:complexContent>
406         <xs:extension base="ims:resource-type">
407           <xs:sequence>
408             <xs:element name="cql" type="xs:string">
409               <xs:annotation>
410                 <xs:documentation xml:lang="en">The CQL representation of the query.</xs:
                      documentation>
411               </xs:annotation>
412             </xs:element>
413             <xs:element ref="ims:resource-class" minOccurs="0"/>
414             <xs:element ref="xcql:xcql" minOccurs="0">
415               <xs:annotation>
416                 <xs:documentation xml:lang="en">The XCQL representation of the query
                      toghether with its results, if any.</xs:documentation>
417               </xs:annotation>
418             </xs:element>
419           </xs:sequence>
420           <xs:attribute ref="ims:created"/>
421         </xs:extension>
422       </xs:complexContent>
423     </xs:complexType>
424   </xs:element>
425   <xs:element name="log-event" substitutionGroup="ims:thing">
426     <xs:annotation>
427       <xs:documentation xml:lang="en">Represents a log event.</xs:documentation>
428     </xs:annotation>
429     <xs:complexType>
430       <xs:complexContent>
431         <xs:extension base="ims:serially-identifiable-resource-type">
432           <xs:sequence>
433             <xs:element name="message" minOccurs="0">
434               <xs:annotation>
435                 <xs:documentation xml:lang="en">The message describing this log event.</
                      xs:documentation>
436               </xs:annotation>
437               <xs:complexType mixed="true">
438                 <xs:complexContent>
439                   <xs:restriction base="xs:anyType">
440                     <xs:sequence>
441                       <xs:any processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
442                     </xs:sequence>
443                     <xs:attribute ref="ims:language"/>
444                   </xs:restriction>
445                 </xs:complexContent>
446               </xs:complexType>
447             </xs:element>
448             <xs:element ref="ims:user" minOccurs="0"/>
449             <xs:element name="action" type="xs:token" minOccurs="0">
450               <xs:annotation>
451                 <xs:documentation xml:lang="en">The action performed by the user when
                      this log event was originated.</xs:documentation>
```

```
452             </xs:annotation>
453           </xs:element>
454           <xs:element name="ip" type="xs:string" minOccurs="0">
455             <xs:annotation>
456               <xs:documentation xml:lang="en">The IP address of the host causing this
                      log event.</xs:documentation>
457             </xs:annotation>
458           </xs:element>
459           <xs:element name="resource" minOccurs="0">
460             <xs:annotation>
461               <xs:documentation xml:lang="en">The resource whose access is causing this
                       log event.</xs:documentation>
462             </xs:annotation>
463             <xs:complexType>
464               <xs:complexContent>
465                 <xs:extension base="ims:namespace-identifiable-resource-type">
466                   <xs:sequence>
467                     <xs:element ref="ims:resource-class" minOccurs="0"/>
468                   </xs:sequence>
469                 </xs:extension>
470               </xs:complexContent>
471             </xs:complexType>
472           </xs:element>
473           <xs:element name="thread" type="xs:string" minOccurs="0">
474             <xs:annotation>
475               <xs:documentation xml:lang="en">The name of the thread which generated
                      this log event.</xs:documentation>
476             </xs:annotation>
477           </xs:element>
478           <xs:element name="class-name" type="xs:string" minOccurs="0">
479             <xs:annotation>
480               <xs:documentation xml:lang="en">The name of the class which generated
                      this log event.</xs:documentation>
481             </xs:annotation>
482           </xs:element>
483           <xs:element name="method" type="xs:string" minOccurs="0">
484             <xs:annotation>
485               <xs:documentation xml:lang="en">The name of the method which generated
                      this log event.</xs:documentation>
486             </xs:annotation>
487           </xs:element>
488           <xs:element name="line-number" type="xs:positiveInteger" minOccurs="0">
489             <xs:annotation>
490               <xs:documentation xml:lang="en">The line number in the source code of the
                       class which generated this log event.</xs:documentation>
491             </xs:annotation>
492           </xs:element>
493           <xs:element name="class-file" type="xs:string" minOccurs="0">
494             <xs:annotation>
495               <xs:documentation xml:lang="en">The name of the file containing the class
                       which generated this log event.</xs:documentation>
496             </xs:annotation>
497           </xs:element>
498           <xs:element name="throwable" minOccurs="0">
499             <xs:annotation>
500               <xs:documentation xml:lang="en">The information about the exception that
                      caused this log event.</xs:documentation>
501             </xs:annotation>
502             <xs:complexType mixed="true">
503               <xs:complexContent>
```

```
504                 <xs:restriction base="xs:anyType">
505                   <xs:sequence>
506                     <xs:any processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
507                   </xs:sequence>
508                 </xs:restriction>
509               </xs:complexContent>
510             </xs:complexType>
511           </xs:element>
512         </xs:sequence>
513         <xs:attribute ref="ims:created"/>
514         <xs:attribute name="level">
515           <xs:annotation>
516             <xs:documentation xml:lang="en">The level of a log event.</xs:documentation
                >
517           </xs:annotation>
518           <xs:simpleType>
519             <xs:restriction base="xs:token">
520               <xs:enumeration value="TRACE">
521                 <xs:annotation>
522                   <xs:documentation xml:lang="en">Designates the finest-grained
                        informational events.</xs:documentation>
523                 </xs:annotation>
524               </xs:enumeration>
525               <xs:enumeration value="DEBUG">
526                 <xs:annotation>
527                   <xs:documentation xml:lang="en">Designates fine-grained informational
                         events that are most useful to debug an application.</xs:
                        documentation>
528                 </xs:annotation>
529               </xs:enumeration>
530               <xs:enumeration value="INFO">
531                 <xs:annotation>
532                   <xs:documentation xml:lang="en">Designates informational messages
                        that highlight the progress of the application at coarse-grained
                        level.</xs:documentation>
533                 </xs:annotation>
534               </xs:enumeration>
535               <xs:enumeration value="WARN">
536                 <xs:annotation>
537                   <xs:documentation xml:lang="en">Designates potentially harmful
                        situations.</xs:documentation>
538                 </xs:annotation>
539               </xs:enumeration>
540               <xs:enumeration value="ERROR">
541                 <xs:annotation>
542                   <xs:documentation xml:lang="en">Designates error events that might
                        still allow the application to continue running.</xs:
                        documentation>
543                 </xs:annotation>
544               </xs:enumeration>
545               <xs:enumeration value="FATAL">
546                 <xs:annotation>
547                   <xs:documentation xml:lang="en">Designates very severe error events
                        that will presumably lead the application to abort.</xs:
                        documentation>
548                 </xs:annotation>
549               </xs:enumeration>
550             </xs:restriction>
551           </xs:simpleType>
552         </xs:attribute>
```

```
553         </xs:extension>
554       </xs:complexContent>
555     </xs:complexType>
556   </xs:element>
557   <xs:element name="metadata-set" substitutionGroup="ims:thing">
558     <xs:annotation>
559       <xs:documentation xml:lang="en">Represents a set of metadata resources. Metadata
              sets can be nested.</xs:documentation>
560     </xs:annotation>
561     <xs:complexType>
562       <xs:complexContent>
563         <xs:extension base="ims:namespace-identifiable-timestamp-traceable-access-
              controllable-resource-type">
564           <xs:sequence>
565             <xs:element name="supersets" minOccurs="0">
566               <xs:annotation>
567                 <xs:documentation xml:lang="en">The super-sets of this metadata set.</xs:
                      documentation>
568               </xs:annotation>
569               <xs:complexType>
570                 <xs:sequence>
571                   <xs:element ref="ims:metadata-set" maxOccurs="unbounded"/>
572                 </xs:sequence>
573               </xs:complexType>
574             </xs:element>
575             <xs:element name="subsets" minOccurs="0">
576               <xs:annotation>
577                 <xs:documentation xml:lang="en">The sub-sets of this metadata set.</xs:
                      documentation>
578               </xs:annotation>
579               <xs:complexType>
580                 <xs:sequence>
581                   <xs:element ref="ims:metadata-set" maxOccurs="unbounded"/>
582                 </xs:sequence>
583               </xs:complexType>
584             </xs:element>
585           </xs:sequence>
586           <xs:attribute name="name" type="xs:token">
587             <xs:annotation>
588               <xs:documentation xml:lang="en">The name of the metadata set.</xs:
                    documentation>
589             </xs:annotation>
590           </xs:attribute>
591           <xs:attribute ref="ims:description"/>
592         </xs:extension>
593       </xs:complexContent>
594     </xs:complexType>
595   </xs:element>
596   <xs:element name="metadata" substitutionGroup="ims:thing">
597     <xs:annotation>
598       <xs:documentation xml:lang="en">Represents a metadata.</xs:documentation>
599     </xs:annotation>
600     <xs:complexType>
601       <xs:complexContent>
602         <xs:extension base="ims:namespace-identifiable-timestamp-traceable-access-
              controllable-resource-type">
603           <xs:sequence>
604             <xs:element name="metadata-sets" minOccurs="0">
605               <xs:annotation>
606                 <xs:documentation xml:lang="en">The metadata sets to which this metadata
```

```
                belongs.</xs:documentation>
607           </xs:annotation>
608           <xs:complexType>
609             <xs:sequence>
610               <xs:element ref="ims:metadata-set" maxOccurs="unbounded"/>
611             </xs:sequence>
612           </xs:complexType>
613         </xs:element>
614         <xs:element name="fields" minOccurs="0">
615           <xs:annotation>
616             <xs:documentation xml:lang="en">The fields of this metadata.</xs:
                  documentation>
617           </xs:annotation>
618           <xs:complexType mixed="true">
619             <xs:complexContent>
620               <xs:restriction base="xs:anyType">
621                 <xs:sequence>
622                   <xs:any processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
623                 </xs:sequence>
624               </xs:restriction>
625             </xs:complexContent>
626           </xs:complexType>
627         </xs:element>
628       </xs:sequence>
629       <xs:anyAttribute namespace="##any" processContents="lax">
630         <xs:annotation>
631           <xs:documentation xml:lang="en">Additional attributes of the metadata
                record, if any.</xs:documentation>
632         </xs:annotation>
633       </xs:anyAttribute>
634     </xs:extension>
635   </xs:complexContent>
636 </xs:complexType>
637 </xs:element>
638 <xs:element name="provenance-event" substitutionGroup="ims:thing">
639   <xs:annotation>
640     <xs:documentation xml:lang="en">An event describing a fact about the provenance of
          a resource.</xs:documentation>
641   </xs:annotation>
642   <xs:complexType>
643     <xs:complexContent>
644       <xs:extension base="ims:serially-identifiable-resource-type">
645         <xs:sequence>
646           <xs:element name="when" type="xs:dateTime">
647             <xs:annotation>
648               <xs:documentation xml:lang="en">The timestamp at which the event occurred
                    .</xs:documentation>
649             </xs:annotation>
650           </xs:element>
651           <xs:element name="who">
652             <xs:annotation>
653               <xs:documentation xml:lang="en">The user who caused the event.</xs:
                    documentation>
654             </xs:annotation>
655             <xs:complexType>
656               <xs:sequence>
657                 <xs:element ref="ims:user"/>
658               </xs:sequence>
659             </xs:complexType>
660           </xs:element>
```

```
661             <xs:element name="predicate">
662               <xs:annotation>
663                 <xs:documentation xml:lang="en">The action carried out in the event.</xs:
                        documentation>
664               </xs:annotation>
665               <xs:simpleType>
666                 <xs:restriction base="xs:token">
667                   <xs:enumeration value="CREATED">
668                     <xs:annotation>
669                       <xs:documentation xml:lang="en">Indicates the a user created a
                              resource.</xs:documentation>
670                     </xs:annotation>
671                   </xs:enumeration>
672                   <xs:enumeration value="READ">
673                     <xs:annotation>
674                       <xs:documentation xml:lang="en">Indicates the a user read a
                              resource.</xs:documentation>
675                     </xs:annotation>
676                   </xs:enumeration>
677                   <xs:enumeration value="UPDATED">
678                     <xs:annotation>
679                       <xs:documentation xml:lang="en">Indicates the a user updated a
                              resource.</xs:documentation>
680                     </xs:annotation>
681                   </xs:enumeration>
682                   <xs:enumeration value="DELETED">
683                     <xs:annotation>
684                       <xs:documentation xml:lang="en">Indicates the a user deleted a
                              resource.</xs:documentation>
685                     </xs:annotation>
686                   </xs:enumeration>
687                   <xs:enumeration value="ACCESSED">
688                     <xs:annotation>
689                       <xs:documentation xml:lang="en">Indicates the a user accessed a
                              resource.</xs:documentation>
690                     </xs:annotation>
691                   </xs:enumeration>
692                 </xs:restriction>
693               </xs:simpleType>
694             </xs:element>
695             <xs:element name="what">
696               <xs:annotation>
697                 <xs:documentation xml:lang="en">The resource originated by the event.</xs
                        :documentation>
698               </xs:annotation>
699               <xs:complexType>
700                 <xs:sequence>
701                   <xs:element ref="ims:thing"/>
702                 </xs:sequence>
703               </xs:complexType>
704             </xs:element>
705             <xs:element name="why" type="xs:token">
706               <xs:annotation>
707                 <xs:documentation xml:lang="en">The motivation that originated the event.
                        </xs:documentation>
708               </xs:annotation>
709             </xs:element>
710           </xs:sequence>
711         </xs:extension>
712       </xs:complexContent>
```

```
713     </xs:complexType>
714   </xs:element>
715   <xs:element name="resource-class" type="xs:token">
716     <xs:annotation>
717       <xs:documentation xml:lang="en">The type of resource retrieved in a search.</xs:
              documentation>
718     </xs:annotation>
719   </xs:element>
720   <xs:element name="owner">
721     <xs:annotation>
722       <xs:documentation xml:lang="en">The owner of a resource.</xs:documentation>
723     </xs:annotation>
724     <xs:complexType>
725       <xs:sequence>
726         <xs:element ref="ims:user"/>
727       </xs:sequence>
728     </xs:complexType>
729   </xs:element>
730   <xs:element name="access-permission">
731     <xs:annotation>
732       <xs:documentation xml:lang="en">The access permission of a group to a resource.</xs
              :documentation>
733     </xs:annotation>
734     <xs:simpleType>
735       <xs:restriction base="xs:token">
736         <xs:enumeration value="DENIED">
737           <xs:annotation>
738             <xs:documentation xml:lang="en">Denotes that access is denied.</xs:
                    documentation>
739           </xs:annotation>
740         </xs:enumeration>
741         <xs:enumeration value="READ_ONLY">
742           <xs:annotation>
743             <xs:documentation xml:lang="en">Denotes the read only access.</xs:
                    documentation>
744           </xs:annotation>
745         </xs:enumeration>
746         <xs:enumeration value="READ_WRITE">
747           <xs:annotation>
748             <xs:documentation xml:lang="en">Denotes the read/write access.</xs:
                    documentation>
749           </xs:annotation>
750         </xs:enumeration>
751       </xs:restriction>
752     </xs:simpleType>
753   </xs:element>
754   <xs:element name="resource">
755     <xs:annotation>
756       <xs:documentation xml:lang="en">A resource which is held by another resource.</xs:
              documentation>
757     </xs:annotation>
758     <xs:complexType>
759       <xs:sequence>
760         <xs:element ref="ims:thing"/>
761       </xs:sequence>
762     </xs:complexType>
763   </xs:element>
764   <xs:element name="resources">
765     <xs:annotation>
766       <xs:documentation xml:lang="en">A set of resources.</xs:documentation>
```

```
767     </xs:annotation>
768     <xs:complexType>
769       <xs:sequence>
770         <xs:element ref="ims:thing" maxOccurs="unbounded"/>
771       </xs:sequence>
772     </xs:complexType>
773   </xs:element>
774   <xs:element name="metric">
775     <xs:annotation>
776       <xs:documentation xml:lang="en">The metric for a measure, i.e. the measurement
              function (JCGM 200:2008 VIM 2.49).</xs:documentation>
777     </xs:annotation>
778     <xs:complexType>
779       <xs:sequence>
780         <xs:element ref="ims:concept"/>
781       </xs:sequence>
782     </xs:complexType>
783   </xs:element>
784   <xs:element name="measure" substitutionGroup="ims:thing">
785     <xs:annotation>
786       <xs:documentation xml:lang="en">The numerical quantity value of a  measurement
              result.</xs:documentation>
787       <xs:documentation xml:lang="en">See JCGM 200:2008, International vocabulary of
              metrology - Basic and general concepts and associated terms (VIM), available at
               http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2008.pdf</xs:
              documentation>
788     </xs:annotation>
789     <xs:complexType>
790       <xs:complexContent>
791         <xs:extension base="ims:identifiable-resource-type">
792           <xs:sequence>
793             <xs:element ref="ims:resource" minOccurs="0"/>
794             <xs:element ref="ims:metric" minOccurs="0"/>
795           </xs:sequence>
796           <xs:attribute ref="ims:created"/>
797           <xs:attribute ref="ims:value"/>
798           <xs:attribute ref="ims:year"/>
799         </xs:extension>
800       </xs:complexContent>
801     </xs:complexType>
802   </xs:element>
803   <xs:element name="measures">
804     <xs:annotation>
805       <xs:documentation xml:lang="en">A set of measures.</xs:documentation>
806     </xs:annotation>
807     <xs:complexType>
808       <xs:sequence>
809         <xs:element ref="ims:measure" maxOccurs="unbounded"/>
810       </xs:sequence>
811     </xs:complexType>
812   </xs:element>
813   <xs:element name="descriptive-statistic">
814     <xs:annotation>
815       <xs:documentation xml:lang="en">The descriptive statistic used for computing the
              aggregated value of a statistic.</xs:documentation>
816     </xs:annotation>
817     <xs:complexType>
818       <xs:sequence>
819         <xs:element ref="ims:concept"/>
820       </xs:sequence>
```

```
821     </xs:complexType>
822   </xs:element>
823   <xs:element name="statistic" substitutionGroup="ims:thing">
824     <xs:annotation>
825       <xs:documentation xml:lang="en">The numerical data relating to an aggregate of
              individuals.</xs:documentation>
826       <xs:documentation xml:lang="en">See  the "OECD Glossary of Statistical Term"
              available at http://stats.oecd.org/glossary/detail.asp?ID=3847.</xs:
              documentation>
827     </xs:annotation>
828     <xs:complexType>
829       <xs:complexContent>
830         <xs:extension base="ims:identifiable-resource-type">
831           <xs:sequence>
832             <xs:element ref="ims:resource" minOccurs="0"/>
833             <xs:element ref="ims:descriptive-statistic" minOccurs="0"/>
834             <xs:element ref="ims:metric" minOccurs="0"/>
835             <xs:element ref="ims:measures" minOccurs="0"/>
836           </xs:sequence>
837           <xs:attribute ref="ims:created"/>
838           <xs:attribute ref="ims:value"/>
839         </xs:extension>
840       </xs:complexContent>
841     </xs:complexType>
842   </xs:element>
843   <xs:element name="statistics">
844     <xs:annotation>
845       <xs:documentation xml:lang="en">A set of statistics.</xs:documentation>
846     </xs:annotation>
847     <xs:complexType>
848       <xs:sequence>
849         <xs:element ref="ims:measure" maxOccurs="unbounded"/>
850       </xs:sequence>
851     </xs:complexType>
852   </xs:element>
853   <xs:element name="contribution" substitutionGroup="ims:thing">
854     <xs:annotation>
855       <xs:documentation> Represents a paper (e.g. a conference paper, a working note, a
              technical
856 report, a journal paper).</xs:documentation>
857     </xs:annotation>
858     <xs:complexType>
859       <xs:complexContent>
860         <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
              resource-type">
861           <xs:sequence>
862             <xs:element ref="ims:concept" minOccurs="0"/>
863             <xs:element name="authors" minOccurs="0">
864               <xs:annotation>
865                 <xs:documentation> The list of users that authors the contribution.</xs:
                      documentation>
866               </xs:annotation>
867               <xs:complexType>
868                 <xs:sequence maxOccurs="unbounded">
869                   <xs:element ref="ims:user"/>
870                 </xs:sequence>
871               </xs:complexType>
872             </xs:element>
873             <xs:element name="publisher" minOccurs="0">
874               <xs:annotation>
```

```
875               <xs:documentation> The publisher of the contribution.</xs:documentation>
876             </xs:annotation>
877             <xs:complexType>
878               <xs:sequence minOccurs="0">
879                 <xs:element ref="ims:user"/>
880               </xs:sequence>
881             </xs:complexType>
882           </xs:element>
883           <xs:element ref="ims:countries" minOccurs="0">
884             <xs:annotation>
885               <xs:documentation xml:lang="en">The countries of the authors of the
                      contribution at the moment of writing it.</xs:documentation>
886             </xs:annotation>
887           </xs:element>
888           <xs:element name="affiliations" minOccurs="0">
889             <xs:annotation>
890               <xs:documentation xml:lang="en">The affiliations of the authors of the
                      contribution at the moment of writing it.</xs:documentation>
891             </xs:annotation>
892             <xs:complexType>
893               <xs:sequence>
894                 <xs:element name="affiliation" type="xs:string" maxOccurs="unbounded">
895                   <xs:annotation>
896                     <xs:documentation xml:lang="en">An affiliation of an author of the
                            contribution.</xs:documentation>
897                   </xs:annotation>
898                 </xs:element>
899               </xs:sequence>
900             </xs:complexType>
901           </xs:element>
902           <xs:element ref="ims:content" minOccurs="0"/>
903         </xs:sequence>
904         <xs:attribute name="title" type="xs:string">
905           <xs:annotation>
906             <xs:documentation>The title of the contribution.</xs:documentation>
907           </xs:annotation>
908         </xs:attribute>
909         <xs:attribute name="pages" type="xs:string">
910           <xs:annotation>
911             <xs:documentation>Additional information about the contribution.</xs:
                    documentation>
912           </xs:annotation>
913         </xs:attribute>
914         <xs:attribute name="additional-information" type="xs:string">
915           <xs:annotation>
916             <xs:documentation>Additional information about the contribution.</xs:
                    documentation>
917           </xs:annotation>
918         </xs:attribute>
919         <xs:attribute name="year" type="xs:gYear">
920           <xs:annotation>
921             <xs:documentation>The year of the contribution.</xs:documentation>
922           </xs:annotation>
923         </xs:attribute>
924         <xs:attribute ref="ims:link"/>
925         <xs:attribute ref="ims:media-type"/>
926         <xs:attribute ref="ims:language"/>
927         <xs:attribute name="copyrighted" type="xs:boolean">
928           <xs:annotation>
929             <xs:documentation xml:lang="en">Indicates whether the content of the
```

```
                contribution is copyrighted.</xs:documentation>
930           </xs:annotation>
931         </xs:attribute>
932       </xs:extension>
933     </xs:complexContent>
934   </xs:complexType>
935 </xs:element>
936 <xs:element name="parameter" substitutionGroup="ims:thing">
937   <xs:annotation>
938     <xs:documentation xml:lang="en">A parameter of a resource.</xs:documentation>
939   </xs:annotation>
940   <xs:complexType>
941     <xs:complexContent>
942       <xs:extension base="ims:identifiable-resource-type">
943         <xs:sequence>
944           <xs:element ref="ims:resource" minOccurs="0"/>
945           <xs:element ref="ims:concept">
946             <xs:annotation>
947               <xs:documentation xml:lang="en">The name of the parameter.</xs:
                      documentation>
948             </xs:annotation>
949           </xs:element>
950           <xs:element name="value">
951             <xs:annotation>
952               <xs:documentation xml:lang="en">The value of the parameter.</xs:
                      documentation>
953             </xs:annotation>
954             <xs:complexType mixed="true">
955               <xs:complexContent>
956                 <xs:restriction base="xs:anyType">
957                   <xs:sequence>
958                     <xs:any processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
959                   </xs:sequence>
960                 </xs:restriction>
961               </xs:complexContent>
962             </xs:complexType>
963           </xs:element>
964         </xs:sequence>
965       </xs:extension>
966     </xs:complexContent>
967   </xs:complexType>
968 </xs:element>
969 <xs:element name="parameters">
970   <xs:annotation>
971     <xs:documentation xml:lang="en">The list of parameters of a resource.</xs:
          documentation>
972   </xs:annotation>
973   <xs:complexType>
974     <xs:sequence>
975       <xs:element ref="ims:parameter" maxOccurs="unbounded"/>
976     </xs:sequence>
977   </xs:complexType>
978 </xs:element>
979 <xs:element name="snapshot" substitutionGroup="ims:thing">
980   <xs:annotation>
981     <xs:documentation>Represents a snapshot of a visualization.</xs:documentation>
982   </xs:annotation>
983   <xs:complexType>
984     <xs:complexContent>
985       <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
```

```
986             <xs:sequence>
987               <xs:element ref="ims:visualization" minOccurs="0"/>
988               <xs:element ref="ims:content" minOccurs="0"/>
989             </xs:sequence>
990             <xs:attribute ref="ims:media-type"/>
991           </xs:extension>
992         </xs:complexContent>
993       </xs:complexType>
994     </xs:element>
995     <xs:element name="visualization" substitutionGroup="ims:thing">
996       <xs:annotation>
997         <xs:documentation xml:lang="en">Represents a visualization.</xs:documentation>
998       </xs:annotation>
999       <xs:complexType>
1000        <xs:complexContent>
1001          <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
1002            <xs:sequence>
1003              <xs:element ref="ims:concept" minOccurs="0"/>
1004              <xs:element ref="ims:resources" minOccurs="0"/>
1005              <xs:element ref="ims:measures" minOccurs="0"/>
1006              <xs:element ref="ims:parameters" minOccurs="0"/>
1007            </xs:sequence>
1008            <xs:attribute ref="ims:description"/>
1009          </xs:extension>
1010        </xs:complexContent>
1011      </xs:complexType>
1012    </xs:element>
1013    <xs:element name="statistical-test" substitutionGroup="ims:thing">
1014      <xs:annotation>
1015        <xs:documentation xml:lang="en">Represents a statistical test.</xs:documentation>
1016      </xs:annotation>
1017      <xs:complexType>
1018        <xs:complexContent>
1019          <xs:extension base="ims:identifiable-resource-type">
1020            <xs:sequence>
1021              <xs:element ref="ims:concept" minOccurs="0"/>
1022              <xs:element ref="ims:resources" minOccurs="0"/>
1023              <xs:element ref="ims:measures" minOccurs="0"/>
1024              <xs:element ref="ims:parameters" minOccurs="0"/>
1025            </xs:sequence>
1026            <xs:attribute ref="ims:created"/>
1027            <xs:attribute ref="ims:description"/>
1028          </xs:extension>
1029        </xs:complexContent>
1030      </xs:complexType>
1031    </xs:element>
1032    <xs:element name="link" substitutionGroup="ims:thing">
1033      <xs:annotation>
1034        <xs:documentation xml:lang="en">A link among two resources.</xs:documentation>
1035      </xs:annotation>
1036      <xs:complexType>
1037        <xs:complexContent>
1038          <xs:extension base="ims:identifiable-resource-type">
1039            <xs:sequence>
1040              <xs:element ref="ims:thing">
1041                <xs:annotation>
1042                  <xs:documentation xml:lang="en">The resource which is acting as source of
                          a link.</xs:documentation>
1043                </xs:annotation>
1044              </xs:element>
```

```
1045              <xs:element name="relation" minOccurs="0">
1046                <xs:annotation>
1047                  <xs:documentation xml:lang="en">The relation among the source and target
                          resources comprising the link.</xs:documentation>
1048                </xs:annotation>
1049                <xs:complexType>
1050                  <xs:sequence>
1051                    <xs:element ref="ims:concept"/>
1052                  </xs:sequence>
1053                </xs:complexType>
1054              </xs:element>
1055              <xs:element ref="ims:thing">
1056                <xs:annotation>
1057                  <xs:documentation xml:lang="en">The resource which is acting as target of
                           a link.</xs:documentation>
1058                </xs:annotation>
1059              </xs:element>
1060            </xs:sequence>
1061            <xs:attribute ref="ims:score"/>
1062            <xs:attribute ref="ims:backward-score"/>
1063            <xs:attribute ref="ims:frequency"/>
1064          </xs:extension>
1065        </xs:complexContent>
1066      </xs:complexType>
1067    </xs:element>
1068    <xs:element name="links">
1069      <xs:annotation>
1070        <xs:documentation xml:lang="en">The list of links among two resources.</xs:
              documentation>
1071      </xs:annotation>
1072      <xs:complexType>
1073        <xs:sequence>
1074          <xs:element ref="ims:link" maxOccurs="unbounded"/>
1075        </xs:sequence>
1076      </xs:complexType>
1077    </xs:element>
1078    <xs:element name="sharings">
1079      <xs:annotation>
1080        <xs:documentation xml:lang="en">The list of groups which share a resource with
              their access permissions.</xs:documentation>
1081      </xs:annotation>
1082      <xs:complexType>
1083        <xs:sequence>
1084          <xs:element name="sharing" maxOccurs="unbounded">
1085            <xs:annotation>
1086              <xs:documentation xml:lang="en">A sharing of the resource with a group.</xs:
                    documentation>
1087            </xs:annotation>
1088            <xs:complexType>
1089              <xs:sequence>
1090                <xs:element ref="ims:group"/>
1091                <xs:element ref="ims:access-permission"/>
1092              </xs:sequence>
1093            </xs:complexType>
1094          </xs:element>
1095        </xs:sequence>
1096      </xs:complexType>
1097    </xs:element>
1098    <xs:element name="content">
1099      <xs:annotation>
```

```
1100        <xs:documentation xml:lang="en">The content of a resource.</xs:documentation>
1101      </xs:annotation>
1102      <xs:complexType mixed="true">
1103        <xs:complexContent>
1104          <xs:restriction base="xs:anyType">
1105            <xs:sequence>
1106              <xs:any processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
1107            </xs:sequence>
1108            <xs:attribute name="content-transfer-encoding">
1109              <xs:annotation>
1110                <xs:documentation xml:lang="en">It specifies what sort of encoding
                       transformation the body was subjected to and hence what decoding
                       operation must be used to restore it to its original form.</xs:
                       documentation>
1111                <xs:documentation source="http://www.ietf.org/rfc/rfc2045.txt" xml:lang="en
                       ">For further information see RFC 2045, "Multipurpose Internet Mail
                       Extensions (MIME) Part One: Format of Internet Message Bodies".</xs:
                       documentation>
1112              </xs:annotation>
1113              <xs:simpleType>
1114                <xs:restriction base="xs:token">
1115                  <xs:enumeration value="base64">
1116                    <xs:annotation>
1117                      <xs:documentation xml:lang="en">The Base64 Content-Transfer-Encoding
                             is designed to represent arbitrary sequences of octets in a form
                             that need not be humanly readable. The encoding and decoding
                             algorithms are simple, but the encoded data are consistently only
                              about 33 percent larger than than unencoded data.</xs:
                             documentation>
1118                      <xs:documentation source="http://www.ietf.org/rfc/rfc2045.txt" xml:
                             lang="en">For further information see RFC 2045, "Multipurpose
                             Internet Mail Extensions (MIME) Part One: Format of Internet
                             Message Bodies".</xs:documentation>
1119                    </xs:annotation>
1120                  </xs:enumeration>
1121                </xs:restriction>
1122              </xs:simpleType>
1123            </xs:attribute>
1124          </xs:restriction>
1125        </xs:complexContent>
1126      </xs:complexType>
1127    </xs:element>
1128    <xs:attribute name="identifier" type="xs:token">
1129      <xs:annotation>
1130        <xs:documentation xml:lang="en">The unique identifier of a resource.</xs:
               documentation>
1131      </xs:annotation>
1132    </xs:attribute>
1133    <xs:attribute name="serial-identifier" type="xs:positiveInteger">
1134      <xs:annotation>
1135        <xs:documentation xml:lang="en">The unique serial identifier of a resource.</xs:
               documentation>
1136      </xs:annotation>
1137    </xs:attribute>
1138    <xs:attribute name="uri" type="xs:anyURI">
1139      <xs:annotation>
1140        <xs:documentation xml:lang="en">The full URI to access a resource.</xs:
               documentation>
1141      </xs:annotation>
1142    </xs:attribute>
```

```
1143  <xs:attribute name="namespace" type="xs:token">
1144    <xs:annotation>
1145      <xs:documentation xml:lang="en">The namespace of a resource.</xs:documentation>
1146    </xs:annotation>
1147  </xs:attribute>
1148  <xs:attribute name="language" type="ims:languageT">
1149    <xs:annotation>
1150      <xs:documentation xml:lang="en">The language of a resource.</xs:documentation>
1151    </xs:annotation>
1152  </xs:attribute>
1153  <xs:element name="languages">
1154    <xs:annotation>
1155      <xs:documentation xml:lang="en">The languages of a resource.</xs:documentation>
1156    </xs:annotation>
1157    <xs:complexType>
1158      <xs:sequence>
1159        <xs:element name="langauge" type="ims:languageT" maxOccurs="unbounded">
1160          <xs:annotation>
1161            <xs:documentation xml:lang="en">A language of a resource.</xs:documentation>
1162          </xs:annotation>
1163        </xs:element>
1164      </xs:sequence>
1165    </xs:complexType>
1166  </xs:element>
1167  <xs:attribute name="country" type="ims:countryT">
1168    <xs:annotation>
1169      <xs:documentation xml:lang="en">The country of a resource.</xs:documentation>
1170    </xs:annotation>
1171  </xs:attribute>
1172  <xs:element name="countries">
1173    <xs:annotation>
1174      <xs:documentation xml:lang="en">The countries of a resource.</xs:documentation>
1175    </xs:annotation>
1176    <xs:complexType>
1177      <xs:sequence>
1178        <xs:element name="country" type="ims:countryT" maxOccurs="unbounded">
1179          <xs:annotation>
1180            <xs:documentation xml:lang="en">A country of a resource.</xs:documentation>
1181          </xs:annotation>
1182        </xs:element>
1183      </xs:sequence>
1184    </xs:complexType>
1185  </xs:element>
1186  <xs:attribute name="description" type="xs:string">
1187    <xs:annotation>
1188      <xs:documentation xml:lang="en">The description of a resource.</xs:documentation>
1189    </xs:annotation>
1190  </xs:attribute>
1191  <xs:attribute name="created" type="xs:dateTime">
1192    <xs:annotation>
1193      <xs:documentation xml:lang="en">The creation timestamp of a resource.</xs:
          documentation>
1194    </xs:annotation>
1195  </xs:attribute>
1196  <xs:attribute name="last-modified" type="xs:dateTime">
1197    <xs:annotation>
1198      <xs:documentation xml:lang="en">The last modification timestamp of the resource.</
          xs:documentation>
1199    </xs:annotation>
1200  </xs:attribute>
```

```
1201  <xs:attribute name="scope">
1202    <xs:annotation>
1203      <xs:documentation xml:lang="en">The scope of a resource.</xs:documentation>
1204    </xs:annotation>
1205    <xs:simpleType>
1206      <xs:restriction base="xs:string">
1207        <xs:enumeration value="PRIVATE">
1208          <xs:annotation>
1209            <xs:documentation xml:lang="en">Denotes private resources.</xs:documentation>
1210          </xs:annotation>
1211        </xs:enumeration>
1212        <xs:enumeration value="SHARED">
1213          <xs:annotation>
1214            <xs:documentation xml:lang="en">Denotes shared resources.</xs:documentation>
1215          </xs:annotation>
1216        </xs:enumeration>
1217        <xs:enumeration value="PUBLIC">
1218          <xs:annotation>
1219            <xs:documentation xml:lang="en">Denotes public resources.</xs:documentation>
1220          </xs:annotation>
1221        </xs:enumeration>
1222      </xs:restriction>
1223    </xs:simpleType>
1224  </xs:attribute>
1225  <xs:attribute name="media-type" type="ims:media-typeT">
1226    <xs:annotation>
1227      <xs:documentation xml:lang="en">The media type of an object according to MIME (
          Multipurpose Internet Mail Extensions) standard.</xs:documentation>
1228    </xs:annotation>
1229  </xs:attribute>
1230  <xs:element name="media-types">
1231    <xs:annotation>
1232      <xs:documentation xml:lang="en">The MIME media types of a resource.</xs:
          documentation>
1233    </xs:annotation>
1234    <xs:complexType>
1235      <xs:sequence>
1236        <xs:element name="media-type" type="ims:media-typeT" maxOccurs="unbounded">
1237          <xs:annotation>
1238            <xs:documentation xml:lang="en">A MIME media type of a resource.</xs:
                documentation>
1239          </xs:annotation>
1240        </xs:element>
1241      </xs:sequence>
1242    </xs:complexType>
1243  </xs:element>
1244  <xs:attribute name="score">
1245    <xs:annotation>
1246      <xs:documentation xml:lang="en">The score of either a result item or a link from
          source to target.</xs:documentation>
1247    </xs:annotation>
1248    <xs:simpleType>
1249      <xs:restriction base="xs:double">
1250        <xs:minInclusive value="0.0"/>
1251        <xs:maxInclusive value="1.0"/>
1252      </xs:restriction>
1253    </xs:simpleType>
1254  </xs:attribute>
1255  <xs:attribute name="backward-score">
1256    <xs:annotation>
```

```
1257        <xs:documentation xml:lang="en">The score of a link from target to source.</xs:
                documentation>
1258      </xs:annotation>
1259      <xs:simpleType>
1260        <xs:restriction base="xs:double">
1261          <xs:minInclusive value="0.0"/>
1262          <xs:maxInclusive value="1.0"/>
1263        </xs:restriction>
1264      </xs:simpleType>
1265    </xs:attribute>
1266    <xs:attribute name="link" type="xs:anyURI">
1267      <xs:annotation>
1268        <xs:documentation xml:lang="en">A URI that represents a link to a resource.</xs:
                documentation>
1269      </xs:annotation>
1270    </xs:attribute>
1271    <xs:attribute name="frequency" type="xs:positiveInteger">
1272      <xs:annotation>
1273        <xs:documentation xml:lang="en">The frequency of a link between resources.</xs:
                documentation>
1274      </xs:annotation>
1275    </xs:attribute>
1276    <xs:attribute name="year" type="xs:gYear">
1277      <xs:annotation>
1278        <xs:documentation>The year to which a resource refers to.</xs:documentation>
1279      </xs:annotation>
1280    </xs:attribute>
1281    <xs:attribute name="value" type="xs:double">
1282      <xs:annotation>
1283        <xs:documentation xml:lang="en">A value of a resource, e.g. the numerical quantity
                value of the  measure or the estimate of a statistic.</xs:documentation>
1284      </xs:annotation>
1285    </xs:attribute>
1286    <xs:complexType name="resource-type">
1287      <xs:annotation>
1288        <xs:documentation xml:lang="en">Represents an entity which has identity.</xs:
                documentation>
1289      </xs:annotation>
1290      <xs:attribute ref="ims:identifier"/>
1291      <xs:attribute ref="ims:uri"/>
1292    </xs:complexType>
1293    <xs:complexType name="identifiable-resource-type">
1294      <xs:annotation>
1295        <xs:documentation xml:lang="en">Represents an entity which is identified by means
                of a unique identifier.</xs:documentation>
1296      </xs:annotation>
1297      <xs:complexContent>
1298        <xs:extension base="ims:resource-type"/>
1299      </xs:complexContent>
1300    </xs:complexType>
1301    <xs:complexType name="identifiable-timestamp-traceable-resource-type">
1302      <xs:annotation>
1303        <xs:documentation xml:lang="en">Represents an entity which is identified by means
                of a unique identifier and  whose creation, last modification, and last access
                events can be traced.</xs:documentation>
1304      </xs:annotation>
1305      <xs:complexContent>
1306        <xs:extension base="ims:resource-type">
1307          <xs:attribute ref="ims:created"/>
1308          <xs:attribute ref="ims:last-modified"/>
```

```
1309        </xs:extension>
1310      </xs:complexContent>
1311    </xs:complexType>
1312    <xs:complexType name="identifiable-timestamp-traceable-access-controllable-resource-
            type">
1313      <xs:annotation>
1314        <xs:documentation xml:lang="en">Represents an entity which is identified by means
              of a unique identifier and namespace,  whose creation, last modification, and
              last access events can be traced, and whose access permissions can be checked.<
              /xs:documentation>
1315      </xs:annotation>
1316      <xs:complexContent>
1317        <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
1318          <xs:sequence>
1319            <xs:element ref="ims:owner" minOccurs="0"/>
1320            <xs:element ref="ims:sharings" minOccurs="0"/>
1321          </xs:sequence>
1322          <xs:attribute ref="ims:scope"/>
1323        </xs:extension>
1324      </xs:complexContent>
1325    </xs:complexType>
1326    <xs:complexType name="namespace-identifiable-resource-type">
1327      <xs:annotation>
1328        <xs:documentation xml:lang="en">Represents an entity which is identified by means
              of a unique identifier and namespace.</xs:documentation>
1329      </xs:annotation>
1330      <xs:complexContent>
1331        <xs:extension base="ims:resource-type">
1332          <xs:attribute ref="ims:namespace"/>
1333        </xs:extension>
1334      </xs:complexContent>
1335    </xs:complexType>
1336    <xs:complexType name="namespace-identifiable-timestamp-traceable-resource-type">
1337      <xs:annotation>
1338        <xs:documentation xml:lang="en">Represents an entity which is identified by means
              of a unique identifier and namespace and  whose creation, last modification,
              and last access events can be traced.</xs:documentation>
1339      </xs:annotation>
1340      <xs:complexContent>
1341        <xs:extension base="ims:identifiable-timestamp-traceable-resource-type">
1342          <xs:attribute ref="ims:namespace"/>
1343        </xs:extension>
1344      </xs:complexContent>
1345    </xs:complexType>
1346    <xs:complexType name="namespace-identifiable-timestamp-traceable-access-controllable-
            resource-type">
1347      <xs:annotation>
1348        <xs:documentation xml:lang="en">Represents an entity which is identified by means
              of a unique identifier and namespace,  whose creation, last modification, and
              last access events can be traced, and whose access permissions can be checked.<
              /xs:documentation>
1349      </xs:annotation>
1350      <xs:complexContent>
1351        <xs:extension base="ims:identifiable-timestamp-traceable-access-controllable-
              resource-type">
1352          <xs:attribute ref="ims:namespace"/>
1353        </xs:extension>
1354      </xs:complexContent>
1355    </xs:complexType>
1356    <xs:complexType name="serially-identifiable-resource-type">
```

```
1357      <xs:annotation>
1358        <xs:documentation xml:lang="en">Represents an entity which is identified by means
              of a unique identifier and a serial identifier.</xs:documentation>
1359      </xs:annotation>
1360      <xs:complexContent>
1361        <xs:extension base="ims:resource-type">
1362          <xs:attribute ref="ims:serial-identifier"/>
1363        </xs:extension>
1364      </xs:complexContent>
1365    </xs:complexType>
1366    <xs:complexType name="ici-type">
1367      <xs:annotation>
1368        <xs:documentation xml:lang="en">Contains the representation of one or more
              resources.</xs:documentation>
1369      </xs:annotation>
1370      <xs:sequence>
1371        <xs:element ref="ims:file-metadata" minOccurs="0"/>
1372        <xs:element ref="ims:thing" minOccurs="0" maxOccurs="unbounded"/>
1373      </xs:sequence>
1374    </xs:complexType>
1375    <xs:simpleType name="countryT">
1376      <xs:annotation>
1377        <xs:documentation xml:lang="en">The country of a resource.</xs:documentation>
1378      </xs:annotation>
1379      <xs:restriction base="xs:token">
1380        <xs:pattern value="[A-Z]{2,3}">
1381          <xs:annotation>
1382            <xs:documentation xml:lang="en">ISO 3166-1:2066 alpha 2 and alpha 3 codes are
                  allowed.</xs:documentation>
1383          </xs:annotation>
1384        </xs:pattern>
1385      </xs:restriction>
1386    </xs:simpleType>
1387    <xs:simpleType name="languageT">
1388      <xs:annotation>
1389        <xs:documentation xml:lang="en">The language of a resource.</xs:documentation>
1390      </xs:annotation>
1391      <xs:restriction base="xs:language">
1392        <xs:pattern value="[a-z]{2,3}">
1393          <xs:annotation>
1394            <xs:documentation xml:lang="en">ISO 639-1:2002 and ISO 639-2:1992 alpha 2 and
                  alpha 3 codes are allowed.</xs:documentation>
1395          </xs:annotation>
1396        </xs:pattern>
1397      </xs:restriction>
1398    </xs:simpleType>
1399    <xs:simpleType name="media-typeT">
1400      <xs:annotation>
1401        <xs:documentation xml:lang="en">The media type of an object according to MIME (
              Multipurpose Internet Mail Extensions) standard.</xs:documentation>
1402      </xs:annotation>
1403      <xs:restriction base="xs:string">
1404        <xs:pattern value="(text|image|audio|video|application|message|multipart)/(\p{L
              }|\.|\-)+(;.*)?"/>
1405      </xs:restriction>
1406    </xs:simpleType>
1407  </xs:schema>
```

The following schema is a modification of the XCQL Schema[14], defined as XML representation of *Contextual Query Language (CQL)* queries [OASIS Search Web Services Technical Committee, 2012].

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- edited with XMLSpy v2011 rel. 2 sp1 (x64) (http://www.altova.com) by UniversitÃà
    degli Studi di Padova (UniversitÃà degli Studi di Padova) -->
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:xcql="http://docs.oasis-open
    .org/ns/search-ws/xcql" xmlns:ims="http://ims.dei.unipd.it/" targetNamespace="http://
    docs.oasis-open.org/ns/search-ws/xcql" elementFormDefault="qualified"
    attributeFormDefault="qualified">
  <xs:annotation>
    <xs:documentation xml:lang="en">This schema extends the XCQL schema to provide
        support for representing search results within an XML representation of a CQL
        query.</xs:documentation>
    <xs:documentation xml:lang="en">Created on 2010-10-02</xs:documentation>
    <xs:documentation xml:lang="en">Last modified on 2012-04-17</xs:documentation>
    <xs:documentation xml:lang="en">Authored by Nicola Ferro (ferro@dei.unipd.it)</xs:
        documentation>
    <xs:documentation xml:lang="en">Copyright (c) 2006-2012 - Information Management
        Systems (IMS) Research Group (http://ims.dei.unipd.it/) - Department of
        Information Engineering (http://www.dei.unipd.it/) - University of Padua (http://
        www.unipd.it/)</xs:documentation>
  </xs:annotation>
  <xs:import namespace="http://ims.dei.unipd.it/" schemaLocation="ici.3.10.xsd">
    <xs:annotation>
      <xs:documentation xml:lang="en">Imports the schema of the IMS Component Integrator
          (ICI) library to include search results in the query representation.</xs:
          documentation>
    </xs:annotation>
  </xs:import>
  <xs:redefine schemaLocation="http://docs.oasis-open.org/search-ws/searchRetrieve/v1.0/
      cs01/schemas/xcql.xsd">
    <xs:complexType name="searchClauseDefinition">
      <xs:complexContent>
        <xs:extension base="xcql:searchClauseDefinition">
          <xs:sequence minOccurs="0">
            <xs:element ref="ims:result"/>
          </xs:sequence>
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>
    <xs:complexType name="tripleDefinition">
      <xs:complexContent>
        <xs:extension base="xcql:tripleDefinition">
          <xs:sequence minOccurs="0">
            <xs:element ref="ims:result"/>
          </xs:sequence>
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>
  </xs:redefine>
</xs:schema>
```

[14] http://www.loc.gov/standards/sru/oasis/schemas/xcql.xsd

B RDF Schema

This appendix reports the RDF schemas of the different managed resources[15].

```
@prefix ims:     <http://ims.dei.unipd.it/data/rdf/> .
@prefix dcterms:   <http://purl.org/dc/terms/> .
@prefix foaf:    <http://xmlns.com/foaf/0.1/> .
@prefix owl:     <http://www.w3.org/2002/07/owl#> .
@prefix rdf:     <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs:    <http://www.w3.org/2000/01/rdf-schema#> .
@prefix xsd:     <http://www.w3.org/2001/XMLSchema#> .
@prefix swrc:    <http://swrc.ontoware.org/ontology#>.
@prefix aktors:    <http://www.aktors.org/ontology/portal#>.
@prefix bibo:    <http://purl.org/ontology/bibo/>.
@prefix gn:      <http://www.geonames.org/ontology#>.
@prefix vann:    <http://purl.org/vocab/vann/>.
@prefix vcard:     <http://www.w3.org/2006/vcard/ns#>.
@prefix prov:    <http://www.w3.org/ns/prov#>

### ICI

# ICI Classes

ims:Resource
  rdf:type     rdfs:Class;
  rdfs:label     "Resource";
  rdfs:comment   "A generic IMS resource".

ims:Namespace-Identifiable-Resource
  rdf:type     rdfs:Class;
  rdfs:label     "Namespace Identifiable Resource";
  rdfs:comment   "A generic IMS resource identified by the pair (UUID,Namespace)";
  rdfs:subClassOf   ims:Resource.

ims:Timestamp-Traceable-Resource
  rdf:type     rdfs:Class;
  rdfs:label     "Timestamp Traceable Resource";
  rdfs:comment   "A generic IMS resource identified by an UUID which has timestamps
      associated";
  rdfs:subClassOf   ims:Resource.

ims:Namespace-Identifiable-Timestamp-Traceable-Resource
  rdf:type     rdfs:Class;
  rdfs:label     "Timestamp Traceable Namespace Identifiable Resource";
  rdfs:comment   "A generic IMS resource identified by the pair (UUID,Namespace) which has
       timestamps associated";
  rdfs:subClassOf   ims:Namespace-Identifiable-Resource.

ims:Timestamp-Traceable-Access-Controllable-Resource
  rdf:type     rdfs:Class;
  rdfs:label     "Timestamp Traceable Namespace Identifiable Resource";
  rdfs:comment   "A generic IMS resource identified by an UUID  which has timestamps
      associated and an owner";
  rdfs:subClassOf   ims:TimestampTraceableResource.

ims:Namespace-Identifiable-Timestamp-Traceable-Access-Controllable-Resource
  rdf:type     rdfs:Class;
  rdfs:label     "Timestamp Traceable Namespace Identifiable Resource";
```

[15] http://ims.dei.unipd.it/data/rdf/ici.3.10.ttl

```
52   rdfs:comment  "A generic IMS resource identified by the pair (UUID,Namespace) which has
         timestamps associated and an owner";
53   rdfs:subClassOf  ims:Namespace-Identifiable-Timestamp-Traceable-Resource.
54
55 # ICI Properties
56
57 ims:identifier
58   rdf:type    rdf:Property;
59   rdfs:domain    ims:Resource;
60   rdfs:range    xsd:string.
61
62 ims:namespace
63   rdf:type    rdf:Property;
64   rdfs:domain    ims:Namespace-Identifiable-Resource;
65   rdfs:range    xsd:string.
66
67 ims:file_metadata
68   rdf:type    rdf:Property;
69   rdfs:domain    ims:Resource;
70   rdfs:range    xsd:Resource;
71   rdfs:comment  "The property defining the relationship between a resource and a blank
       node (pseudo-resource), containing the metadata information of this resource".
72
73 ims:owner
74   rdf:type    rdf:Property;
75   rdfs:domain    ims:Resource;
76   rdfs:range    ims:User;
77   rdfs:comment  "The owner of the resource".
78
79
80 # datatype definitions
81 :userGender
82    a       owl:DatatypeProperty ;
83    rdfs:label "The gender of the user"^^xsd:string ;
84    rdfs:range
85           [ a       rdfs:Datatype ;
86             owl:oneOf ("MALE"^^xsd:string "FEMALE"^^xsd:string)
87           ] .
88
89 :provenancePredicate
90    a       owl:DatatypeProperty ;
91    rdfs:label "The action carried out in the event."^^xsd:string ;
92    rdfs:range
93           [ a       rdfs:Datatype ;
94             owl:oneOf ("CREATED"^^xsd:token "READ"^^xsd:token "UPDATED"^^xsd:token "
                   DELETED"^^xsd:token "ACCESSED"^^xsd:token)
95           ] .
96
97 # Classes
98
99 ims:Namespace
100   rdf:type    rdfs:Class;
101   rdfs:label    "Namespace";
102   rdfs:comment  "the class of representing a Namespace";
103   rdfs:subClassOf ims:Timestamp-Traceable-Resource .
104
105 ims:User
106   rdf:type    rdfs:Class;
107   rdfs:label    "User";
108   rdfs:comment  "Represents a user.";
```

```
109   rdfs:subClassOf ims:Namespace-Identifiable-Timestamp-Traceable-Resource.
110
111 ims:Role
112   rdf:type     rdfs:Class;
113   rdfs:label     "Role";
114   rdfs:comment   "Represents a role of users.";
115   rdfs:subClassOf ims:Namespace-Identifiable-Timestamp-Traceable-Resource.
116
117 ims:Group
118   rdf:type     rdfs:Class;
119   rdfs:label     "Group";
120   rdfs:comment   "Represents a group of users.";
121   rdfs:subClassOf ims:Namespace-Identifiable-Timestamp-Traceable-Resource.
122
123 ims:Concept
124   rdf:type     rdfs:Class;
125   rdfs:label     "Concept";
126   rdfs:comment   "Represents a concept viewed as an idea or notion; a unit of thought";
127   rdfs:subClassOf ims:Namespace-Identifiable-Timestamp-Traceable-Resource.
128
129 ims:Metadata-Set
130   rdf:type     rdfs:Class;
131   rdfs:label     "Metadata-Set";
132   rdfs:comment   "Represents a set of metadata resources. Metadata sets can be nested.";
133   rdfs:subClassOf ims:Namespace-Identifiable-Timestamp-Traceable-Resource.
134
135 ims:Metadata
136   rdf:type     rdfs:Class;
137   rdfs:label     "Metadata";
138   rdfs:comment   "Represents a metadata.";
139   rdfs:subClassOf ims:Namespace-Identifiable-Timestamp-Traceable-Resource.
140
141 ims:Contribution
142   rdf:type     rdfs:Class;
143   rdfs:label     "Contribution";
144   rdfs:comment   "Represents a paper (e.g. a conference paper, a working note, a technical
          report, a journal paper).";
145   rdfs:subClassOf ims:TimestampTraceableResource.
146
147 ims:Binary-Object
148   rdf:type     rdfs:Class;
149   rdfs:label     "Binary Object";
150   rdfs:comment   "Represents a binary object.";
151   rdfs:subClassOf ims:Namespace-Identifiable-Timestamp-Traceable-Resource.
152
153 ims:Digital-Object
154   rdf:type     rdfs:Class;
155   rdfs:label     "Digital Object";
156   rdfs:comment   "Represents a digital object.";
157   rdfs:subClassOf ims:Namespace-Identifiable-Timestamp-Traceable-Resource.
158
159 ims:Measure
160   rdf:type     rdfs:Class;
161   rdfs:label     "Measure";
162   rdfs:comment   "The numerical quantity value of a  measurement result.";
163   rdfs:subClassOf ims:Resource.
164
165 ims:Metric
166   rdf:type     rdfs:Class;
167   rdfs:label     "Metric";
```

```
168   rdfs:comment  "The metric for a measure, i.e. the measurement function (JCGM 200:2008
          VIM 2.49).";
169   rdfs:subClassOf ims:Concept.
170
171 ims:Bibliometrics
172   rdf:type    rdfs:Class;
173   rdfs:label    "Bibliometrics";
174   rdfs:comment  "Represents the bibliometrics for a given resource, e.g. a Contribution";
175   rdfs:subClassOf ims:Measure.
176
177 ims:Parameter
178   rdf:type    rdfs:Class;
179   rdfs:label    "Parameter";
180   rdfs:comment  "A parameter of a resource.";
181   rdfs:subClassOf ims:Resource.
182
183 ims:Statistic
184   rdf:type    rdfs:Class;
185   rdfs:label    "Statistic";
186   rdfs:comment  "The numerical data relating to an aggregate of individuals.";
187   rdfs:subClassOf ims:Resource.
188
189 ims:Provenance-Event
190   rdf:type    rdfs:Class;
191   rdfs:label    "Provenance Event";
192   rdfs:comment  "An event describing a fact about the provenance of a resource.";
193   rdfs:subClassOf ims:Resource.
194
195 ims:Link
196   rdf:type    rdfs:Class;
197   rdfs:label    "Link";
198   rdfs:comment  "A link among two resources.";
199   rdfs:subClassOf ims:Resource.
200
201 # Properties
202
203 ims:is-namespace-of
204   rdf:type    rdf:Property;
205   rdfs:domain   ims:Namespace;
206   rdfs:range    ims:Resource.
207
208 ims:has-namespace
209   rdf:type    rdf:Property;
210   rdfs:domain   ims:Namespace-Identifiable-Resource;
211   rdfs:range    ims:Namespace.
212
213 ims:is-shared-by
214   rdf:type    rdf:Property;
215   rdfs:comment  "The group sharing this resource.";
216   rdfs:domain   ims:Resource;
217   rdfs:range    ims:Group.
218
219 ims:has-metadata
220   rdf:type    rdf:Property;
221   rdfs:comment  "The resource is described of a resource.";
222   rdfs:domain   ims:Resource;
223   rdfs:range    ims:Metadata.
224
225 ims:is-binary-object-of
226   rdf:type    rdf:Property;
```

```
227   rdfs:comment   "The relation between a binary object and a resource.";
228   rdfs:domain    ims:Binary-Object;
229   rdfs:range     ims:Resource.
230
231 ims:has-binary-object
232   rdf:type     rdf:Property;
233   rdfs:comment   "The binary object of this resource.";
234   rdfs:domain    ims:Resource;
235   rdfs:range     ims:Binary-Object.
236
237 ims:is-digital-object-of
238   rdf:type     rdf:Property;
239   rdfs:comment   "The relation between a digital object and a resource.";
240   rdfs:domain    ims:Digital-Object;
241   rdfs:range     ims:Resource.
242
243 ims:has-digital-object
244   rdf:type     rdf:Property;
245   rdfs:comment   "The digital object of this resource.";
246   rdfs:domain    ims:Resource;
247   rdfs:range     ims:Digital-Object.
248
249 ims:has-measure
250   rdf:type     rdf:Property;
251   rdfs:comment   "It relates a generic Resource to a Measure.";
252   rdfs:domain    ims:Resource;
253   rdfs:range     ims:Measure.
254
255 ims:has-parameter
256   rdf:type     rdf:Property;
257   rdfs:comment   "It relates a generic Resource to a Parameter.";
258   rdfs:domain    ims:Resource;
259   rdfs:range     ims:Parameter.
260
261 ims:has-statistic
262   rdf:type     rdf:Property;
263   rdfs:comment   "It relates a generic Resource to a Statistic.";
264   rdfs:domain    ims:Resource;
265   rdfs:range     ims:Statistic.
266
267
268 # User Properties
269
270 ims:has-group
271   rdf:type     rdf:Property;
272   rdfs:domain    ims:User;
273   rdfs:range     ims:Group.
274
275 ims:has-role
276   rdf:type     rdf:Property;
277   rdfs:domain    ims:User;
278   rdfs:range     ims:Role.
279
280 # Role Properties
281
282 ims:is-role-of
283   rdf:type     rdf:Property;
284   rdfs:domain    ims:Role;
285   rdfs:range     ims:User.
286
```

```
# Group Properties

ims:is-group-of
  rdf:type     rdf:Property;
  rdfs:domain    ims:Group;
  rdfs:range     ims:User.

# Metadata-Set Properties

ims:subset
  rdf:type     rdf:Property;
  rdfs:domain    ims:Metadata-Set;
  rdfs:range     ims:Metadata-Set;
  rdfs:comment   "The sub-sets of this metadata set.".

ims:superset
  rdf:type     rdf:Property;
  rdfs:domain    ims:Metadata-Set;
  rdfs:range     ims:Metadata-Set;
  rdfs:comment   "The super-sets of this metadata set.".

ims:has-metadata
  rdf:type     rdf:Property;
  rdfs:domain    ims:Metadata-Set;
  rdfs:range     ims:Metadata;
  rdfs:comment   "The metadata contained in this metadata set.".

# Metadata Properties

ims:belongs-to
  rdf:type     rdf:Property;
  rdfs:domain    ims:Metadata;
  rdfs:range     ims:Metadata-Set;
  rdfs:comment   "The metadata sets containing this metadata.".

ims:is-metadata-of
  rdf:type     rdf:Property;
  rdfs:comment   "The metadata describing a resource.";
  rdfs:domain    ims:Metadata;
  rdfs:range     ims:Resource.

# Contribution Properties

swrc:has-author
  rdf:type     rdf:Property;
  rdfs:comment   "A user who authors the contribution";
  rdfs:domain    ims:Contribution;
  rdfs:range     ims:User.

ims:publisher
  rdf:type     rdf:Property;
  rdfs:comment   "A user who publishes the contribution";
  rdfs:domain    ims:Contribution;
  rdfs:range     ims:User.

ims:contribution-type
  rdf:type     rdf:Property;
  rdfs:comment   "The type of a contribution";
  rdfs:domain    ims:Contribution;
  rdfs:range     ims:Concept.
```

```
347
348 ims:parameter-type
349   rdf:type     rdf:Property;
350   rdfs:comment   "The type of a parameter";
351   rdfs:domain    ims:Parameter;
352   rdfs:range     ims:Concept.
353
354 # Metric properties
355
356 ims:is-metric-for
357   rdf:type     rdf:Property;
358   rdfs:comment   "It relates a Metric to a Measure.";
359   rdfs:domain    ims:Metric;
360   rdfs:range     ims:Measure.
361
362 # Measure properties
363
364 ims:is-measure-of
365   rdf:type     rdf:Property;
366   rdfs:comment   "It relates a Measure to a generic resource.";
367   rdfs:domain    ims:Measure;
368   rdfs:range     ims:Resource.
369
370 ims:has-metric
371   rdf:type     rdf:Property;
372   rdfs:comment   "It relates a Measure to a Metric.";
373   rdfs:domain    ims:Measure;
374   rdfs:range     ims:Metric.
375
376 # Measure properties
377
378 ims:is-parameter-of
379   rdf:type     rdf:Property;
380   rdfs:comment   "It relates a Parameter to a generic resource.";
381   rdfs:domain    ims:Parameter;
382   rdfs:range     ims:Resource.
383
384 ims:parameter-type
385   rdf:type     rdf:Property;
386   rdfs:comment   "It relates a Parameter to a Concept (type).";
387   rdfs:domain    ims:Parameter;
388   rdfs:range     ims:Concept.
389
390 # Statistic properties
391
392 ims:is-statistic-of
393   rdf:type     rdf:Property;
394   rdfs:comment   "It relates a Statistic to a Resource.";
395   rdfs:domain    ims:Statistic;
396   rdfs:range     ims:Resource.
397
398 ims:has-descriptive-statistic
399   rdf:type     rdf:Property;
400   rdfs:comment   "The descriptive statistic used for computing the aggregated value of a
        statistic.";
401   rdfs:domain    ims:Statistic;
402   rdfs:range     ims:Concept.
403
404 ims:has-metric
405   rdf:type     rdf:Property;
```

```
406   rdfs:comment   "It relates a Statistic to a Metric.";
407   rdfs:domain    ims:Statistic;
408   rdfs:range     ims:Metric.
409
410 ims:has-measure
411   rdf:type     rdf:Property;
412   rdfs:comment   "It relates a Statistic to a Measure.";
413   rdfs:domain    ims:Statistic;
414   rdfs:range     ims:Measure.
415
416 # Provenance-Event Properties
417
418 ims:who
419   rdf:type     rdf:Property;
420   rdfs:comment   "The user who caused the event.";
421   rdfs:domain    ims:Provenance-Event;
422   rdfs:range     ims:User;
423   owl:sameAs     prov:wasAttributedTo;
424   owl:sameAs     prov:wasAssociatedWith:
425   owl:sameAs     prov:actedOnBehalfOf.
426
427 ims:what
428   rdf:type     rdf:Property;
429   rdfs:comment   "The resource originated by the event.";
430   rdfs:domain    ims:Provenance-Event;
431   rdfs:range     ims:Resource;
432   owl:sameAs     prov:Entity.
433
434 # Link Properties
435
436 ims:has-source
437   rdf:type     rdf:Property;
438   rdfs:comment   "It relates to the resource which is acting as source of a link.";
439   rdfs:domain    ims:Link;
440   rdfs:range     ims:Resource.
441
442 ims:has-target
443   rdf:type     rdf:Property;
444   rdfs:comment   "It relates to the resource which is acting as target of a link.";
445   rdfs:domain    ims:Link;
446   rdfs:range     ims:Resource.
447
448 ims:relation
449   rdf:type     rdf:Property;
450   rdfs:comment   "The relation among the source and target resources comprising the link
        .";
451   rdfs:domain    ims:Link;
452   rdfs:range     ims:Concept.
453
454 # Resource Datatype Properties
455
456 ims:identifier
457   rdf:type     owl:DatatypeProperty;
458   rdfs:comment   "The unique identifier of a resource";
459   rdfs:domain    ims:Resource;
460   rdfs:range     xsd:string.
461
462 ims:created
463   rdf:type     owl:DatatypeProperty;
464   rdfs:comment   "The timestamp of the Resource creation";
```

```
465   rdfs:domain    ims:Resource;
466   rdfs:range     xsd:dateTime.
467
468 ims:last-modified
469   rdf:type     owl:DatatypeProperty;
470   rdfs:comment   "The timestamp of the Resource modification";
471   rdfs:domain    ims:Resource;
472   rdfs:range     xsd:dateTime.
473
474 ims:description
475   rdf:type     owl:DatatypeProperty;
476   rdfs:comment   "The description of the Resource";
477   rdfs:domain    ims:Resource;
478   rdfs:range     xsd:string.
479
480 ims:name
481   rdf:type     owl:DatatypeProperty;
482   rdfs:comment   "The name of the Resource";
483   rdfs:domain    ims:Resource;
484   rdfs:range     xsd:string.
485
486 ims:content
487   rdf:type     owl:DatatypeProperty;
488   rdfs:comment   "The binary content of the Resource";
489   rdfs:domain    ims:Resource;
490   rdfs:range     xsd:string.
491
492 ims:content-transfer-encoding
493   rdf:type     owl:DatatypeProperty;
494   rdfs:comment   "It specifies what sort of encoding transformation the body was subjected
          to and hence what decoding operation must be used to restore it to its original
         form.";
495   rdfs:domain    ims:Resource;
496   rdfs:range     xsd:token.
497
498 ims:language
499   rdf:type     owl:DatatypeProperty;
500   rdfs:comment   "The language of the user.";
501   rdfs:domain    ims:Resource;
502   rdfs:range     xsd:string;
503   owl:sameAs     xsd:lang.
504
505 ims:country
506   rdf:type     owl:DatatypeProperty;
507   rdfs:comment   "The country of the user.";
508   rdfs:domain    ims:Resource;
509   rdfs:range     xsd:string;
510   owl:sameAs     gn:countryCode.
511
512 # Namespace Datatype Properties
513
514 ims:prefix
515   rdf:type     owl:DatatypeProperty;
516   rdfs:comment   "The prefix of the namespace";
517   rdfs:domain    ims:Namespace;
518   rdfs:range     xsd:string;
519   owl:sameAs     vann:preferredNamespaceURI.
520
521
522 # User Datatype Properties
```

```
523
524 ims:password
525   rdf:type     owl:DatatypeProperty;
526   rdfs:comment  "The password of the user.";
527   rdfs:domain   ims:User;
528   rdfs:range    xsd:string.
529
530 ims:first-name
531   rdf:type     owl:DatatypeProperty;
532   rdfs:comment  "The first name of the user.";
533   rdfs:domain   ims:User;
534   rdfs:range    xsd:string;
535   owl:sameAs    foaf:givenName.
536
537
538 ims:last-name
539   rdf:type     owl:DatatypeProperty;
540   rdfs:comment  "The last/family name of the user.";
541   rdfs:domain   ims:User;
542   rdfs:range    xsd:string;
543   owl:sameAs    foaf:familyName.
544
545
546 ims:affiliation
547   rdf:type     owl:DatatypeProperty;
548   rdfs:comment  "The affiliation of the user.";
549   rdfs:domain   ims:User;
550   rdfs:range    xsd:string;
551   owl:sameAs    foaf:Organization.
552
553 ims:e-mail
554   rdf:type     owl:DatatypeProperty;
555   rdfs:comment  "The e-mail of the user.";
556   rdfs:domain   ims:User;
557   rdfs:range    xsd:string;
558   owl:sameAs    foaf:mbox.
559
560 ims:birth-date
561   rdf:type     owl:DatatypeProperty;
562   rdfs:comment  "The birth date of the user.";
563   rdfs:domain   ims:User;
564   rdfs:range    xsd:date;
565   owl:sameAs    foaf:birthday.
566
567 ims:gender
568   rdf:type     owl:DatatypeProperty;
569   rdfs:comment  "The affiliation of the user.";
570   rdfs:domain   ims:User;
571   rdfs:range    :userGender;
572   owl:sameAs    foaf:gender.
573
574 ims:address
575   rdf:type     owl:DatatypeProperty;
576   rdfs:comment  "The address of the user.";
577   rdfs:domain   ims:User;
578   rdfs:range    xsd:string;
579   owl:sameAs    vcard:streetAddress.
580
581 ims:city
582   rdf:type     owl:DatatypeProperty;
```

```
583   rdfs:comment   "The city of the user.";
584   rdfs:domain    ims:User;
585   rdfs:range     xsd:string;
586   owl:sameAs     vcard:locality.
587
588 ims:state
589   rdf:type     owl:DatatypeProperty;
590   rdfs:comment   "The state of the user.";
591   rdfs:domain    ims:User;
592   rdfs:range     xsd:string;
593   owl:sameAs     vcard:region.
594
595 ims:zip
596   rdf:type     owl:DatatypeProperty;
597   rdfs:comment   "The zip code of the user.";
598   rdfs:domain    ims:User;
599   rdfs:range     xsd:string;
600   owl:sameAs     vcard:postalCode.
601
602 ims:phone
603   rdf:type     owl:DatatypeProperty;
604   rdfs:comment   "The phone of the user.";
605   rdfs:domain    ims:User;
606   rdfs:range     xsd:string;
607   owl:sameAs     vcard:telephone.
608
609 ims:facsimile
610   rdf:type     owl:DatatypeProperty;
611   rdfs:comment   "The facsimile number of the user.";
612   rdfs:domain    ims:User;
613   rdfs:range     xsd:string;
614   owl:sameAs     vcard:telephone.
615
616 ims:mobile
617   rdf:type     owl:DatatypeProperty;
618   rdfs:comment   "The mobile of the user.";
619   rdfs:domain    ims:User;
620   rdfs:range     xsd:string;
621   owl:sameAs     vcard:cell.
622
623 ims:voip-caller-id
624   rdf:type     owl:DatatypeProperty;
625   rdfs:comment   "The voip-caller-id of the user.";
626   rdfs:range     xsd:token.
627
628 ims:homepage
629   rdf:type     owl:DatatypeProperty;
630   rdfs:comment   "The homepage of the user.";
631   rdfs:domain    ims:User;
632   rdfs:range     xsd:anyURI.
633
634 # Contribution Datatype Properties
635
636 ims:affiliation
637   rdf:type     owl:DatatypeProperty;
638   rdfs:comment   "An affiliation of an author of the contribution.";
639   rdfs:domain    ims:Contribution;
640   rdfs:range     xsd:string.;
641   owl:sameAs     foaf:Organization.
642
```

```
643 ims:title
644   rdf:type     owl:DatatypeProperty;
645   rdfs:comment  "The title of the contribution.";
646   rdfs:domain    ims:Contribution;
647   rdfs:range     xsd:string;
648   owl:sameAs     dc:title.
649
650 ims:pages
651   rdf:type     owl:DatatypeProperty;
652   rdfs:comment  "Additional information about the contribution.";
653   rdfs:domain    ims:Contribution;
654   rdfs:range     xsd:string.
655
656 ims:additional-information
657   rdf:type     owl:DatatypeProperty;
658   rdfs:comment  "Additional information about the contribution.";
659   rdfs:domain    ims:Contribution;
660   rdfs:range     xsd:string;
661   owl:sameAs     rdfs:comment.
662
663 ims:year
664   rdf:type     owl:DatatypeProperty;
665   rdfs:comment  "The year of the contribution.";
666   rdfs:domain    ims:Contribution;
667   rdfs:range     xsd:gYear.
668
669 ims:link
670   rdf:type     owl:DatatypeProperty;
671   rdfs:comment  "A link to the actual contribution outside the system.";
672   rdfs:domain    ims:Contribution;
673   rdfs:range     xsd:string;
674   owl:sameAs     dc:URI.
675
676 ims:copyrighted
677   rdf:type     owl:DatatypeProperty;
678   rdfs:comment  "Indicates whether the content of the contribution is copyrighted.";
679   rdfs:domain    ims:Contribution;
680   rdfs:range     xsd:boolean.
681
682 # Provenance-Event Data Type
683
684 ims:serial-identifier
685   rdf:type     owl:DatatypeProperty;
686   rdfs:comment  "the serial identifier of this event";
687   rdfs:domain    ims:Provenance-Event;
688   rdfs:range     xsd:string.
689
690 ims:predicate
691   rdf:type     owl:DatatypeProperty;
692   rdfs:comment  "The action.";
693   rdfs:domain    ims:Provenance-Event;
694   rdfs:range     :provenancePredicate.
695
696 ims:when
697   rdf:type     owl:DatatypeProperty;
698   rdfs:comment  "The timestamp at which the event occurred.";
699   rdfs:domain    ims:Provenance-Event;
700   rdfs:range     xsd:dateTime.
701
702 ims:why
```

```
703   rdf:type     owl:DatatypeProperty;
704   rdfs:comment  "The motivation that originated the event.";
705   rdfs:domain    ims:Provenance-Event;
706   rdfs:range     xsd:token.
707
708 # Link DataType properties
709
710 ims:score
711   rdf:type     owl:DatatypeProperty;
712   rdfs:comment  "The score of a link from source to target.";
713   rdfs:domain    ims:Link;
714   rdfs:range     xsd:double.
715
716 ims:backward-score
717   rdf:type     owl:DatatypeProperty;
718   rdfs:comment  "The score of a link from target to source.";
719   rdfs:domain    ims:Link;
720   rdfs:range     xsd:double.
721
722 ims:frequency
723   rdf:type     owl:DatatypeProperty;
724   rdfs:comment  "The frequency of a link between resources.";
725   rdfs:domain    ims:Link;
726   rdfs:range     xsd:positiveInteger.
727
728 # Bibliographic taxonomy
729
730 # Bibliographic properties
731
732 ims:is-a
733   rdf:type         rdf:Property;
734   rdfs:comment       "The is a relationship relating two ims:Concept.";
735   rdfs:domain        ims:Concept;
736   rdfs:range         ims:Concept.
```

C RESTful WebService

As discussed in the previous section, the DIRECT is accessible to client applications by means of a RESTful Web Service [Fielding and Taylor, 2002; Richardson and Ruby, 2007].

The DIRECT RESTful Web Service offers several API build around the following main resources:

- **namespace**: manages all the operations related to namespaces and their provenance;
- **role**: manages all the operations related to roles of users and their provenance;
- **group**: manages all the operations related to groups of users and their provenance;
- **user**: manages all the operations related to users and their provenance;
- **concept**: manages all the operations related to concepts and their provenance;
- **log event**: manages all the operations related to log events;
- **metadata**: the metadata managed by the system;
- **metadata set**: sets grouping metadata according to various criteria;
- **application**: identifies a running software application which can be evaluated by an evaluation activity;
- **component**: represents a building block of a running system;
- **configuration**: identifies the configuration of a component, a system or an application under evaluation;
- **contribution**: refers to a paper (e.g., a conference paper, a working note, a technical report, a journal paper);
- **corpus**: represents a set of informative units, which allows us to perform a series of investigations in a research area;
- **estimate**: represents the value of a metric (which is represented by means of a concept) calculated on some experiment handled by the infrastructure;
- **evaluation activity**: represents any type of activity aiming at the evaluation of applications, systems, or methodologies for information access;
- **campaign**: represents a traditional evaluation activity divided into tracks and tasks;
- **education**: represents an evaluation activity carried out for educational purposes;
- **trial**: represents an evaluation activity that may be actively run by a research group, a person or a corporate body for their own interest;

- **experimental Collection**: represents a logical entity that allows us to set up a traditional IR evaluation environment composed by a corpus, a set of topics and a set of relevance judgments;
- **experiment**: represents a part of the data produced by a system under evaluation;
- **experiment item**: represents an item of an experiment, that is a retrieved information unit for a given topic;
- **ground truth**: represents a container of assessments obtained through the pooling technique;
- **ground truth item**: represents a single item of a ground truth.;
- **guerrilla**: represents an innovative step in the experimental evaluation panorama. The main purpose is to perform application-centric evaluation;
- **information unit**: represents the object on which the evaluated system acts; e.g., the object which is retrieved by the system under evaluation;
- **measure**: represents the value of a metric calculated on some experiment handled by the infrastructure;
- **pool**: represents a container of assessments obtained through the pooling technique;
- **run**: represents a part of the data produced by a system under evaluation;
- **run item**: represents an item of an experiment of type run, that is a retrieved information unit for a given topic;
- **snapshot**: stores the snapshot of a visualization;
- **statistical test**: represents mechanism for making quantitative decisions about a process or processes;
- **system**: represents a running software engine, which is under evaluation;
- **task**: represents a piece of work that is undertaken within an evaluation activity and aims at testing a specific (research) hypothesis;
- **topic group**: represents a set of topics, which are grouped together because they are used to address a research task carried out in an evaluation activity;
- **topic**: represents the materialization of an information need;
- **track**: represents a group of tasks carried within a campaign;
- **visualization**: refers to the information used by the infrastructure to store and recover whichever visualization of the data that the users do;

- **search**: manages the search of resources according to queries which comply with the DIRECT CQL Context Set, described later on in Section D;
- **list**: manages the search and listing of resources according to queries which comply with the DIRECT CQL Context Set, described later on in Section D.

The API for accessing the various resources are described in detail in the following. Each section presents: the *Uniform Resource Identifier (URI)* [Berners-Lee et al., 2005] to be used to refer to the desired resource; the method to be used to access the resource (GET, POST, PUT, DELETE, HEAD); the request parameters; the response HTTP status code [Fielding et al., 1999] and body for the different possible cases.

As discussed in Section **??** about the Access Control Infrastructure, some resources are publicly available, some others require authentication before being accessed. The DIRECT RESTFul Web Service makes use of the basic HTTP authentication scheme [Fielding et al., 1999; Franks et al., 1999].

If you try to access a resource that needs authentication, you will receive, as response, an authentication challenge with HTTP status code `401 - Unauthorized` asking you for a user name and password.

Remember that DIRECT uniquely identifies users by means of their unique identifier and namespace: such information must be provided in the user name field of the HTTP Basic Authentication Scheme. To separate between the unique user identifier and the namespace, you should use the ; (semicolon) symbol.

Therefore, the user name must be provided with the following syntax:

```
user-identifier;namespace
```

Moreover, since the namespace is usually identified by means of an URI which may contain characters that needs to be escaped, the proper URI encoding has to be performed according to [Berners-Lee et al., 2005]. Consider the following example: for the user `direct` in the namespace `http://direct.dei.unipd.it/`, you should use as user name field for the HTTP Basic Authentication Scheme:

```
direct;http%3A%2F%2Fdirect%2Edei%2Eunipd%2Eit%2F
```

Finally, note that all the URI presented in the following sections are relative to a base URI which depends on the installation of the DIRECT system. Therefore, these URI needs to be appended to the base URI.

All the resources supports two input and output formats: XML [W3C, 2006, 2008] and *JavaScript Object Notation (JSON)* [Crockford, 2006]. This can be set by using the standard HTTP headers: `Content-Type` for specifying the input format and `Accept` for the desired output format followed by either `application/xml` or `application/json` MIME media types.

The remainder of this section is organized as follows: Section **??** describes the optimistic locking mechanism adopted by the DIRECT annotation service; Section C.1 explains the error messages returned by the systems and provides an example of the representation in XML and JSON; Sections

from C.2 to C.41 describe the different resources managed by the DIRECT annotation service and for each resource provide the API for accessing it as well as an example of its representation in XML and JSON.

C.1 Error Messages

Table 3 summarizes the error conditions reported by the system. These error conditions are common across all the resources managed by the system.

For each error condition, the table contains:

- the HTTP status code;
- the Error Code;
- a short description.

For each error condition, the response body contains detailed diagnostic messaged further explaining it.

HTTP Status Code	Error Code	Description
400 – Bad Request	C2002 – INVALID_PARAMETER	An invalid parameter (null, empty, missing, ...) has been provided
400 – Bad Request	C2003 – MALFORMED_REPRESENTATION	A malformed representation of a resource (not well-formed, not valid, ...) has been provided
401 – Unauthorized	C3000 – AUTHENTICATION_REQUIRED	An attempt to access a resource without the required authentication has been performed
403 – Forbidden	C3001 – INSUFFICIENT_ACCESS_RIGHTS	An attempt to access a resource with insufficient access rights has been performed
404 – Not Found	C4003 – NOT_FOUND_RESOURCE	An attempt to refer to an inexistent resource has been performed
405 – Method Not Allowed	C1001 – UNSUPPORTED_OPERATION	An unsupported operation has been requested
406 – Not Acceptable	C2000 – UNSUPPORTED_OUTPUT_FORMAT	An unsupported output format has been requested
409 – Conflict	C4002 – DUPLICATED_RESOURCE	An attempt to create an already existing resource has been performed

HTTP Status Code	Error Code	Description
409 – Conflict	C4004 – NOT_MODIFIABLE_RESOURCE	An attempt to update or delete a resource that cannot be modified has been performed
409 – Conflict	C4005 – CONCURRENT_RESOURCE_MODIFICATION	An attempt to update a resource that has been concurrently updated has been performed
415 – Unsupported Media Type	C2001 – UNSUPPORTED_INPUT_FORMAT	An unsupported input format has been provided
500 – Internal Server Error	C1000 – INTERNAL_ERROR	An error internal to the system has occurred

Table 3: Error messages and status codes.

C.1.1 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:error ims:identifier="7d50ee98-9bb4-4952-a6f4-141e4fad8491" ims:code="0C4001"
    ims:type="INVALID_RESOURCE" ims:created="2012-08-01T19:09:30.852+02:00">
    <ims:details ims:language="eng">
      invalid resource
    </ims:details>
    <ims:diagnostic>
      java.lang.IllegalArgumentException: Invalid resource.
        at it.unipd.dei.ims.ici.resource.representation.ErrorRepresentation.
          setUpBeforeClass(ErrorRepresentation.java:45)
        at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
        at sun.reflect.NativeMethodAccessorImpl.
          invoke(NativeMethodAccessorImpl.java:39)
        at sun.reflect.DelegatingMethodAccessorImpl.
          invoke(DelegatingMethodAccessorImpl.java:25)
        at java.lang.reflect.Method.invoke(Method.java:597)
        at org.junit.runners.model.FrameworkMethod$1.
          runReflectiveCall(FrameworkMethod.java:45)
        at org.junit.internal.runners.model.ReflectiveCallable.
          run(ReflectiveCallable.java:15)
        at org.junit.runners.model.FrameworkMethod.
          invokeExplosively(FrameworkMethod.java:42)
        at org.junit.internal.runners.statements.RunBefores.
          evaluate(RunBefores.java:27)
        at org.junit.runners.ParentRunner.run(ParentRunner.java:300)
        at org.eclipse.jdt.internal.junit4.runner.JUnit4TestReference.
          run(JUnit4TestReference.java:50)
        at org.eclipse.jdt.internal.junit.runner.TestExecution.
          run(TestExecution.java:38)
        at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
          runTests(RemoteTestRunner.java:467)
        at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
          runTests(RemoteTestRunner.java:683)
```

```
        at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
          run(RemoteTestRunner.java:390)
        at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
          main(RemoteTestRunner.java:197)
    </ims:diagnostic>
  </ims:error>
</ims:direct>
```

C.1.2 JSON Representation

```
{
   "direct":{
      "error":{
         "identifier":"7d50ee98-9bb4-4952-a6f4-141e4fad8491",
         "code":"C4001",
         "type":"INVALID_RESOURCE",
         "created":"2012-08-01T19:09:30.852+02:00",
         "details":{
            "language":"eng",
            "details":"invalid resource"
         },
         "diagnostic":"java.lang.IllegalArgumentException: Invalid resource.\n\t
          at it.unipd.dei.ims.ici.resource.representation.ErrorRepresentation.
            setUpBeforeClass(ErrorRepresentation.java:45)\n\t
          at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)\n\t
          at sun.reflect.NativeMethodAccessorImpl.
            invoke(NativeMethodAccessorImpl.java:39)\n\t
          at sun.reflect.DelegatingMethodAccessorImpl.
            invoke(DelegatingMethodAccessorImpl.java:25)\n\t
          at java.lang.reflect.Method.invoke(Method.java:597)\n\t
          at org.junit.runners.model.FrameworkMethod$1.
            runReflectiveCall(FrameworkMethod.java:45)\n\t
          at org.junit.internal.runners.model.ReflectiveCallable.
            run(ReflectiveCallable.java:15)\n\t
          at org.junit.runners.model.FrameworkMethod.
            invokeExplosively(FrameworkMethod.java:42)\n\t
          at org.junit.internal.runners.statements.RunBefores.
            evaluate(RunBefores.java:27)\n\t
          at org.junit.runners.ParentRunner.run(ParentRunner.java:300)\n\t
        at org.eclipse.jdt.internal.junit4.runner.JUnit4TestReference.
          run(JUnit4TestReference.java:50)\n\t
          at org.eclipse.jdt.internal.junit.runner.TestExecution.
            run(TestExecution.java:38)\n\t
          at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
            runTests(RemoteTestRunner.java:467)\n\t
          at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
            runTests(RemoteTestRunner.java:683)\n\t
          at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
            run(RemoteTestRunner.java:390)\n\t
          at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
            main(RemoteTestRunner.java:197)\n"
      }
   }
}
```

C.2 Log Event Resource

C.2.1 API

Action	HTTP Method	URI
READ_LOG_EVENT	GET	/log-event/{id}
LIST_LOG_EVENTS	GET	/log-event/last/{n}

Table 4: API for accessing the log event resource.

where {id} is the unique identifier of the log event and {n} is the number of log event to be listed.

C.2.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:log-event ims:serial-identifier="1000" ims:level="INFO"
    ims:created="2012-08-01T19:18:04.987+02:00">
    <ims:message>
      message
    </ims:message>
    <ims:user ims:identifier="user-1" ims:namespace="http://ims.dei.unipd.it/" />
    <ims:action>
      AUTHENTICATE_USER
    </ims:action>
    <ims:ip>
      127.0.2.1
    </ims:ip>
    <ims:resource ims:identifier="resource 1"
      ims:namespace="http://www.openarchives.org/OAI/2.0/oai_dc/">
      <ims:resource-class>
        resource class 1
      </ims:resource-class>
    </ims:resource>
    <ims:thread>
      thread 1
    </ims:thread>
    <ims:class-name>
      class 1
    </ims:class-name>
    <ims:method>
      method 1
    </ims:method>
    <ims:line-number>
      37
    </ims:line-number>
    <ims:class-file>
      file 1
    </ims:class-file>
    <ims:throwable>
      java.lang.IllegalArgumentException: Invalid resource.
        at it.unipd.dei.ims.ici.resource.representation.ErrorRepresentation.
          setUpBeforeClass(ErrorRepresentation.java:45)
        at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
        at sun.reflect.NativeMethodAccessorImpl.
          invoke(NativeMethodAccessorImpl.java:39)
        at sun.reflect.DelegatingMethodAccessorImpl.
          invoke(DelegatingMethodAccessorImpl.java:25)
```

```
47          at java.lang.reflect.Method.invoke(Method.java:597)
48          at org.junit.runners.model.FrameworkMethod$1.
49            runReflectiveCall(FrameworkMethod.java:45)
50          at org.junit.internal.runners.model.ReflectiveCallable.
51            run(ReflectiveCallable.java:15)
52          at org.junit.runners.model.FrameworkMethod.
53            invokeExplosively(FrameworkMethod.java:42)
54          at org.junit.internal.runners.statements.RunBefores.
55            evaluate(RunBefores.java:27)
56          at org.junit.runners.ParentRunner.run(ParentRunner.java:300)
57          at org.eclipse.jdt.internal.junit4.runner.JUnit4TestReference.
58            run(JUnit4TestReference.java:50)
59          at org.eclipse.jdt.internal.junit.runner.TestExecution.
60            run(TestExecution.java:38)
61          at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
62            runTests(RemoteTestRunner.java:467)
63          at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
64            runTests(RemoteTestRunner.java:683)
65          at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
66            run(RemoteTestRunner.java:390)
67          at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
68            main(RemoteTestRunner.java:197)
69      </ims:throwable>
70    </ims:log-event>
71 </ims:direct>
```

C.2.3 JSON Representation

```
1 {
2    "direct":{
3       "log-event":{
4          "serial-identifier":1000,
5          "level":"INFO",
6          "created":"2012-08-01T19:18:04.987+02:00",
7          "message":"message",
8          "user":{
9             "identifier":"user-1",
10            "namespace":"http://ims.dei.unipd.it/"
11         },
12         "action":"AUTHENTICATE_USER",
13         "resource":{
14            "identifier":"resource 1",
15            "namespace":"http://www.openarchives.org/OAI/2.0/oai_dc/",
16            "resource-class":"resource class 1"
17         },
18         "ip":"127.0.2.1",
19         "thread":"thread 1",
20         "class-name":"class 1",
21         "method":"method 1",
22         "line-number":37,
23         "class-file":"file 1",
24         "throwable":"java.lang.IllegalArgumentException: Invalid resource.\n\t
25          at it.unipd.dei.ims.ici.resource.representation.ErrorRepresentation.
26            setUpBeforeClass(ErrorRepresentation.java:45)\n\t
27          at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)\n\t
28          at sun.reflect.NativeMethodAccessorImpl.
29            invoke(NativeMethodAccessorImpl.java:39)\n\t
30          at sun.reflect.DelegatingMethodAccessorImpl.
31            invoke(DelegatingMethodAccessorImpl.java:25)\n\t
32          at java.lang.reflect.Method.invoke(Method.java:597)\n\t
```

```
33            at org.junit.runners.model.FrameworkMethod$1.
34              runReflectiveCall(FrameworkMethod.java:45)\n\t
35            at org.junit.internal.runners.model.ReflectiveCallable.
36              run(ReflectiveCallable.java:15)\n\t
37            at org.junit.runners.model.FrameworkMethod.
38              invokeExplosively(FrameworkMethod.java:42)\n\t
39            at org.junit.internal.runners.statements.RunBefores.
40              evaluate(RunBefores.java:27)\n\t
41            at org.junit.runners.ParentRunner.run(ParentRunner.java:300)\n\t
42          at org.eclipse.jdt.internal.junit4.runner.JUnit4TestReference.
43            run(JUnit4TestReference.java:50)\n\t
44            at org.eclipse.jdt.internal.junit.runner.TestExecution.
45              run(TestExecution.java:38)\n\t
46            at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
47              runTests(RemoteTestRunner.java:467)\n\t
48            at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
49              runTests(RemoteTestRunner.java:683)\n\t
50            at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
51              run(RemoteTestRunner.java:390)\n\t
52            at org.eclipse.jdt.internal.junit.runner.RemoteTestRunner.
53              main(RemoteTestRunner.java:197)\n"
54        }
55    }
56 }
```

C.3 Namespace Resource

C.3.1 API

Action	HTTP Method	URI
CREATE_NAMESPACE	POST	/namespace
READ_NAMESPACE	GET	/namespace/{id}
UPDATE_NAMESPACE	PUT	/namespace/{id}
DELETE_NAMESPACE	DELETE	/namespace/{id}
LIST_NAMESPACES	GET	/namespace
LIST_NAMESPACE_PROVENANCE_EVENTS	GET	/namespace/{id}/provenance

Table 5: API for accessing the namespace resource.

where {id} is the unique identifier of the namespace.

C.3.2 XML Representation

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <ims:direct xmlns:ims="http://ims.dei.unipd.it/"
3   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
4   xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
5   <ims:namespace ims:identifier="http://www.ns1.com/" ims:prefix="ns1"
6     ims:description="namespace 1"
7     ims:created="2012-08-01T18:52:28.193+02:00"
8     ims:last-modified="2012-08-01T18:52:28.193+02:00" />
9 </ims:direct>
```

C.3.3 JSON Representation

```
{
   "direct":{
      "namespace":{
         "identifier":"http://www.ns1.com/",
         "prefix":"ns1",
         "description":"namespace 1",
         "created":"2012-08-01T18:52:28.193+02:00",
         "last-modified":"2012-08-01T18:52:28.193+02:00"
      }
   }
}
```

C.4 Concept Resource

C.4.1 API

Action	HTTP Method	URI
CREATE_CONCEPT	POST	/concept
READ_CONCEPT	GET	/concept/{id};{ns}
UPDATE_CONCEPT	PUT	/concept/{id};{ns}
DELETE_CONCEPT	DELETE	/concept/{id};{ns}
LIST_CONCEPTS	GET	/concept
LIST_RELATED_CONCEPTS	GET	/concept/{id};{ns}/link
RELATE_CONCEPT	GET, PUT, POST	/concept/{source-id};{source-ns}/link/{target-id};{target-ns}/relation/{relation-id};{relation-ns}[/strength/{score}]
UNRELATE_CONCEPT	DELETE	/concept/{source-id};{source-ns}/link/{target-id};{target-ns}
LIST_CONCEPT_PROVENANCE_EVENTS	GET	/concept/{id};{ns}/provenance
LIST_USER_FEATURES	GET	/concept/featured-user/{id};{ns}
ADD_MEASURE	GET, POST, PUT	/concept/{id};{ns}/measure
READ_MEASURE	GET	/concept/measure/{id}
REMOVE_MEASURE	DELETE	/concept/measure/{id}
LIST_CONTRIBUTION_FEATURES	GET	/concept/featured-contribution/{id}
LIST_CONTRIBUTION_FEATURES	GET	/concept/featured-contribution/{id}
LIST_MEASURES	GET	/concept/{id};{ns}/measure

Action	HTTP Method	URI
ADD_STATISTIC	GET, POST, PUT	/concept/{id};{ns}/statistic
READ_STATISTIC	GET	/concept/statistic/{id}
REMOVE_STATISTIC	DELETE	/concept/statistic/{id}
LIST_STATISTICS	GET	/concept/{id};{ns}/statistic

Table 6: API for accessing the concept resource.

where {id} is the unique identifier of the concept and {ns} is the namespace to which the concept belongs. When relating/unrelating concepts, {source-id} and {source-ns} are the identifier and namespace of the source concept; {target-id} and {target-ns} are the identifier and namespace of the target concept; {relation-id} and {relation-ns} are the identifier and namespace of the concept expressing the relation between the source and target concepts. When relating two concepts, if a score is provided, it will express the strength of the relation between the two concepts; if no score is provided, it will default to 1; scores should be in the range [0, 1]. This allows us to create taxonomies and knowledge organization systems of concepts, if needed.

C.4.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:concept ims:identifier="c1" ims:namespace="http://ims.dei.unipd.it/"
    ims:description="concept 1"
    ims:created="2012-11-22T19:01:34.064+02:00"
    ims:last-modified="2012-11-22T19:01:34.064+02:00">
    <ims:links>
      <ims:link ims:score="8.9361187812E-1">
        <ims:concept ims:identifier="author"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept ims:identifier="IS_A"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:concept ims:identifier="c1"
          ims:namespace="http://ims.dei.unipd.it/" />
      </ims:link>
      <ims:link ims:score="1.405708327E-1">
        <ims:concept ims:identifier="reviewer"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept ims:identifier="OWNS-A"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:concept ims:identifier="c1"
          ims:namespace="http://ims.dei.unipd.it/" />
      </ims:link>
      <ims:link ims:score="3.759954505E-1">
        <ims:concept ims:identifier="c1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
```

```
34            <ims:concept ims:identifier="HAS_A"
35              ims:namespace="http://ims.dei.unipd.it/" />
36          </ims:relation>
37          <ims:concept ims:identifier="publisher"
38            ims:namespace="http://ims.dei.unipd.it/" />
39        </ims:link>
40        <ims:link ims:score="1.6785223513E-1">
41          <ims:concept ims:identifier="c1"
42            ims:namespace="http://ims.dei.unipd.it/" />
43          <ims:relation>
44            <ims:concept ims:identifier="LIKES"
45              ims:namespace="http://ims.dei.unipd.it/" />
46          </ims:relation>
47          <ims:concept ims:identifier="curator"
48            ims:namespace="http://ims.dei.unipd.it/" />
49        </ims:link>
50      </ims:links>
51    </ims:concept>
52  </ims:direct>
```

C.4.3 JSON Representation

```
1  {
2     "direct":{
3        "concept":{
4           "identifier":"c1",
5           "namespace":"http://ims.dei.unipd.it/",
6           "description":"concept 1",
7           "created":"2012-11-22T19:01:34.064+02:00",
8           "last-modified":"2012-11-22T19:01:34.064+02:00",
9           "links":[
10             {
11                "link":{
12                   "concept":{
13                      "identifier":"author",
14                      "namespace":"http://ims.dei.unipd.it/"
15                   },
16                   "relation":{
17                      "concept":{
18                         "identifier":"IS_A",
19                         "namespace":"http://ims.dei.unipd.it/"
20                      }
21                   },
22                   "concept":{
23                      "identifier":"c1",
24                      "namespace":"http://ims.dei.unipd.it/"
25                   },
26                   "score":"8.9361187812E-1"
27                }
28             },
29             {
30                "link":{
31                   "concept":{
32                      "identifier":"reviewer",
33                      "namespace":"http://ims.dei.unipd.it/"
34                   },
35                   "relation":{
36                      "concept":{
37                         "identifier":"OWNS-A",
38                         "namespace":"http://ims.dei.unipd.it/"
```

```
                    }
                },
                "concept":{
                    "identifier":"c1",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "score":"1.405708327E-1"
            }
        },
        {
            "link":{
                "concept":{
                    "identifier":"c1",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"HAS_A",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "concept":{
                    "identifier":"publisher",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "score":"3.759954505E-1"
            }
        },
        {
            "link":{
                "concept":{
                    "identifier":"c1",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"LIKES",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "concept":{
                    "identifier":"curator",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "score":"1.6785223513E-1"
            }
        }
    ]
  }
 }
}
```


C.5 Group Resource

C.5.1 API

Action	HTTP Method	URI
CREATE_GROUP	POST	/group

Action	HTTP Method	URI
READ_GROUP	GET	/group/{id};{ns}
UPDATE_GROUP	PUT	/group/{id};{ns}
DELETE_GROUP	DELETE	/group/{id};{ns}
LIST_GROUPS	GET	/group
LIST_GROUP_PROVENANCE_EVENTS	GET	/group/{id};{ns}/provenance

Table 7: API for accessing the group resource.

where {id} is the unique identifier of the group and {ns} is the namespace to which the group belongs.

C.5.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:group ims:identifier="g1" ims:namespace="http://ims.dei.unipd.it/"
    ims:description="group 1"
    ims:created="2012-08-01T19:24:40.991+02:00"
    ims:last-modified="2012-08-01T19:24:40.991+02:00">
    <ims:users>
      <ims:user ims:identifier="user-1" ims:namespace="http://ims.dei.unipd.it/" />
      <ims:user ims:identifier="user-2" ims:namespace="http://ims.dei.unipd.it/" />
      <ims:user ims:identifier="user-3" ims:namespace="http://ims.dei.unipd.it/" />
    </ims:users>
  </ims:group>
</ims:direct>
```

C.5.3 JSON Representation

```
{
   "direct":{
      "group":{
         "identifier":"g1",
         "namespace":"http://ims.dei.unipd.it/",
         "description":"group 1",
         "created":"2012-08-01T19:24:40.991+02:00",
         "last-modified":"2012-08-01T19:24:40.991+02:00",
         "users":[
            {
               "user":{
                  "identifier":"user-1",
                  "namespace":"http://ims.dei.unipd.it/"
               }
            },
            {
               "user":{
                  "identifier":"user-2",
                  "namespace":"http://ims.dei.unipd.it/"
               }
            },
```

```
22              {
23                 "user":{
24                    "identifier":"user-3",
25                    "namespace":"http://ims.dei.unipd.it/"
26                 }
27              }
28           ]
29        }
30     }
31 }
```

C.6 Role Resource

C.6.1 API

Action	HTTP Method	URI
CREATE_ROLE	POST	/role
READ_ROLE	GET	/role/{id};{ns}
UPDATE_ROLE	PUT	/role/{id};{ns}
DELETE_ROLE	DELETE	/role/{id};{ns}
LIST_ROLES	GET	/role
LIST_ROLE_PROVENANCE_EVENTS	GET	/role/{id};{ns}/provenance

Table 8: API for accessing the role resource.

where {id} is the unique identifier of the role and {ns} is the namespace to which the role belongs.

C.6.2 XML Representation

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <ims:direct xmlns:ims="http://ims.dei.unipd.it/"
3   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
4   xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
5   <ims:role ims:identifier="r1" ims:namespace="http://ims.dei.unipd.it/"
6     ims:description="role 1"
7     ims:created="2012-08-01T19:24:40.991+02:00"
8     ims:last-modified="2012-08-01T19:24:40.991+02:00">
9     <ims:users>
10      <ims:user ims:identifier="user-1" ims:namespace="http://ims.dei.unipd.it/" />
11      <ims:user ims:identifier="user-2" ims:namespace="http://ims.dei.unipd.it/" />
12      <ims:user ims:identifier="user-3" ims:namespace="http://ims.dei.unipd.it/" />
13    </ims:users>
14  </ims:role>
15 </ims:direct>
```

C.6.3 JSON Representation

```
1 {
2    "direct":{
3       "role":{
4          "identifier":"r1",
```

```
5           "namespace":"http://ims.dei.unipd.it/",
6           "description":"role 1",
7           "created":"2012-08-01T19:24:40.991+02:00",
8           "last-modified":"2012-08-01T19:24:40.991+02:00",
9           "users":[
10             {
11                "user":{
12                   "identifier":"user-1",
13                   "namespace":"http://ims.dei.unipd.it/"
14                }
15             },
16             {
17                "user":{
18                   "identifier":"user-2",
19                   "namespace":"http://ims.dei.unipd.it/"
20                }
21             },
22             {
23                "user":{
24                   "identifier":"user-3",
25                   "namespace":"http://ims.dei.unipd.it/"
26                }
27             }
28          ]
29       }
30    }
31 }
```

C.7 User Resource

C.7.1 API

Action	HTTP Method	URI
CREATE_USER	POST	/user
READ_USER	GET	/user/{id};{ns}
UPDATE_USER	PUT	/user/{id};{ns}
DELETE_USER	DELETE	/user/{id};{ns}
CHANGE_USER_PASSWORD	PUT	/user/{id};{ns}/changePassword
AUTHENTICATE_USER	GET, PUT, POST, DELETE, OPTIONS, HEAD	/user/authenticate
ADD_USER_TO_GROUP	GET, PUT, POST	/user/{id};{ns}/member/{owner-id};{owner-ns}
REMOVE_USER_FROM_GROUP	DELETE	/user/{id};{ns}/member/{owner-id};{owner-ns}
ADD_USER_TO_ROLE	GET, PUT, POST	/user/{id};{ns}/subscriber/{owner-id};{owner-ns}

Action	HTTP Method	URI
REMOVE_USER_FROM_ROLE	DELETE	/user/{id};{ns}/subscriber/{owner-id};{owner-ns}
LIST_USERS	GET	/user
LIST_USER_PROVENANCE_EVENTS	GET	/user/{id};{ns}/provenance
RELATE_USER	GET, POST, PUT	/user/{id};{ns}/link/{id};{ns}/relation/{id};{ns}/score/{value}
UNRELATE_USER	DELETE	/user/{id};{ns}/link/{id};{ns}
LIST_RELATED_USERS	GET	/user/{id};{ns}/link
ADD_FEATURE_TO_USER	GET, POST, PUT	/user/{id};{ns}/feature/{id};{ns}/score/{value}/backward-score/{value}
REMOVE_FEATURE_FROM_USER	DELETE	/user/{id};{ns}/feature/{id};{ns}
LIST_FEATURED_USERS	GET	/user/feature/{id};{ns}
ADD_MEASURE	GET, POST, PUT	/user/{id};{ns}/measure
READ_MEASURE	GET	/user/measure/{id}
REMOVE_MEASURE	DELETE	/user/measure/{id}
LIST_MEASURES	GET	/user/{id};{ns}/measure
ADD_STATISTIC	GET, POST, PUT	/user/{id};{ns}/statistic
READ_STATISTIC	GET	/user/statistic/{id}
REMOVE_STATISTIC	DELETE	/user/statistic/{id}
LIST_STATISTICS	GET	/user/{id};{ns}/statistic

Table 9: API for accessing the user resource.

where {id} is the unique identifier of the user and {ns} is the namespace to which the user belongs while {owner-id} and {owner-ns} are the identifier and namespace of the group/role to which the user belongs.

C.7.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:user ims:identifier="u1" ims:namespace="http://ims.dei.unipd.it/"
    ims:first-name="firstName" ims:last-name="lastName"
    ims:affiliation="affiliation" ims:e-mail="email@email.org"
    ims:birth-date="2012-08-01" ims:gender="MALE"
    ims:address="address" ims:city="city" ims:state="state" ims:zip="zip"
```

```
    ims:country="ITA" ims:language="ita" ims:phone="123456" ims:facsimile="123456"
    ims:mobile="123456" ims:voip-caller-id="voipCallerId"
    ims:homepage="www.homepage.com"
    ims:created="2012-08-01T19:33:41.893+02:00"
    ims:last-modified="2012-08-01T19:33:41.893+02:00">
    <ims:groups>
      <ims:group ims:identifier="group-1" ims:namespace="http://ims.dei.unipd.it/" />
      <ims:group ims:identifier="group-2" ims:namespace="http://ims.dei.unipd.it/" />
      <ims:group ims:identifier="group-3" ims:namespace="http://ims.dei.unipd.it/" />
    </ims:groups>
    <ims:roles>
      <ims:role ims:identifier="role-1" ims:namespace="http://ims.dei.unipd.it/" />
      <ims:role ims:identifier="role-2" ims:namespace="http://ims.dei.unipd.it/" />
      <ims:role ims:identifier="role-3" ims:namespace="http://ims.dei.unipd.it/" />
    </ims:roles>
  </ims:user>
</ims:direct>
```

C.7.3 JSON Representation

```
{
   "direct":{
      "user":{
         "identifier":"u1",
         "namespace":"http://ims.dei.unipd.it/",
         "first-name":"firstName",
         "last-name":"lastName",
         "affiliation":"affiliation",
         "e-mail":"email@email.org",
         "birth-date":"2012-08-01",
         "gender":"MALE",
         "address":"address",
         "city":"city",
         "state":"state",
         "zip":"zip",
         "country":"ITA",
         "language":"ita",
         "phone":"123456",
         "facsimile":"123456",
         "mobile":"123456",
         "voip-caller-id":"voipCallerId",
         "homepage":"www.homepage.com",
         "created":"2012-08-01T19:33:41.893+02:00",
         "last-modified":"2012-08-01T19:33:41.893+02:00",
         "groups":[
            {
               "group":{
                  "identifier":"group-1",
                  "namespace":"http://ims.dei.unipd.it/"
               }
            },
            {
               "group":{
                  "identifier":"group-2",
                  "namespace":"http://ims.dei.unipd.it/"
               }
            },
            {
               "group":{
                  "identifier":"group-3",
```

```
                    "namespace":"http://ims.dei.unipd.it/"
                }
            }
        ],
        "roles":[
            {
                "role":{
                    "identifier":"role-1",
                    "namespace":"http://ims.dei.unipd.it/"
                }
            },
            {
                "role":{
                    "identifier":"role-2",
                    "namespace":"http://ims.dei.unipd.it/"
                }
            },
            {
                "role":{
                    "identifier":"role-3",
                    "namespace":"http://ims.dei.unipd.it/"
                }
            }
        ]
    }
  }
}
```

C.8 Metadata Set Resource

C.8.1 API

Action	HTTP Method	URI
CREATE_METADATA_SET	POST	/metadata-set
READ_METADATA_SET	GET	/metadata-set/{id};{ns}
UPDATE_METADATA_SET	PUT	/metadata-set/{id};{ns}
DELETE_METADATA_SET	DELETE	/metadata-set/{id};{ns}
INCLUDE_SUBSET_INTO_SUPERSET	GET, PUT, POST	/metadata-set/{id};{ns}/member/{owner-id};{owner-ns}
EXCLUDE_SUBSET_FROM_SUPERSET	DELETE	/metadata-set/{id};{ns}/member/{owner-id};{owner-ns}
LIST_METADATA_SETS	GET	/metadata-set
LIST_METADATA_SET_PROVENANCE_EVENTS	GET	/metadata-set/{id};{ns}/provenance
SHARE_METADATA_SET	GET, POST, PUT	/metadata-set/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}

Action	HTTP Method	URI
UNSHARE_METADATA_SET	DELETE	/metadata-set/{id}/share/{sharer-id};{sharer-ns}

Table 10: API for accessing the metadata set resource.

where {id} is the unique identifier of the metadata set and {ns} is the namespace to which the metadata set belongs while {owner-id} and {owner-ns} are the identifier and namespace of the super-set to which the metadata set belongs.

C.8.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:metadata-set ims:identifier="ms1" ims:namespace="http://ims.dei.unipd.it/"
    ims:name="set1" ims:description="metadata set 1"
    ims:scope="PUBLIC" ims:created="2012-08-02T13:50:29.143+02:00"
    ims:last-modified="2012-08-02T13:50:29.143+02:00">
    <ims:supersets>
      <ims:metadata-set ims:identifier="superset-1"
        ims:namespace="http://ims.dei.unipd.it/" />
      <ims:metadata-set ims:identifier="superset-2"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:supersets>
    <ims:subsets>
      <ims:metadata-set ims:identifier="subset-1"
        ims:namespace="http://ims.dei.unipd.it/" />
      <ims:metadata-set ims:identifier="subset-2"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:subsets>
  </ims:metadata-set>
</ims:direct>
```

C.8.3 JSON Representation

```
{
   "direct":{
      "metadata-set":{
         "identifier":"ms1",
         "namespace":"http://ims.dei.unipd.it/",
         "name":"set1",
         "description":"metadata set 1",
         "scope":"PUBLIC",
         "created":"2012-08-02T13:50:29.143+02:00",
         "last-modified":"2012-08-02T13:50:29.143+02:00",
         "supersets":[
            {
               "metadata-set":{
                  "identifier":"superset-1",
                  "namespace":"http://ims.dei.unipd.it/"
               }
            },
```

```
18              {
19                  "metadata-set":{
20                     "identifier":"superset-2",
21                     "namespace":"http://ims.dei.unipd.it/"
22                  }
23              }
24          ],
25          "subsets":[
26              {
27                  "metadata-set":{
28                     "identifier":"subset-1",
29                     "namespace":"http://ims.dei.unipd.it/"
30                  }
31              },
32              {
33                  "metadata-set":{
34                     "identifier":"subset-2",
35                     "namespace":"http://ims.dei.unipd.it/"
36                  }
37              }
38          ]
39      }
40   }
41 }
```

C.9 Metadata Resource

C.9.1 API

Action	HTTP Method	URI
CREATE_METADATA	POST	/metadata
READ_METADATA	GET	/metadata/{id};{ns}
UPDATE_METADATA	PUT	/metadata/{id};{ns}
DELETE_METADATA	DELETE	/metadata/{id};{ns}
ADD_METADATA_TO_METADATA_SET	GET, PUT, POST	/metadata/{id};{ns}/member/{owner-id};{owner-ns}
REMOVE_METADATA_FROM_METADATA_SET	DELETE	/metadata/{id};{ns}/member/{owner-id};{owner-ns}
LIST_METADATA_BELONGING_TO_METADATA_SET	GET	/metadata/member/{owner-id};{owner-ns}
LIST_METADATA	GET	/metadata
LIST_METADATA_PROVENANCE_EVENTS	GET	/metadata/{id};{ns}/provenance
SHARE_METADATA	GET, POST, PUT	/metadata/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}

Action	HTTP Method	URI
UNSHARE_METADATA	DELETE	/metadata/{id}/share/{sharer-id};{sharer-ns}

Table 11: API for accessing the metadata resource.

where {id} is the unique identifier of the metadata set and {ns} is the namespace to which the metadata set belongs while {owner-id} and {owner-ns} are the identifier and namespace of the metadata set to which the metadata belongs.

C.9.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:metadata xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dmy="http://www.dummy.org/"
    ims:identifier="md1" ims:namespace="http://ims.dei.unipd.it/"
    ims:language="eng" ims:scope="PUBLIC"
    ims:created="2012-08-02T14:04:33.995+02:00"
    ims:last-modified="2012-08-02T14:04:33.995+02:00"
    dc:subject="a subject attribute"
    dc:contributor="a contributor attribute">
    <ims:metadata-sets>
      <ims:metadata-set ims:identifier="metadata-set-1"
        ims:namespace="http://ims.dei.unipd.it/" />
      <ims:metadata-set ims:identifier="metadata-set-2"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:metadata-sets>
    <ims:fields>
      <dc:type>
        a type field
      </dc:type>
      <dc:type>
        another type field
      </dc:type>
      <dc:type>
        a type field
      </dc:type>
      <dc:type>
        another type field
      </dc:type>
      <dc:identifier>
        an identifier field
      </dc:identifier>
      <dc:coverage>
        a coverage field
      </dc:coverage>
      <dc:title>
        a title field
      </dc:title>
      <dc:title>
        another title field
      </dc:title>
```

```
      <dc:publisher>
        a publisher field
      </dc:publisher>
      <dc:contributor>
        a contributor field
      </dc:contributor>
      <dmy:accessCondition dc:date="2010-01-01" dc:relation="a relation">
        <dc:contributor>
          a contributor
        </dc:contributor>
        <dc:creator>
          a locator
        </dc:creator>
      </dmy:accessCondition>
      <dmy:shelfLocator dc:date="2010-01-01" dc:relation="a relation">
        a format field with attributes
      </dmy:shelfLocator>
      <dmy:holdingSimple>
        <dc:contributor>
          a contributor
        </dc:contributor>
        <dc:creator>
          a locator
        </dc:creator>
      </dmy:holdingSimple>
    </ims:fields>
  </ims:metadata>
</ims:direct>
```

C.9.3 JSON Representation

```
{
   "direct":{
      "metadata":{
         "identifier":"md1",
         "namespace":"http://ims.dei.unipd.it/",
         "language":"aar",
         "created":"2012-08-02T14:04:33.995+02:00",
         "last-modified":"2012-08-02T14:04:33.995+02:00",
         "scope":"PUBLIC",
         "schemas":[
            {
               "dc":"http://purl.org/dc/elements/1.1/"
            },
            {
               "dmy":"http://www.dummy.org/"
            }
         ],
         "attributes":[
            {
               "subject":{
                  "schema":"dc",
                  "value":"a subject attribute"
               }
            },
            {
               "contributor":{
                  "schema":"dc",
                  "value":"a contributor attribute"
               }
```

```
            }
        ],
        "metadata-sets":[
            {
                "metadata-set":{
                    "identifier":"metadata-set-1",
                    "namespace":"http://ims.dei.unipd.it/"
                }
            },
            {
                "metadata-set":{
                    "identifier":"metadata-set-2",
                    "namespace":"http://ims.dei.unipd.it/"
                }
            }
        ],
        "fields":[
            {
                "type":{
                    "schema":"dc",
                    "value":"a type field"
                }
            },
            {
                "type":{
                    "schema":"dc",
                    "value":"another type field"
                }
            },
            {
                "type":{
                    "schema":"dc",
                    "value":"a type field"
                }
            },
            {
                "type":{
                    "schema":"dc",
                    "value":"another type field"
                }
            },
            {
                "identifier":{
                    "schema":"dc",
                    "value":"an identifier field"
                }
            },
            {
                "coverage":{
                    "schema":"dc",
                    "value":"a coverage field"
                }
            },
            {
                "title":{
                    "schema":"dc",
                    "value":"a title field"
                }
            },
            {
```

```
            "title":{
               "schema":"dc",
               "value":"another title field"
            }
         },
         {
            "publisher":{
               "schema":"dc",
               "value":"a publisher field"
            }
         },
         {
            "contributor":{
               "schema":"dc",
               "value":"a contributor field"
            }
         },
         {
            "accessCondition":{
               "schema":"dmy",
               "attributes":[
                  {
                     "date":{
                        "schema":"dc",
                        "value":"2010-01-01"
                     }
                  },
                  {
                     "relation":{
                        "schema":"dc",
                        "value":"a relation"
                     }
                  }
               ],
               "sub-fields":[
                  {
                     "contributor":{
                        "schema":"dc",
                        "value":"a contributor"
                     }
                  },
                  {
                     "creator":{
                        "schema":"dc",
                        "value":"a locator"
                     }
                  }
               ]
            }
         },
         {
            "shelfLocator":{
               "schema":"dmy",
               "attributes":[
                  {
                     "date":{
                        "schema":"dc",
                        "value":"2010-01-01"
                     }
                  },
```

```
                    {
                        "relation":{
                            "schema":"dc",
                            "value":"a relation"
                        }
                    }
                ],
                "value":"a format field with attributes"
            }
        },
        {
            "holdingSimple":{
                "schema":"dmy",
                "sub-fields":[
                    {
                        "contributor":{
                            "schema":"dc",
                            "value":"a contributor"
                        }
                    },
                    {
                        "creator":{
                            "schema":"dc",
                            "value":"a locator"
                        }
                    }
                ]
            }
        }
    ]
  }
 }
}
```

C.10 Search Resource

C.10.1 API

Action	HTTP Method	URI
SEARCH	POST	/search
SEARCH	GET	/search?query={query}
SEARCH	GET	/search/{query}

Table 12: API for accessing the search resource.

where {query} is the query expressed using the query language discussed in Section D. In the GET version you need to URI encode the {query} parameter while in the POST version you send the query as body of the HTTP entity.

The next two sections show an example of the representation of the results.

C.10.2 XML Representation

```xml
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:result ims:identifier="029b427d-62f7-451e-8945-1c22dc6e5ffa"
    ims:created="2012-08-02T10:21:34.294+02:00"
      ims:size="3">
    <ims:query ims:identifier="987f8a05-e688-4626-bd68-f9da63fe8c18"
      ims:created="2012-08-02T10:21:34.294+02:00">
      <ims:cql>
        ici.namespace.created &gt; 1970-01-01
      </ims:cql>
    </ims:query>
    <ims:resource-class>
      it.unipd.dei.ims.ici.resource.Namespace
    </ims:resource-class>
    <ims:items>
      <ims:item ims:identifier="1b848114-a975-4646-839c-712227bcff8b" ims:rank="0"
        ims:score="1.0E0" />
      <ims:item ims:identifier="9e812fc7-a21f-4ae5-9101-4adf2b423dac" ims:rank="1"
        ims:score="9.0E-1" />
      <ims:item ims:identifier="155611e5-07cb-418b-9839-6a0424c0388f" ims:rank="2"
        ims:score="8.0E-1" />
    </ims:items>
  </ims:result>
</ims:direct>
```

C.10.3 JSON Representation

```json
{
   "direct":{
      "result":{
         "identifier":"dea70afa-9897-4acc-a96c-4e70cdff256e",
         "created":"2012-08-02T10:26:48.482+02:00",
         "size":3,
         "query":{
            "identifier":"63a49b47-74a4-4eab-b24d-e77d1ab68102",
            "created":"2012-08-02T10:26:48.482+02:00",
            "cql":"ici.namespace.created > 1970-01-01"
         },
         "resource-class":"it.unipd.dei.ims.ici.resource.Namespace",
         "items":[
            {
               "item":{
                  "identifier":"3a8dd857-ca03-437f-869b-711a0839f0d2",
                  "rank":0,
                  "score":1.0
               }
            },
            {
               "item":{
                  "identifier":"e98045ff-fabf-499b-97e8-dc5f0eeabfd5",
                  "rank":1,
                  "score":0.9
               }
            },
            {
               "item":{
                  "identifier":"f97a5456-ccfe-4523-aec3-67bc3c9f9b71",
                  "rank":2,
```

```
32                      "score":0.8
33                  }
34              }
35          ]
36      }
37  }
38 }
```

C.11 List Resource

C.11.1 API

Action	HTTP Method	URI
SEARCH	POST	`/list`
SEARCH	GET	`/list?query={query}`
SEARCH	GET	`/list/{query}`

Table 13: API for accessing the list resource.

where `{query}` is the query expressed using the query language discussed in Section D. In the GET version you need to URI encode the `{query}` parameter while in the POST version you send the query as body of the HTTP entity.

The `list` resource works the same way as the `search` resource but, instead of returning a list of result items together with their score and rank, it directly returns the resources which correspond to the query.

C.12 Application Resource

Identifies a running software Application which can be evaluated by an evaluation activity such as a Guerrilla Experiment.

C.12.1 API

Action	HTTP Method	URI
CREATE_APPLICATION	POST	`/application`
READ_APPLICATION	GET	`/application/{id}`
UPDATE_APPLICATION	PUT	`/application/{id}`
DELETE_APPLICATION	DELETE	`/application/{id}`
LIST_APPLICATIONS	GET	`/application`
LIST_APPLICATIONS_PROVENANCE_EVENTS	GET	`/application/{id}/provenance`
ADD_COMPONENT_TO_APPLICATION	POST	`/application/{id}/component/{id}`

Action	HTTP Method	URI
REMOVE_COMPONENT_FROM_APPLICATION	DELETE	/application/{id}/component/{id}
LIST_COMPONENT_FROM_APPLICATION	GET	/application/{id}/component
ADD_CONFIGURATION_TO_APPLICATION	POST	/application/{id}/configuration/{id}
REMOVE_CONFIGURATION_FROM_APPLICATION	DELETE	/application/{id}/configuration
READ_CONFIGURATION_FROM_APPLICATION	GET	/application/{id}/configuration
ADD_SYSTEM_TO_APPLICATION	POST	/application/{id}/system/{id}
REMOVE_SYSTEM_FROM_APPLICATION	DELETE	/application/{id}/system/{id}
LIST_SYSTEM_FROM_APPLICATION	GET	/application/{id}/system
SHARE_APPLICATION	GET, POST, PUT	/application/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_APPLICATION	DELETE	/application/{id}/share/{sharer-id};{sharer-ns}

Table 14: API for accessing the application resource.

where {id} is the unique identifier of the application.

The next two sections show an example of the representation of the results.

C.12.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:application
    ims:identifier="app-1"
    ims:description="Description of app 1"
    ims:name="Name of app 1"
    ims:scope="SHARED"
    ims:created="2012-09-13T17:17:25.378+02:00"
    ims:last-modified="2012-09-13T17:17:25.378+02:00">
    <ims:owner>
```

```
14        <ims:user
15          ims:identifier="user-1"
16          ims:namespace="http://ims.dei.unipd.it/" />
17      </ims:owner>
18      <ims:sharings>
19        <ims:sharing>
20          <ims:group
21            ims:identifier="group-1"
22            ims:namespace="http://ims.dei.unipd.it/" />
23          <ims:access-permission>DENIED</ims:access-permission>
24        </ims:sharing>
25        <ims:sharing>
26          <ims:group
27            ims:identifier="group-2"
28            ims:namespace="http://ims.dei.unipd.it/" />
29          <ims:access-permission>READ_ONLY</ims:access-permission>
30        </ims:sharing>
31        <ims:sharing>
32          <ims:group
33            ims:identifier="group-3"
34            ims:namespace="http://ims.dei.unipd.it/" />
35          <ims:access-permission>READ_WRITE</ims:access-permission>
36        </ims:sharing>
37      </ims:sharings>
38      <ims:links>
39        <ims:link>
40          <ims:metadata
41            ims:identifier="md-1"
42            ims:namespace="http://ims.dei.unipd.it/" />
43          <ims:relation>
44            <ims:concept
45              ims:identifier="isPartOf"
46              ims:namespace="http://ims.dei.unipd.it/" />
47          </ims:relation>
48          <ims:application ims:identifier="app-1" />
49        </ims:link>
50        <ims:link>
51          <ims:metadata
52            ims:identifier="md-2"
53            ims:namespace="http://ims.dei.unipd.it/" />
54          <ims:relation>
55            <ims:concept
56              ims:identifier="isCopyrightOf"
57              ims:namespace="http://ims.dei.unipd.it/" />
58          </ims:relation>
59          <ims:application ims:identifier="app-1" />
60        </ims:link>
61        <ims:link>
62          <ims:metadata
63            ims:identifier="md-3"
64            ims:namespace="http://ims.dei.unipd.it/" />
65          <ims:relation>
66            <ims:concept
67              ims:identifier="isDescriptionOf"
68              ims:namespace="http://ims.dei.unipd.it/" />
69          </ims:relation>
70          <ims:application ims:identifier="app-1" />
71        </ims:link>
72      </ims:links>
73      <ims:configuration ims:identifier="cnf-1" />
```

```
  </ims:application>
</ims:direct>
```

C.12.3 JSON Representation

```
{
   "direct":{
      "application":{
         "identifier":"app-1",
         "name":"Name of app 1",
         "description":"Description of app 1",
         "scope":"SHARED",
         "created":"2012-09-14T10:04:05.310+02:00",
         "last-modified":"2012-09-14T10:04:05.310+02:00",
         "owner":{
            "user":{
               "identifier":"user-1",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "sharings":[
            {
               "sharing":{
                  "group":{
                     "identifier":"group-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"DENIED"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-2",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_ONLY"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-3",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_WRITE"
               }
            }
         ],
         "links":[
            {
               "link":{
                  "metadata":{
                     "identifier":"md-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "relation":{
                     "concept":{
                        "identifier":"isPartOf",
                        "namespace":"http://ims.dei.unipd.it/"
```

```
                    }
                },
                "application":{
                    "identifier":"app-1"
                }
            }
        },
        {
            "link":{
                "metadata":{
                    "identifier":"md-2",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"isCopyrightOf",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "application":{
                    "identifier":"app-1"
                }
            }
        },
        {
            "link":{
                "metadata":{
                    "identifier":"md-3",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"isDescriptionOf",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "application":{
                    "identifier":"app-1"
                }
            }
        }
    ],
    "configuration":{
        "identifier":"cnf-1"
    }
  }
 }
}
```

C.13 Component Resource

Represents a building block of a running System.

C.13.1 API

Action	HTTP Method	URI
CREATE_COMPONENT	POST	/component

Action	HTTP Method	URI
READ_COMPONENT	GET	/component/{id}
UPDATE_COMPONENT	PUT	/component/{id}
DELETE_COMPONENT	DELETE	/component/{id}
LIST_COMPONENTS	GET	/component
LIST_COMPONENTS_PROVENANCE_EVENTS	GET	/component/{id}/provenance
ADD_CONFIGURATION_TO_COMPONENT	POST	/component/{id}/configuration/{id}
REMOVE_CONFIGURATION_FROM_COMPONENT	DELETE	/component/{id}/configuration
READ_CONFIGURATION_FROM_COMPONENT	GET	/component/{id}/configuration
SHARE_COMPONENT	GET, POST, PUT	/component/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_COMPONENT	DELETE	/component/{id}/share/{sharer-id};{sharer-ns}

Table 15: API for accessing the component resource.

where {id} is the unique identifier of the component.

The next two sections show an example of the representation of the results.

C.13.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:component
    ims:identifier="cmp-1"
    ims:created="2012-09-13T17:32:16.787+02:00"
    ims:last-modified="2012-09-13T17:32:16.787+02:00"
    ims:name="Name of component"
    ims:description="Description of the component"
    ims:scope="SHARED">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
```

```
19        <ims:sharing>
20          <ims:group
21            ims:identifier="group-1"
22            ims:namespace="http://ims.dei.unipd.it/" />
23          <ims:access-permission>DENIED</ims:access-permission>
24        </ims:sharing>
25        <ims:sharing>
26          <ims:group
27            ims:identifier="group-2"
28            ims:namespace="http://ims.dei.unipd.it/" />
29          <ims:access-permission>READ_ONLY</ims:access-permission>
30        </ims:sharing>
31        <ims:sharing>
32          <ims:group
33            ims:identifier="group-3"
34            ims:namespace="http://ims.dei.unipd.it/" />
35          <ims:access-permission>READ_WRITE</ims:access-permission>
36        </ims:sharing>
37      </ims:sharings>
38      <ims:links>
39        <ims:link>
40          <ims:metadata
41            ims:identifier="md-1"
42            ims:namespace="http://ims.dei.unipd.it/" />
43          <ims:relation>
44            <ims:concept
45              ims:identifier="isDescriptionOf"
46              ims:namespace="http://ims.dei.unipd.it/" />
47          </ims:relation>
48          <ims:component ims:identifier="cmp-1" />
49        </ims:link>
50        <ims:link>
51          <ims:metadata
52            ims:identifier="md-2"
53            ims:namespace="http://ims.dei.unipd.it/" />
54          <ims:relation>
55            <ims:concept
56              ims:identifier="isCopyrightOf"
57              ims:namespace="http://ims.dei.unipd.it/" />
58          </ims:relation>
59          <ims:component ims:identifier="cmp-1" />
60        </ims:link>
61        <ims:link>
62          <ims:metadata
63            ims:identifier="md-3"
64            ims:namespace="http://ims.dei.unipd.it/" />
65          <ims:relation>
66            <ims:concept
67              ims:identifier="isAdministrationOf"
68              ims:namespace="http://ims.dei.unipd.it/" />
69          </ims:relation>
70          <ims:component ims:identifier="cmp-1" />
71        </ims:link>
72      </ims:links>
73      <ims:concept
74        ims:identifier="cnc-1"
75        ims:namespace="http://ims.dei.unipd.it/" />
76      <ims:configuration ims:identifier="cnf-1" />
77    </ims:component>
78  </ims:direct>
```

C.13.3 JSON Representation

```
{
   "direct":{
      "component":{
         "identifier":"cmp-1",
         "name":"Name of component",
         "description":"Description of the component",
         "scope":"SHARED",
         "created":"2012-09-13T17:32:16.787+02:00",
         "last-modified":"2012-09-13T17:32:16.787+02:00",
         "owner":{
            "user":{
               "identifier":"user-1",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "sharings":[
            {
               "sharing":{
                  "group":{
                     "identifier":"group-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"DENIED"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-2",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_ONLY"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-3",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_WRITE"
               }
            }
         ],
         "links":[
            {
               "link":{
                  "metadata":{
                     "identifier":"md-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "relation":{
                     "concept":{
                        "identifier":"isDescriptionOf",
                        "namespace":"http://ims.dei.unipd.it/"
                     }
                  },
                  "component":{
```

```
                    "identifier":"cmp-1"
                }
            }
        },
        {
            "link":{
                "metadata":{
                    "identifier":"md-2",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"isCopyrightOf",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "component":{
                    "identifier":"cmp-1"
                }
            }
        },
        {
            "link":{
                "metadata":{
                    "identifier":"md-3",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"isAdministrationOf",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "component":{
                    "identifier":"cmp-1"
                }
            }
        }
    ],
    "configuration":{
        "identifier":"cnf-1"
    },
    "concept":{
        "identifier":"cnc-1",
        "namespace":"http://ims.dei.unipd.it/"
    }
  }
 }
}
```


C.14 Configuration Resource

Identifies the configuration of a component, a system or an application under evaluation.

C.14.1 API

Action	HTTP Method	URI
CREATE_CONFIGURATION	POST	/configuration
READ_CONFIGURATION	GET	/configuration/{id}
UPDATE_CONFIGURATION	PUT	/configuration/{id}
DELETE_CONFIGURATION	DELETE	/configuration/{id}
LIST_CONFIGURATIONS	GET	/configuration
LIST_CONFIGURATION_PROVENANCE_EVENTS	GET	/configuration/{id}/provenance

Table 16: API for accessing the configuration resource.

where {id} is the unique identifier of the configuration.

The next two sections show an example of the representation of the results.

C.14.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:configuration
    ims:identifier="c1"
    ims:description="description of the configuration"
    ims:created="2012-09-13T17:59:35.603+02:00"
    ims:last-modified="2012-09-13T17:59:35.603+02:00">
    <ims:parameters>
      <ims:parameter>
        <ims:concept
          ims:identifier="parameterA"
          ims:namespace="http://direct.dei.unipd.it/" />
        <ims:value>value A</ims:value>
      </ims:parameter>
      <ims:parameter>
        <ims:concept
          ims:identifier="parameterB"
          ims:namespace="http://direct.dei.unipd.it/" />
        <ims:value>value B</ims:value>
      </ims:parameter>
      <ims:parameter>
        <ims:concept
          ims:identifier="parameterC"
          ims:namespace="http://direct.dei.unipd.it/" />
        <ims:value>value C</ims:value>
      </ims:parameter>
    </ims:parameters>
  </ims:configuration>
</ims:direct>
```

C.14.3 JSON Representation

```
{
```

```
2    "direct":{
3       "configuration":{
4          "identifier":"c1",
5          "created":"2012-09-13T17:59:35.603+02:00",
6          "last-modified":"2012-09-13T17:59:35.603+02:00",
7          "description":"description of the configuration",
8          "parameters":[
9             {
10               "parameter":{
11                  "concept":{
12                     "identifier":"parameterA",
13                     "namespace":"http://direct.dei.unipd.it/"
14                  },
15                  "value":"value A"
16               }
17            },
18            {
19               "parameter":{
20                  "concept":{
21                     "identifier":"parameterB",
22                     "namespace":"http://direct.dei.unipd.it/"
23                  },
24                  "value":"value B"
25               }
26            },
27            {
28               "parameter":{
29                  "concept":{
30                     "identifier":"parameterC",
31                     "namespace":"http://direct.dei.unipd.it/"
32                  },
33                  "value":"value C"
34               }
35            }
36         ]
37      }
38   }
39 }
```

C.15 Contribution Resource

Refers to a paper (e.g., a conference paper, a working note, a technical report, a journal paper) which has been published or that is publicly available and that its related.

C.15.1 API

Action	HTTP Method	URI
CREATE_CONTRIBUTION	POST	/contribution
READ_CONTRIBUTION	GET	/contribution/{id}
LIST_CONTRIBUTIONS	GET	/contribution
UPDATE_CONTRIBUTION	PUT	/contribution/{id}
DELETE_CONTRIBUTION	DELETE	/contribution/{id}
READ_CONTRIBUTION_CONTENT	GET, POST	/contribution/{id}/content

Action	HTTP Method	URI
UPDATE_CONTRIBUTION_CONTENT	PUT	/contribution/{id}/content
SHARE_CONTRIBUTION_WITH_GROUPS	GET, POST, PUT	/contribution/{id}/share/{id};{ns}/permission/{id}
UNSHARE_CONTRIBUTION_WITH_GROUPS	DELETE	/contribution/{id}/share/{id};{ns}
ADD_METADATA_TO_CONTRIBUTION	GET, POST, PUT	/contribution/{id}/metadata/{id};{ns}/relation/{id};{ns}/score/{value}
REMOVE_METADATA_FROM_CONTRIBUTION	DELETE	/contribution/{id}/metadata/{id};{ns}
LIST_METADATA_RELATED_TO_CONTRIBUTION	GET	/contribution/{id}/metadata
ADD_MEASURE_TO_CONTRIBUTION	POST, PUT	/contribution/{id}/measure
READ_MEASURE_OF_CONTRIBUTION	GET	/contribution/measure/{id}
REMOVE_MEASURE_FROM_CONTRIBUTION	GET	/contribution/measure/{id}
LIST_MEASURE_OF_CONTRIBUTION	GET	/contribution/{id}/measure
RELATE_CONTRIBUTION_TO_CONTRIBUTION	POST, PUT	/contribution/{id}/link/{id}/relation/{id};{ns}/score/{value}/frequency/{value}
UNRELATE_CONTRIBUTION_FROM_CONTRIBUTION	DELETE	/contribution/{id}/link/{id}
LIST_RELATED_CONTRIBUTIONS	GET	/contribution/{id}/link
ADD_FEATURE_TO_CONTRIBUTION	GET, POST, PUT	/contribution/{id}/feature/{id};{ns}/score/{value}
REMOVE_FEATURE_FROM_CONTRIBUTION	DELETE	/contribution/{id}/feature/{id};{ns}
LIST_FEATURED_CONTRIBUTIONS	GET	/contribution/feature/{id};{ns}

Action	HTTP Method	URI
ADD_STATISTIC	GET, POST, PUT	/contribution/{id}/statistic
READ_STATISTIC	GET	/contribution/statistic/{id}
REMOVE_STATISTIC	DELETE	/contribution/statistic/{id}
LIST_STATISTICS	GET	/contribution/{id}/statistic

Table 17: API for accessing the contribution resource.

where {id} is the unique identifier of the contribution.

The next two sections show an example of the representation of the results.

C.15.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:contribution
    ims:identifier="ctb-1"
    ims:created="2012-09-13T18:00:44.675+02:00"
    ims:last-modified="2012-09-13T18:00:44.675+02:00"
    ims:title="title of ctb 1"
    ims:year="2012"
    ims:media-type="application/xml"
    ims:language="ita">
    <ims:authors>
      <ims:user
        ims:identifier="u1"
        ims:namespace="http://ims.dei.unipd.it/" />
      <ims:user
        ims:identifier="u2"
        ims:namespace="http://ims.dei.unipd.it/" />
      <ims:user
        ims:identifier="u3"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:authors>
    <ims:links>
      <ims:link>
        <ims:metadata
          ims:identifier="md-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isDescriptionOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
```

```
35          <ims:contribution ims:identifier="ctb-1" />
36        </ims:link>
37        <ims:link>
38          <ims:metadata
39            ims:identifier="md-2"
40            ims:namespace="http://ims.dei.unipd.it/" />
41          <ims:relation>
42            <ims:concept
43              ims:identifier="isCopyrightOf"
44              ims:namespace="http://ims.dei.unipd.it/" />
45          </ims:relation>
46          <ims:contribution ims:identifier="ctb-1" />
47        </ims:link>
48        <ims:link>
49          <ims:metadata
50            ims:identifier="md-3"
51            ims:namespace="http://ims.dei.unipd.it/" />
52          <ims:relation>
53            <ims:concept
54              ims:identifier="isAdministrativeOf"
55              ims:namespace="http://ims.dei.unipd.it/" />
56          </ims:relation>
57          <ims:contribution ims:identifier="ctb-1" />
58        </ims:link>
59        <ims:link>
60          <ims:contribution ims:identifier="ctb-s1" />
61          <ims:relation>
62            <ims:concept
63              ims:identifier="INCLUDES"
64              ims:namespace="http://ims.dei.unipd.it/" />
65          </ims:relation>
66          <ims:contribution ims:identifier="ctb-1" />
67        </ims:link>
68        <ims:link>
69          <ims:contribution ims:identifier="ctb-s2" />
70          <ims:relation>
71            <ims:concept
72              ims:identifier="INCLUDES"
73              ims:namespace="http://ims.dei.unipd.it/" />
74          </ims:relation>
75          <ims:contribution ims:identifier="ctb-1" />
76        </ims:link>
77        <ims:link>
78          <ims:contribution ims:identifier="ctb-1" />
79          <ims:relation>
80            <ims:concept
81              ims:identifier="IS_INCLUDED_BY"
82              ims:namespace="http://ims.dei.unipd.it/" />
83          </ims:relation>
84          <ims:contribution ims:identifier="ctb-t1" />
85        </ims:link>
86        <ims:link>
87          <ims:contribution ims:identifier="ctb-1" />
88          <ims:relation>
89            <ims:concept
90              ims:identifier="IS_INCLUDED_BY"
91              ims:namespace="http://ims.dei.unipd.it/" />
92          </ims:relation>
93          <ims:contribution ims:identifier="ctb-t2" />
94        </ims:link>
```

```
    </ims:links>
    <ims:content>
      <contribution_content>Flexible and Indepenedent Graphical
        Application </contribution_content>
    </ims:content>
  </ims:contribution>
</ims:direct>
```

C.15.3 JSON Representation

```
{
   "direct":{
      "contribution":{
         "identifier":"ctb-1",
         "created":"2012-09-13T18:00:44.675+02:00",
         "last-modified":"2012-09-13T18:00:44.675+02:00",
         "title":"title of ctb 1",
         "year":"2012",
         "authors":[
            {
               "user":{
                  "identifier":"u1",
                  "namespace":"http://ims.dei.unipd.it/"
               }
            },
            {
               "user":{
                  "identifier":"u2",
                  "namespace":"http://ims.dei.unipd.it/"
               }
            },
            {
               "user":{
                  "identifier":"u3",
                  "namespace":"http://ims.dei.unipd.it/"
               }
            }
         ],
         "media-type":"application/xml",
         "language":"ita",
         "content":{
            "content":"<contribution_content>Flexible and Indepenedent
                  Graphical Application </contribution_content>"
         },
         "links":[
            {
               "link":{
                  "metadata":{
                     "identifier":"md-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "relation":{
                     "concept":{
                        "identifier":"isDescriptionOf",
                        "namespace":"http://ims.dei.unipd.it/"
                     }
                  },
                  "contribution":{
                     "identifier":"ctb-1"
                  }
```

```
            }
         },
         {
            "link":{
               "metadata":{
                  "identifier":"md-2",
                  "namespace":"http://ims.dei.unipd.it/"
               },
               "relation":{
                  "concept":{
                     "identifier":"isCopyrightOf",
                     "namespace":"http://ims.dei.unipd.it/"
                  }
               },
               "contribution":{
                  "identifier":"ctb-1"
               }
            }
         },
         {
            "link":{
               "metadata":{
                  "identifier":"md-3",
                  "namespace":"http://ims.dei.unipd.it/"
               },
               "relation":{
                  "concept":{
                     "identifier":"isAdministrativeOf",
                     "namespace":"http://ims.dei.unipd.it/"
                  }
               },
               "contribution":{
                  "identifier":"ctb-1"
               }
            }
         },
         {
            "link":{
               "contribution":{
                  "identifier":"ctb-s1"
               },
               "relation":{
                  "concept":{
                     "identifier":"INCLUDES",
                     "namespace":"http://ims.dei.unipd.it/"
                  }
               },
               "contribution":{
                  "identifier":"ctb-1"
               }
            }
         },
         {
            "link":{
               "contribution":{
                  "identifier":"ctb-s2"
               },
               "relation":{
                  "concept":{
                     "identifier":"INCLUDES",
```

```
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "contribution":{
                    "identifier":"ctb-1"
                }
            }
        },
        {
            "link":{
                "contribution":{
                    "identifier":"ctb-1"
                },
                "relation":{
                    "concept":{
                        "identifier":"IS_INCLUDED_BY",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "contribution":{
                    "identifier":"ctb-t1"
                }
            }
        },
        {
            "link":{
                "contribution":{
                    "identifier":"ctb-1"
                },
                "relation":{
                    "concept":{
                        "identifier":"IS_INCLUDED_BY",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "contribution":{
                    "identifier":"ctb-t2"
                }
            }
        }
    ]
  }
 }
}
```

C.16 Corpus Resource

Represents a set of informative units, which allows us to perform a series of investigations in a research area.

C.16.1 API

Action	HTTP Method	URI
CREATE_CORPUS	POST	/corpus
READ_CORPUS	GET	/corpus/{id}

Action	HTTP Method	URI
UPDATE_CORPUS	PUT	/corpus/{id}
DELETE_CORPUS	DELETE	/corpus/{id}
LIST_CORPORA	GET	/corpus
CREATE_CORPUS_PROVENANCE_PARTITION	GET	/corpus/provenance/{year}
DETACH_CORPUS_PROVENANCE_PARTITION	DELETE	/corpus/provenance/{year}
LIST_CORPUS_PROVENANCE_EVENTS	GET	/corpus/{id}/provenance
ADD_INFORMATION_UNIT_TO_CORPUS ***** non presente nel restManager *****	POST	/corpus/{id}/information-unit/{id}
REMOVE_INFORMATION_UNIT_FROM_CORPUS ***** non presente nel restManager *****	DELETE	/corpus/{id}/information-unit/{id}
LIST_INFORMATION_UNIT_FROM_CORPUS ***** non presente nel restManager *****	GET	/corpus/{id}/information-unit
ADD_CONTRIBUTION_TO_CORPUS ***** non presente nel restManager *****	POST	/corpus/{id}/contribution/{id}
REMOVE_CONTRIBUTION_FROM_CORPUS ***** non presente nel restManager *****	DELETE	/corpus/{id}/contribution/{id}
LIST_CONTRIBUTION_FROM_CORPUS ***** non presente nel restManager *****	GET	/corpus/{id}/contribution
SHARE_CORPUS	GET, POST, PUT	/corpus/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_CORPUS	DELETE	/corpus/{id}/share/{sharer-id};{sharer-ns}

Action	HTTP Method	URI
RELATE_METADATA_TO_CORPUS	GET, POST, PUT	/corpus/{source-id}/link/{target-id};{target-ns}/relation/{relation-id};{relation-ns}
RELATE_METADATA_TO_CORPUS	GET, POST, PUT	/corpus/{source-id}/link/{target-id};{target-ns}
UNRELATE_METADATA_FROM_CORPUS	DELETE	/corpus/{source-id}/link/{target-id};{target-ns}/relation/{relation-id};{relation-ns}
UNRELATE_METADATA_FROM_CORPUS	DELETE	/corpus/{source-id}/link/{target-id};{target-ns}

Table 18: API for accessing the corpus resource.

where {id} is the unique identifier of the corpus.

The next two sections show an example of the representation of the results.

C.16.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:corpus
    ims:identifier="c1"
    ims:description="Description of corpus, e.g. Wall Street Journal, 1987"
    ims:scope="SHARED"
    ims:created="2012-09-13T18:02:04.035+02:00"
    ims:last-modified="2012-09-13T18:02:04.035+02:00">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
      <ims:sharing>
        <ims:group
          ims:identifier="group-1"
          ims:namespace="http://ims.dei.unipd.it/" />
```

```
22          <ims:access-permission>DENIED</ims:access-permission>
23        </ims:sharing>
24        <ims:sharing>
25          <ims:group
26            ims:identifier="group-2"
27            ims:namespace="http://ims.dei.unipd.it/" />
28          <ims:access-permission>READ_ONLY</ims:access-permission>
29        </ims:sharing>
30        <ims:sharing>
31          <ims:group
32            ims:identifier="group-3"
33            ims:namespace="http://ims.dei.unipd.it/" />
34          <ims:access-permission>READ_WRITE</ims:access-permission>
35        </ims:sharing>
36      </ims:sharings>
37      <ims:links>
38        <ims:link>
39          <ims:metadata
40            ims:identifier="md-1"
41            ims:namespace="http://ims.dei.unipd.it/" />
42          <ims:relation>
43            <ims:concept
44              ims:identifier="isDescriptionOf"
45              ims:namespace="http://ims.dei.unipd.it/" />
46          </ims:relation>
47          <ims:corpus ims:identifier="c1" />
48        </ims:link>
49        <ims:link>
50          <ims:metadata
51            ims:identifier="md-2"
52            ims:namespace="http://ims.dei.unipd.it/" />
53          <ims:relation>
54            <ims:concept
55              ims:identifier="isCopyrightOf"
56              ims:namespace="http://ims.dei.unipd.it/" />
57          </ims:relation>
58          <ims:corpus ims:identifier="c1" />
59        </ims:link>
60        <ims:link>
61          <ims:metadata
62            ims:identifier="md-3"
63            ims:namespace="http://ims.dei.unipd.it/" />
64          <ims:relation>
65            <ims:concept
66              ims:identifier="isAdministrationOf"
67              ims:namespace="http://ims.dei.unipd.it/" />
68          </ims:relation>
69          <ims:corpus ims:identifier="c1" />
70        </ims:link>
71      </ims:links>
72      <ims:media-types>
73        <ims:media-type>application/atom+xml;charset=ISO-8859-1</ims:media-type>
74        <ims:media-type>application/json</ims:media-type>
75      </ims:media-types>
76      <ims:languages>
77        <ims:language>ita</ims:language>
78        <ims:language>eng</ims:language>
79        <ims:language>fra</ims:language>
80      </ims:languages>
81    </ims:corpus>
```

```
</ims:direct>
```

C.16.3 JSON Representation

```
{
   "direct":{
      "corpus":{
         "identifier":"c1",
         "description":"Description of corpus, e.g. Wall Street Journal, 1987",
         "scope":"SHARED",
         "created":"2012-09-13T18:02:04.035+02:00",
         "last-modified":"2012-09-13T18:02:04.035+02:00",
         "owner":{
            "user":{
               "identifier":"user-1",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "sharings":[
            {
               "sharing":{
                  "group":{
                     "identifier":"group-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"DENIED"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-2",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_ONLY"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-3",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_WRITE"
               }
            }
         ],
         "links":[
            {
               "link":{
                  "metadata":{
                     "identifier":"md-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "relation":{
                     "concept":{
                        "identifier":"isDescriptionOf",
                        "namespace":"http://ims.dei.unipd.it/"
                     }
                  },
```

```
                    "corpus":{
                        "identifier":"c1"
                    }
                }
            },
            {
                "link":{
                    "metadata":{
                        "identifier":"md-2",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "relation":{
                        "concept":{
                            "identifier":"isCopyrightOf",
                            "namespace":"http://ims.dei.unipd.it/"
                        }
                    },
                    "corpus":{
                        "identifier":"c1"
                    }
                }
            },
            {
                "link":{
                    "metadata":{
                        "identifier":"md-3",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "relation":{
                        "concept":{
                            "identifier":"isAdministrationOf",
                            "namespace":"http://ims.dei.unipd.it/"
                        }
                    },
                    "corpus":{
                        "identifier":"c1"
                    }
                }
            }
        ],
        "languages":[
            {
                "language":"ita"
            },
            {
                "language":"eng"
            },
            {
                "language":"fra"
            }
        ],
        "media-types":[
            {
                "media-type":"application/atom+xml;charset=ISO-8859-1"
            },
            {
                "media-type":"application/json"
            }
        ]
    }
```

```
117     }
118 }
```

C.17 Estimate Resource

Represents the value of a Metric (which is represented by means of a Concept) calculated on some Experiment handled by the infrastructure.

C.17.1 API

Action	HTTP Method	URI
CREATE_ESTIMATE	POST	/estimate
READ_ESTIMATE	GET	/estimate/{id}
READ_ESTIMATE	GET	/task/{tskid}/topic/{tpcid}/descriptive-statistic/{dsid};{dsns}/metric/{mtcid};{mtcns}/estimate
READ_ESTIMATE	GET	/run/{runid}/descriptive-statistic/{dsid};{dsns}/metric/{mtcid};{mtcns}/estimate
UPDATE_ESTIMATE	PUT	/estimate/{id}
DELETE_ESTIMATE	DELETE	/estimate/{id}
LIST_ESTIMATES	GET	/estimate
LIST_ESTIMATES	GET	/task/{tskid}/estimate
LIST_ESTIMATES	GET	/task/{tskid}/topic/{tpcid}/estimate
LIST_ESTIMATES	GET	/task/{tskid}/metric/{mtcid};{mtcns}/estimate
LIST_ESTIMATES	GET	/task/{tskid}/descriptive-statistic/{dsid};{dsns}/estimate
LIST_ESTIMATES	GET	/task/{tskid}/topic/{tpcid}/descriptive-statistic/{dsid};{dsns}/estimate
LIST_ESTIMATES	GET	/task/{tskid}/descriptive-statistic/{dsid};{dsns}/metric/{mtcid};{mtcns}/estimate

Action	HTTP Method	URI
LIST_ESTIMATES	GET	/task/{tskid}/topic/{tpcid}/metric/{mtcid};{mtcns}/estimate
LIST_ESTIMATES	GET	/descriptive-statistic/{dsid};{dsns}/metric/{mtcid};{mtcns}/estimate
LIST_ESTIMATES	GET	/run/{runid}/estimate
LIST_ESTIMATES	GET	/run/{runid}/descriptive-statistic/{dsid};{dsns}/estimate
LIST_ESTIMATES	GET	/run/{runid}/metric/{mtcid};{mtcns}/estimate
CREATE_ESTIMATE_PROVENANCE_PARTITION	GET	/estimate/provenance/{year}
DETACH_ESTIMATE_PROVENANCE_PARTITION	DELETE	/estimate/provenance/{year}
LIST_ESTIMATE_PROVENANCE_EVENTS	GET	/estimate/{id}/provenance

Table 19: API for accessing the estimate resource.

where {id} is the unique identifier of the estimate.

The next two sections show an example of the representation of the results.

C.17.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:estimate
    ims:identifier="est-1"
    ims:value="0.1"
    ims:created="2012-09-13T18:04:32.133+02:00"
    ims:last-modified="2012-09-13T18:04:32.133+02:00">
    <ims:descriptive-statistic>
      <ims:concept
        ims:identifier="ds-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:descriptive-statistic>
    <ims:metric>
      <ims:concept
        ims:identifier="mtc-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:metric>
    <ims:run ims:identifier="run-1" />
    <ims:task ims:identifier="tsk-1" />
    <ims:topic ims:identifier="tpc-1" />
```

```
  </ims:estimate>
</ims:direct>
```

C.17.3 JSON Representation

```
{
   "direct":{
      "estimate":{
         "identifier":"est-1",
         "created":"2012-09-13T18:04:32.133+02:00",
         "last-modified":"2012-09-13T18:04:32.133+02:00",
         "value":"0.1",
         "descriptive-statistic":{
            "concept":{
               "identifier":"ds-1",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "metric":{
            "concept":{
               "identifier":"mtc-1",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "run":{
            "identifier":"run-1"
         },
         "task":{
            "identifier":"tsk-1"
         },
         "topic":{
            "identifier":"tpc-1"
         }
      }
   }
}
```

C.18 Evaluation Activity Resource

Represents any type of activity aiming at the evaluation of applications, systems, or methodologies for information access.

C.18.1 API

Action	HTTP Method	URI
CREATE_EVALUATION-ACTIVITY	POST	/evaluation-activity
READ_EVALUATION-ACTIVITY	GET	/evaluation-activity/{id};{ns}
READ_EVALUATION-ACTIVITY	GET	/task/{id}/evaluation-activity
READ_EVALUATION-ACTIVITY	GET	/track/{id}/evaluation-activity

Action	HTTP Method	URI
UPDATE_EVALUATION-ACTIVITY	PUT	/evaluation-activity/{id};{ns}
DELETE_EVALUATION-ACTIVITY	DELETE	/evaluation-activity/{id};{ns}
LIST_EVALUATION-ACTIVITIES	GET	/evaluation-activity
CREATE_EVALUATION_ACTIVITY_PROVENANCE_PARTITION	GET	/evaluation-activity/provenance/{year}
DETACH_EVALUATION_ACTIVITY_PROVENANCE_PARTITION	GET	/evaluation-activity/provenance/{year}
LIST_EVALUATION-ACTIVITY_PROVENANCE_EVENTS	GET	/evaluation-activity/{id};{ns}/provenance
ADD_TRACK_TO_EVALUATION_ACTIVITY	GET, PUT, POST	/evaluation-activity/{id};{ns}/track/{id}
REMOVE_TRACK_FROM_EVALUATION_ACTIVITY	DELETE	/evaluation-activity/{id};{ns}/track/{id}
ADD_TASK_TO_EVALUATION_ACTIVITY	POST	/evaluation-activity/{id};{ns}/task/{id}
REMOVE_TASK_FROM_EVALUATION_ACTIVITY	DELETE	/evaluation-activity/{id};{ns}/task/{id}
SHARE_EVALUATION_ACTIVITY	GET, POST, PUT	/evaluation-activity/{id};{ns}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_EVALUATION_ACTIVITY	DELETE	/evaluation-activity/{id};{ns}/share/{sharer-id};{sharer-ns}
RELATE_METADATA_TO_EVALUATION_ACTIVITY	GET, POST, PUT	/evaluation-activity/{source-id};{source-ns}/link/{target-id};{target-ns}/relation/{relation-id};{relation-ns}

Action	HTTP Method	URI
RELATE_METADATA_TO_EVALUATION_ACTIVITY	GET, POST, PUT	/evaluation-activity/{source-id};{source-ns}/link/{target-id};{target-ns}
UNRELATE_METADATA_FROM_EVALUATION_ACTIVITY	DELETE	/evaluation-activity/{source-id};{source-ns}/link/{target-id};{target-ns}/relation/{relation-id};{relation-ns}
UNRELATE_METADATA_FROM_EVALUATION_ACTIVITY	DELETE	/evaluation-activity/{source-id};{source-ns}/link/{target-id};{target-ns}

Table 20: API for accessing the evaluation-activity resource.

where {id} is the unique identifier of the evaluation-activity and {ns} is the namespace to which the evaluation-activity belongs.

The next two sections show an example of the representation of the results.

C.18.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:evaluation-activity
    ims:identifier="ea-1"
    ims:namespace="http://ims.dei.unipd.it/"
    ims:name="Name of evaluation activity 1"
    ims:description="Description of evaluation activity, e.g. CLEF 2012"
    ims:status="AVAILABLE"
    ims:scope="SHARED"
    ims:created="2012-09-13T18:12:34.954+02:00"
    ims:last-modified="2012-09-13T18:12:34.954+02:00">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
```

```
      <ims:sharing>
        <ims:group
          ims:identifier="group-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>DENIED</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_ONLY</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_WRITE</ims:access-permission>
      </ims:sharing>
    </ims:sharings>
    <ims:links>
      <ims:link>
        <ims:metadata
          ims:identifier="md-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isDescriptionOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:evaluation-activity ims:identifier="ea-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isCopyrightOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:evaluation-activity ims:identifier="ea-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isAdministrationOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:evaluation-activity ims:identifier="ea-1" />
      </ims:link>
    </ims:links>
  </ims:evaluation-activity>
</ims:direct>
```

C.18.3 JSON Representation

```
{
```

```
"direct":{
   "evaluation-activity":{
      "identifier":"ea-1",
      "namespace":"http://ims.dei.unipd.it/",
      "name":"Name of evaluation activity 1",
      "description":"Description of evaluation activity, e.g. CLEF 2012",
      "status":"AVAILABLE",
      "scope":"SHARED",
      "created":"2012-09-13T18:12:34.954+02:00",
      "last-modified":"2012-09-13T18:12:34.954+02:00",
      "owner":{
         "user":{
            "identifier":"user-1",
            "namespace":"http://ims.dei.unipd.it/"
         }
      },
      "sharings":[
         {
            "sharing":{
               "group":{
                  "identifier":"group-1",
                  "namespace":"http://ims.dei.unipd.it/"
               },
               "access-permission":"DENIED"
            }
         },
         {
            "sharing":{
               "group":{
                  "identifier":"group-2",
                  "namespace":"http://ims.dei.unipd.it/"
               },
               "access-permission":"READ_ONLY"
            }
         },
         {
            "sharing":{
               "group":{
                  "identifier":"group-3",
                  "namespace":"http://ims.dei.unipd.it/"
               },
               "access-permission":"READ_WRITE"
            }
         }
      ],
      "links":[
         {
            "link":{
               "metadata":{
                  "identifier":"md-1",
                  "namespace":"http://ims.dei.unipd.it/"
               },
               "relation":{
                  "concept":{
                     "identifier":"isDescriptionOf",
                     "namespace":"http://ims.dei.unipd.it/"
                  }
               },
               "evaluation-activity":{
                  "identifier":"ea-1"
```

```
                    }
                }
            },
            {
                "link":{
                    "metadata":{
                        "identifier":"md-2",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "relation":{
                        "concept":{
                            "identifier":"isCopyrightOf",
                            "namespace":"http://ims.dei.unipd.it/"
                        }
                    },
                    "evaluation-activity":{
                        "identifier":"ea-1"
                    }
                }
            },
            {
                "link":{
                    "metadata":{
                        "identifier":"md-3",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "relation":{
                        "concept":{
                            "identifier":"isAdministrationOf",
                            "namespace":"http://ims.dei.unipd.it/"
                        }
                    },
                    "evaluation-activity":{
                        "identifier":"ea-1"
                    }
                }
            }
        ]
    }
  }
}
```

C.19 Campaign Resource

Deals with the different aspects of an evaluation forum, such as the different campaigns and the different editions, the tracks along which the campaign is organized and the tasks in which each track is divided. A peculiar characteristic of a Campaign is to be a public and shared activity that may be undertaken by accademic, commercial ad governmental groups that are interested in the activity organized and structured by a third-party body. The concept of campaign derives from the traditional IR view of an evaluation activity on which basis the major international evaluation initiatives (e.g. TREC, CLEF and NTCIR) rely.

C.19.1 API

Action	HTTP Method	URI
CREATE_CAMPAIGN	POST	/campaign
READ_CAMPAIGN	GET	/campaign/{id};{ns}
UPDATE_CAMPAIGN	PUT	/campaign/{id};{ns}
DELETE_CAMPAIGN	DELETE	/campaign/{id};{ns}
LIST_CAMPAIGNS	GET	/campaign
LIST_CAMPAIGN_PROVENANCE_EVENTS	GET	/campaign/{id};{ns}/provenance
ADD_CONTRIBUTION_TO_CAMPAIGN	POST	/campaign/{id};{ns}/contribution/{id}
REMOVE_CONTRIBUTION_FROM_CAMPAIGN	DELETE	/campaign/{id};{ns}/contribution/{id}
LIST_CONTRIBUTION_FROM_CAMPAIGN	GET	/campaign/{id};{ns}/contribution
ADD_TASK_TO_CAMPAIGN	POST	/campaign/{id};{ns}/task/{id}
REMOVE_TASK_FROM_CAMPAIGN	DELETE	/campaign/{id};{ns}/task/{id}
LIST_TASK_FROM_CAMPAIGN	GET	/campaign/{id};{ns}/task
ADD_TRACK_TO_CAMPAIGN	POST	/campaign/{id};{ns}/track/{id}
REMOVE_TRACK_FROM_CAMPAIGN	DELETE	/campaign/{id};{ns}/track/{id}
LIST_TRACK_FROM_CAMPAIGN	GET	/campaign/{id};{ns}/track
SHARE_TRACK	GET, POST, PUT	/track/{id};{ns}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_TRACK	DELETE	/track/{id};{ns}/share/{sharer-id};{sharer-ns}

Table 21: API for accessing the campaign resource.

where {id} is the unique identifier of the campaign and {ns} is the namespace to which the campaign belongs.

The next two sections show an example of the representation of the results.

C.19.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:campaign
    ims:identifier="c-1"
    ims:namespace="http://ims.dei.unipd.it/"
    ims:name="Name of campaign 1"
    ims:description="Description of campaign 1"
    ims:status="AVAILABLE"
    ims:scope="SHARED"
    ims:created="2012-09-13T18:12:34.955+02:00"
    ims:last-modified="2012-09-13T18:12:34.955+02:00">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
      <ims:sharing>
        <ims:group
          ims:identifier="group-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>DENIED</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_ONLY</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_WRITE</ims:access-permission>
      </ims:sharing>
    </ims:sharings>
    <ims:links>
      <ims:link>
        <ims:metadata
          ims:identifier="md-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isDescriptionOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:evaluation-activity ims:identifier="c-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isCopyrightOf"
```

```
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:evaluation-activity ims:identifier="c-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isAdministrationOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:evaluation-activity ims:identifier="c-1" />
      </ims:link>
    </ims:links>
  </ims:campaign>
</ims:direct>
```

C.19.3 JSON Representation

```
{
   "direct":{
      "campaign":{
         "identifier":"c-1",
         "namespace":"http://ims.dei.unipd.it/",
         "name":"Name of campaign 1",
         "description":"Description of campaign 1",
         "status":"AVAILABLE",
         "scope":"SHARED",
         "created":"2012-09-13T18:12:34.955+02:00",
         "last-modified":"2012-09-13T18:12:34.955+02:00",
         "owner":{
            "user":{
               "identifier":"user-1",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "sharings":[
            {
               "sharing":{
                  "group":{
                     "identifier":"group-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"DENIED"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-2",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_ONLY"
               }
            },
            {
               "sharing":{
                  "group":{
```

```
                    "identifier":"group-3",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "access-permission":"READ_WRITE"
            }
        }
    ],
    "links":[
        {
            "link":{
                "metadata":{
                    "identifier":"md-1",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"isDescriptionOf",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "evaluation-activity":{
                    "identifier":"c-1"
                }
            }
        },
        {
            "link":{
                "metadata":{
                    "identifier":"md-2",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"isCopyrightOf",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "evaluation-activity":{
                    "identifier":"c-1"
                }
            }
        },
        {
            "link":{
                "metadata":{
                    "identifier":"md-3",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"isAdministrationOf",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "evaluation-activity":{
                    "identifier":"c-1"
                }
            }
        }
    ]
```

```
100         }
101     }
102 }
```

C.20 Education Resource

Represents an evaluation activity carried out for educational purposes.

C.20.1 API

Action	HTTP Method	URI
CREATE_EDUCATION	POST	/education
READ_EDUCATION	GET	/education/{id};{ns}
UPDATE_EDUCATION	PUT	/education/{id};{ns}
DELETE_EDUCATION	DELETE	/education/{id};{ns}
LIST_EDUCATIONS	GET	/education
LIST_EDUCATION_PROVENANCE_EVENTS	GET	/education/{id};{ns}/provenance
ADD_CONTRIBUTION_TO_EDUCATION	POST	/education/{id};{ns}/contribution/{id}
REMOVE_CONTRIBUTION_FROM_EDUCATION	DELETE	/education/{id};{ns}/contribution/{id}
LIST_CONTRIBUTION_FROM_EDUCATION	GET	/education/{id};{ns}/contribution
ADD_TASK_TO_EDUCATION	POST	/education/{id};{ns}/task/{id}
REMOVE_TASK_FROM_EDUCATION	DELETE	/education/{id};{ns}/task/{id}
LIST_TASK_FROM_EDUCATION	GET	/education/{id};{ns}/task
SHARE_EDUCATION	GET, POST, PUT	/education/{id};{ns}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_EDUCATION	DELETE	/education/{id};{ns}/share/{sharer-id};{sharer-ns}

Action	HTTP Method	URI

Table 22: API for accessing the education resource.

where {id} is the unique identifier of the education and {ns} is the namespace to which the education belongs.

The next two sections show an example of the representation of the results.

C.20.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:education
    ims:identifier="edu-1"
    ims:namespace="http://ims.dei.unipd.it/"
    ims:name="Name of education 1"
    ims:description="Description of education 1"
    ims:status="AVAILABLE"
    ims:scope="SHARED"
    ims:created="2012-09-13T18:12:34.955+02:00"
    ims:last-modified="2012-09-13T18:12:34.955+02:00">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
      <ims:sharing>
        <ims:group
          ims:identifier="group-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>DENIED</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_ONLY</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_WRITE</ims:access-permission>
      </ims:sharing>
    </ims:sharings>
    <ims:links>
      <ims:link>
        <ims:metadata
          ims:identifier="md-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
```

```
            ims:identifier="isDescriptionOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:evaluation-activity ims:identifier="edu-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isCopyrightOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:evaluation-activity ims:identifier="edu-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isAdministrationOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:evaluation-activity ims:identifier="edu-1" />
      </ims:link>
    </ims:links>
  </ims:education>
</ims:direct>
```

C.20.3 JSON Representation

```
{
   "direct":{
      "education":{
         "identifier":"edu-1",
         "namespace":"http://ims.dei.unipd.it/",
         "name":"Name of education 1",
         "description":"Description of education 1",
         "status":"AVAILABLE",
         "scope":"SHARED",
         "created":"2012-09-13T18:12:34.955+02:00",
         "last-modified":"2012-09-13T18:12:34.955+02:00",
         "owner":{
            "user":{
               "identifier":"user-1",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "sharings":[
            {
               "sharing":{
                  "group":{
                     "identifier":"group-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"DENIED"
               }
            },
```

```
            {
                "sharing":{
                    "group":{
                        "identifier":"group-2",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "access-permission":"READ_ONLY"
                }
            },
            {
                "sharing":{
                    "group":{
                        "identifier":"group-3",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "access-permission":"READ_WRITE"
                }
            }
        ],
        "links":[
            {
                "link":{
                    "metadata":{
                        "identifier":"md-1",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "relation":{
                        "concept":{
                            "identifier":"isDescriptionOf",
                            "namespace":"http://ims.dei.unipd.it/"
                        }
                    },
                    "evaluation-activity":{
                        "identifier":"edu-1"
                    }
                }
            },
            {
                "link":{
                    "metadata":{
                        "identifier":"md-2",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "relation":{
                        "concept":{
                            "identifier":"isCopyrightOf",
                            "namespace":"http://ims.dei.unipd.it/"
                        }
                    },
                    "evaluation-activity":{
                        "identifier":"edu-1"
                    }
                }
            },
            {
                "link":{
                    "metadata":{
                        "identifier":"md-3",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
```

```
                    "relation":{
                        "concept":{
                            "identifier":"isAdministrationOf",
                            "namespace":"http://ims.dei.unipd.it/"
                        }
                    },
                    "evaluation-activity":{
                        "identifier":"edu-1"
                    }
                }
            }
        ]
    }
}
```

C.21 Trial Resource

Represents an evaluation activity that may be actively run by a research group, a person or a corporate body for their own interest.

C.21.1 API

Action	HTTP Method	URI
CREATE_TRIAL	POST	/trial
READ_TRIAL	GET	/trial/{id};{ns}
UPDATE_TRIAL	PUT	/trial/{id};{ns}
DELETE_TRIAL	DELETE	/trial/{id};{ns}
LIST_TRIALS	GET	/trial
LIST_TRIAL_PROVENANCE_EVENTS	GET	/trial/{id};{ns}/provenance
ADD_CONTRIBUTION_TO_TRIAL	POST	/trial/{id};{ns}/contribution/{id}
REMOVE_CONTRIBUTION_FROM_TRIAL	DELETE	/trial/{id};{ns}/contribution/{id}
LIST_CONTRIBUTION_FROM_TRIAL	GET	/trial/{id};{ns}/contribution
ADD_TASK_TO_TRIAL	POST	/trial/{id};{ns}/task/{id}
REMOVE_TASK_FROM_TRIAL	DELETE	/trial/{id};{ns}/task/{id}
LIST_TASK_FROM_TRIAL	GET	/trial/{id};{ns}/task

Action	HTTP Method	URI
SHARE_TRAIL	GET, POST, PUT	/trial/{id};{ns}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_TRIAL	DELETE	/trial/{id};{ns}/share/{sharer-id};{sharer-ns}

Table 23: API for accessing the trial resource.

where {id} is the unique identifier of the trial and {ns} is the namespace to which the trial belongs.

The next two sections show an example of the representation of the results.

C.21.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:trial
    ims:identifier="t-1"
    ims:namespace="http://ims.dei.unipd.it/"
    ims:name="Name of trial 1"
    ims:description="Description of trial 1"
    ims:status="AVAILABLE"
    ims:scope="SHARED"
    ims:created="2012-09-13T18:12:34.955+02:00"
    ims:last-modified="2012-09-13T18:12:34.955+02:00">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
      <ims:sharing>
        <ims:group
          ims:identifier="group-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>DENIED</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_ONLY</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-3"
          ims:namespace="http://ims.dei.unipd.it/" />
```

```
        <ims:access-permission>READ_WRITE</ims:access-permission>
      </ims:sharing>
    </ims:sharings>
    <ims:links>
      <ims:link>
        <ims:metadata
          ims:identifier="md-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isDescriptionOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:evaluation-activity ims:identifier="t-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isCopyrightOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:evaluation-activity ims:identifier="t-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isAdministrationOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:evaluation-activity ims:identifier="t-1" />
      </ims:link>
    </ims:links>
  </ims:trial>
</ims:direct>
```

C.21.3 JSON Representation

```
{
   "direct":{
      "trial":{
         "identifier":"t-1",
         "namespace":"http://ims.dei.unipd.it/",
         "name":"Name of trial 1",
         "description":"Description of trial 1",
         "status":"AVAILABLE",
         "scope":"SHARED",
         "created":"2012-09-13T18:12:34.955+02:00",
         "last-modified":"2012-09-13T18:12:34.955+02:00",
         "owner":{
            "user":{
               "identifier":"user-1",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
```

```
"sharings":[
   {
      "sharing":{
         "group":{
            "identifier":"group-1",
            "namespace":"http://ims.dei.unipd.it/"
         },
         "access-permission":"DENIED"
      }
   },
   {
      "sharing":{
         "group":{
            "identifier":"group-2",
            "namespace":"http://ims.dei.unipd.it/"
         },
         "access-permission":"READ_ONLY"
      }
   },
   {
      "sharing":{
         "group":{
            "identifier":"group-3",
            "namespace":"http://ims.dei.unipd.it/"
         },
         "access-permission":"READ_WRITE"
      }
   }
],
"links":[
   {
      "link":{
         "metadata":{
            "identifier":"md-1",
            "namespace":"http://ims.dei.unipd.it/"
         },
         "relation":{
            "concept":{
               "identifier":"isDescriptionOf",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "evaluation-activity":{
            "identifier":"t-1"
         }
      }
   },
   {
      "link":{
         "metadata":{
            "identifier":"md-2",
            "namespace":"http://ims.dei.unipd.it/"
         },
         "relation":{
            "concept":{
               "identifier":"isCopyrightOf",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "evaluation-activity":{
```

```
                    "identifier":"t-1"
                }
            }
        },
        {
            "link":{
                "metadata":{
                    "identifier":"md-3",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"isAdministrationOf",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "evaluation-activity":{
                    "identifier":"t-1"
                }
            }
        }
    ]
  }
 }
}
```

C.22 Experimental Collection Resource

Represents a logical entity that allows us to set up a traditional IR evaluation environment.

C.22.1 API

Action	HTTP Method	URI
CREATE_EXPERIMENTAL_COLLECTION	POST	/experimental-collection
READ_EXPERIMENTAL_COLLECTION	GET	/experimental-collection/{id}
UPDATE_EXPERIMENTAL_COLLECTION	PUT	/experimental-collection/{id}
DELETE_EXPERIMENTAL_COLLECTION	DELETE	/experimental-collection/{id}
LIST_EXPERIMENTAL_COLLECTIONS	GET	/experimental-collection
LIST_EXPERIMENTAL_COLLECTION_PROVENANCE_EVENTS	GET	/experimental-collection/{id}/provenance
ADD_CONTRIBUTION_TO_EXPERIMENTAL_COLLECTION	POST	/experimental-collection/{id}/contribution/{id}
REMOVE_CONTRIBUTION_FROM_EXPERIMENTAL_COLLECTION	DELETE	/experimental-collection/{id}/contribution/{id}
LIST_CONTRIBUTION_FROM_EXPERIMENTAL_COLLECTION	GET	/experimental-collection/{id}/contribution
ADD_CORPUS_TO_EXPERIMENTAL_COLLECTION	POST	/experimental-collection/{id}/corpus/{id}
REMOVE_CORPUS_FROM_EXPERIMENTAL_COLLECTION	DELETE	/experimental-collection/{id}/corpus/{id}

Action	HTTP Method	URI
LIST_CORPUS_FROM_EXPERIMENTAL_COLLECTION	GET	/experimental-collection/{id}/corpus
ADD_TASK_TO_EXPERIMENTAL_COLLECTION	POST	/experimental-collection/{id}/task/{id}
REMOVE_TASK_FROM_EXPERIMENTAL_COLLECTION	DELETE	/experimental-collection/{id}/task/{id}
LIST_TASK_FROM_EXPERIMENTAL_COLLECTION	GET	/experimental-collection/{id}/task
ADD_TOPIC_GROUP_TO_EXPERIMENTAL_COLLECTION	POST	/experimental-collection/{id}/topic-group/{id}
REMOVE_TOPIC_GROUP_FROM_EXPERIMENTAL_COLLECTION	DELETE	/experimental-collection/{id}/topic-group/{id}
LIST_TOPIC_GROUP_FROM_EXPERIMANTAL_COLLECTION	GET	/experimental-collection/{id}/topic-group
SHARE_EXPERIMENTAL_COLLECTION	GET, POST, PUT	/experimental-collection/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_EXPERIMENTAL_COLLECTION	DELETE	/experimental-collection/{id}/share/{sharer-id};{sharer-ns}

Table 24: API for accessing the experimental-collection resource.

where {id} is the unique identifier of the experimental-collection.

The next two sections show an example of the representation of the results.

C.22.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:experimental-collection
    ims:identifier="ec-1"
    ims:description="description of experimental collection"
    ims:scope="SHARED"
    ims:created="2012-09-13T18:25:15.595+02:00"
    ims:last-modified="2012-09-13T18:25:15.595+02:00">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
      <ims:sharing>
        <ims:group
          ims:identifier="group-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>DENIED</ims:access-permission>
      </ims:sharing>
```

```
      <ims:sharing>
        <ims:group
          ims:identifier="group-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_ONLY</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_WRITE</ims:access-permission>
      </ims:sharing>
    </ims:sharings>
    <ims:links>
      <ims:link>
        <ims:metadata
          ims:identifier="md-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isDescriptionOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:experimental-collection
          ims:identifier="ec-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isCopyrightOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:experimental-collection
          ims:identifier="ec-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isAdministrationOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:experimental-collection
          ims:identifier="ec-1" />
      </ims:link>
    </ims:links>
    <ims:topic-group ims:identifier="tg1" />
    <ims:corpora>
      <ims:corpus ims:identifier="c1" />
      <ims:corpus ims:identifier="c2" />
      <ims:corpus ims:identifier="c3" />
      <ims:corpus ims:identifier="c4" />
    </ims:corpora>
    <ims:ground-truth ims:identifier="gt1" />
  </ims:experimental-collection>
```

```
</ims:direct>
```

C.22.3 JSON Representation

```
{
   "direct":{
      "experimental-collection":{
         "identifier":"ec-1",
         "description":"description of experimental collection",
         "scope":"SHARED",
         "created":"2012-09-13T18:25:15.595+02:00",
         "last-modified":"2012-09-13T18:25:15.595+02:00",
         "owner":{
            "user":{
               "identifier":"user-1",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "sharings":[
            {
               "sharing":{
                  "group":{
                     "identifier":"group-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"DENIED"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-2",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_ONLY"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-3",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_WRITE"
               }
            }
         ],
         "links":[
            {
               "link":{
                  "metadata":{
                     "identifier":"md-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "relation":{
                     "concept":{
                        "identifier":"isDescriptionOf",
                        "namespace":"http://ims.dei.unipd.it/"
                     }
                  },
```

```
                "experimental-collection":{
                    "identifier":"ec-1"
                }
            }
        },
        {
            "link":{
                "metadata":{
                    "identifier":"md-2",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"isCopyrightOf",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "experimental-collection":{
                    "identifier":"ec-1"
                }
            }
        },
        {
            "link":{
                "metadata":{
                    "identifier":"md-3",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"isAdministrationOf",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "experimental-collection":{
                    "identifier":"ec-1"
                }
            }
        }
    ],
    "topic-group":{
        "identifier":"tg1"
    },
    "corpora":[
        {
            "corpus":{
                "identifier":"c1"
            }
        },
        {
            "corpus":{
                "identifier":"c2"
            }
        },
        {
            "corpus":{
                "identifier":"c3"
            }
        },
        {
```

```
                "corpus":{
                   "identifier":"c4"
                }
             }
          ],
          "ground-truth":{
             "identifier":"gt1"
          }
       }
    }
}
```

C.23 Experiment Resource

Represents a part of the data produced by a system under evaluation.

C.23.1 API

Action	HTTP Method	URI
CREATE_EXPERIMENT	POST	/experiment
READ_EXPERIMENT	GET	/experiment/{id}
UPDATE_EXPERIMENT	PUT	/experiment/{id}
DELETE_EXPERIMENT	DELETE	/experiment/{id}
LIST_EXPERIMENTS	GET	/experiment
LIST_EXPERIMENT_PROVENANCE_EVENTS	GET	/experiment/{id}/provenance
ADD_CONFIGURATION_TO_EXPERIMENT	POST	/experiment/{id}/configuration/{id}
REMOVE_CONFIGURATION_FROM_EXPERIMENT	DELETE	/experiment/{id}/configuration
READ_CONFIGURATION_FROM_EXPERIMENT	GET	/experiment/{id}/configuration
ADD_CONTRIBUTION_TO_EXPERIMENT	POST	/experiment/{id}/contribution/{id}
REMOVE_CONTRIBUTION_FROM_EXPERIMENT	DELETE	/experiment/{id}/contribution/{id}
LIST_CONTRIBUTION_FROM_EXPERIMENT	GET	/experiment/{id}/contribution
ADD_EXPERIMENT_ITEM_TO_EXPERIMENT	POST	/experiment/{id}/experiment-item/{id}
REMOVE_EXPERIMENT_ITEM_FROM_EXPERIMENT	DELETE	/experiment/{id}/experiment-item/{id}
LIST_EXPERIMENT_ITEM_FROM_EXPERIMENT	GET	/experiment/{id}/experiment-item

Action	HTTP Method	URI
ADD_MEASURE_TO_EXPERIMENT	POST	/experiment/{id}/measure/{id}
REMOVE_MEASURE_FROM_EXPERIMENT	DELETE	/experiment/{id}/measure/{id}
LIST_MEASURE_FROM_EXPERIMENT	GET	/experiment/{id}/measure
ADD_STATISTICAL_TEST_TO_EXPERIMENT	POST	/experiment/{id}/statistical-test/{id}
REMOVE_STATISTICAL_TEST_FROM_EXPERIMENT	DELETE	/experiment/{id}/statistical-test/{id}
LIST_STATISTICAL_TEST_FROM_EXPERIMENT	GET	/experiment/{id}/statistical-test
SHARE_EXPERIMENT	GET, POST, PUT	/experiment/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_EXPERIMENT	DELETE	/experiment/{id}/share/{sharer-id};{sharer-ns}

Table 25: API for accessing the experiment resource.

where {id} is the unique identifier of the experiment.

The next two sections show an example of the representation of the results.

C.23.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:experiment
    ims:identifier="exp-1"
    ims:description="Description of experiment, e.g. experiment submitted to TREC7"
    ims:scope="SHARED"
    ims:created="2012-09-13T18:27:29.748+02:00"
    ims:last-modified="2012-09-13T18:27:29.748+02:00">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
```

```
17      <ims:sharings>
18        <ims:sharing>
19          <ims:group
20            ims:identifier="group-1"
21            ims:namespace="http://ims.dei.unipd.it/" />
22          <ims:access-permission>DENIED</ims:access-permission>
23        </ims:sharing>
24        <ims:sharing>
25          <ims:group
26            ims:identifier="group-2"
27            ims:namespace="http://ims.dei.unipd.it/" />
28          <ims:access-permission>READ_ONLY</ims:access-permission>
29        </ims:sharing>
30        <ims:sharing>
31          <ims:group
32            ims:identifier="group-3"
33            ims:namespace="http://ims.dei.unipd.it/" />
34          <ims:access-permission>READ_WRITE</ims:access-permission>
35        </ims:sharing>
36      </ims:sharings>
37      <ims:links>
38        <ims:link>
39          <ims:metadata
40            ims:identifier="md-1"
41            ims:namespace="http://ims.dei.unipd.it/" />
42          <ims:relation>
43            <ims:concept
44              ims:identifier="isDescriptionOf"
45              ims:namespace="http://ims.dei.unipd.it/" />
46          </ims:relation>
47          <ims:experiment ims:identifier="exp-1" />
48        </ims:link>
49        <ims:link>
50          <ims:metadata
51            ims:identifier="md-2"
52            ims:namespace="http://ims.dei.unipd.it/" />
53          <ims:relation>
54            <ims:concept
55              ims:identifier="isCopyrightOf"
56              ims:namespace="http://ims.dei.unipd.it/" />
57          </ims:relation>
58          <ims:experiment ims:identifier="exp-1" />
59        </ims:link>
60        <ims:link>
61          <ims:metadata
62            ims:identifier="md-3"
63            ims:namespace="http://ims.dei.unipd.it/" />
64          <ims:relation>
65            <ims:concept
66              ims:identifier="isAdministrationOf"
67              ims:namespace="http://ims.dei.unipd.it/" />
68          </ims:relation>
69          <ims:experiment ims:identifier="exp-1" />
70        </ims:link>
71      </ims:links>
72      <ims:task ims:identifier="task-1" />
73      <ims:configuration ims:identifier="configuration-1" />
74    </ims:experiment>
75  </ims:direct>
```

C.23.3 JSON Representation

```
{
   "direct":{
      "experiment":{
         "identifier":"exp-1",
         "description":"Description of experiment, e.g. experiment submitted to TREC7",
         "scope":"SHARED",
         "created":"2012-09-13T18:27:29.748+02:00",
         "last-modified":"2012-09-13T18:27:29.748+02:00",
         "owner":{
            "user":{
               "identifier":"user-1",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "sharings":[
            {
               "sharing":{
                  "group":{
                     "identifier":"group-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"DENIED"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-2",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_ONLY"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-3",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_WRITE"
               }
            }
         ],
         "links":[
            {
               "link":{
                  "metadata":{
                     "identifier":"md-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "relation":{
                     "concept":{
                        "identifier":"isDescriptionOf",
                        "namespace":"http://ims.dei.unipd.it/"
                     }
                  },
                  "experiment":{
                     "identifier":"exp-1"
```

```
                    }
                }
            },
            {
                "link":{
                    "metadata":{
                        "identifier":"md-2",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "relation":{
                        "concept":{
                            "identifier":"isCopyrightOf",
                            "namespace":"http://ims.dei.unipd.it/"
                        }
                    },
                    "experiment":{
                        "identifier":"exp-1"
                    }
                }
            },
            {
                "link":{
                    "metadata":{
                        "identifier":"md-3",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "relation":{
                        "concept":{
                            "identifier":"isAdministrationOf",
                            "namespace":"http://ims.dei.unipd.it/"
                        }
                    },
                    "experiment":{
                        "identifier":"exp-1"
                    }
                }
            }
        ],
        "task":{
            "identifier":"task-1"
        },
        "configuration":{
            "identifier":"configuration-1"
        }
    }
}
```

C.24 Experiment Item Resource

Represents an item of an Experiment, that is a retrieved information unit for a given Topic.

C.24.1 API

Action	HTTP Method	URI
CREATE_EXPERIMENT-ITEM	POST	/experiment-item

Action	HTTP Method	URI
READ_EXPERIMENT-ITEM	GET	/experiment-item/{id}
UPDATE_EXPERIMENT-ITEM	PUT	/experiment-item/{id}
DELETE_EXPERIMENT-ITEM	DELETE	/experiment-item/{id}
LIST_EXPERIMENT-ITEMS	GET	/experiment-item
LIST_EXPERIMENT-ITEM_PROVENANCE_EVENTS	GET	/experiment-item/{id}/provenance

Table 26: API for accessing the experiment-item resource.

where {id} is the unique identifier of the experiment-item.

The next two sections show an example of the representation of the results.

C.24.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:experiment-item ims:identifier="ei-1">
    <ims:experiment ims:identifier="exp-1" />
  </ims:experiment-item>
</ims:direct>
```

C.24.3 JSON Representation

```
{
   "direct":{
      "experiment-item":{
         "identifier":"ei-1",
         "experiment":{
            "identifier":"exp-1"
         }
      }
   }
}
```

C.25 Ground Truth Resource

Represents a container of assessments obtained through the pooling technique.

C.25.1 API

Action	HTTP Method	URI
CREATE_GROUND-TRUTH	POST	/ground-truth
READ_GROUND-TRUTH	GET	/ground-truth/{id}
UPDATE_GROUND-TRUTH	PUT	/ground-truth/{id}
DELETE_GROUND-TRUTH	DELETE	/ground-truth/{id}
LIST_GROUND-TRUTHS	GET	/ground-truth
LIST_GROUND-TRUTH_PROVENANCE_EVENTS	GET	/ground-truth/{id}/provenance
ADD_CONTRIBUTION_TO_GROUND-TRUTH	POST	/ground-truth/{id}/contribution/{id}
REMOVE_CONTRIBUTION_FROM_GROUND-TRUTH	DELETE	/ground-truth/{id}/contribution/{id}
LIST_CONTRIBUTION_FROM_GROUND_TRUTH	GET	/ground-truth/{id}/contribution
ADD_GROUND_TRUTH_ITEM_TO_GROUND_TRUTH	POST	/ground-truth/{id}//ground-truth-item/{id}
REMOVE_GROUND_TRUTH_ITEM_FROM_GROUND_TRUTH	DELETE	/ground-truth/{id}/ground-truth-item/{id}
LIST_GROUND_TRUTH_ITEM_FROM_GROUND_TRUTH	GET	/ground-truth/{id}/ground-truth-item
ADD_STATISTICAL_TEST_TO_GROUND-TRUTH	POST	/ground-truth/{id}/statistical-test/{id}
REMOVE_STATISTICAL_TEST_FROM_GROUND-TRUTH	DELETE	/ground-truth/{id}/statistical-test/{id}
LIST_STATISTICAL_TEST_FROM_GROUND_TRUTH	GET	/ground-truth/{id}/statistical-test
SHARE_GROUND_TRUTH	GET, POST, PUT	/ground-truth/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_GROUND_TRUTH	DELETE	/ground-truth/{id}/share/{sharer-id};{sharer-ns}

Table 27: API for accessing the ground-truth resource.

where {id} is the unique identifier of the ground-truth.

The next two sections show an example of the representation of the results.

C.25.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:ground-truth
    ims:identifier="gt1"
    ims:description="Description of ground truth"
    ims:scope="SHARED"
    ims:created="2012-09-13T18:30:01.195+02:00"
    ims:last-modified="2012-09-13T18:30:01.196+02:00">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
      <ims:sharing>
        <ims:group
          ims:identifier="group-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>DENIED</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_ONLY</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_WRITE</ims:access-permission>
      </ims:sharing>
    </ims:sharings>
    <ims:links>
      <ims:link>
        <ims:metadata
          ims:identifier="md-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isDescriptionOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:ground-truth ims:identifier="gt1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isCopyrightOf"
```

```
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:ground-truth ims:identifier="gt1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isAdministrationOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:ground-truth ims:identifier="gt1" />
      </ims:link>
    </ims:links>
  </ims:ground-truth>
</ims:direct>
```

C.25.3 JSON Representation

```
{
   "direct":{
      "ground-truth":{
         "identifier":"gt1",
         "description":"Description of ground truth",
         "scope":"SHARED",
         "created":"2012-09-13T18:30:01.195+02:00",
         "last-modified":"2012-09-13T18:30:01.196+02:00",
         "owner":{
            "user":{
               "identifier":"user-1",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "sharings":[
            {
               "sharing":{
                  "group":{
                     "identifier":"group-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"DENIED"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-2",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_ONLY"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-3",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
```

```
                    "access-permission":"READ_WRITE"
                }
            }
        ],
        "links":[
            {
                "link":{
                    "metadata":{
                        "identifier":"md-1",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "relation":{
                        "concept":{
                            "identifier":"isDescriptionOf",
                            "namespace":"http://ims.dei.unipd.it/"
                        }
                    },
                    "ground-truth":{
                        "identifier":"gt1"
                    }
                }
            },
            {
                "link":{
                    "metadata":{
                        "identifier":"md-2",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "relation":{
                        "concept":{
                            "identifier":"isCopyrightOf",
                            "namespace":"http://ims.dei.unipd.it/"
                        }
                    },
                    "ground-truth":{
                        "identifier":"gt1"
                    }
                }
            },
            {
                "link":{
                    "metadata":{
                        "identifier":"md-3",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "relation":{
                        "concept":{
                            "identifier":"isAdministrationOf",
                            "namespace":"http://ims.dei.unipd.it/"
                        }
                    },
                    "ground-truth":{
                        "identifier":"gt1"
                    }
                }
            }
        ]
    }
  }
}
```

C.26 Ground Truth Item Resource

Represents an item of a GroundTruth.

C.26.1 API

Action	HTTP Method	URI
CREATE_GROUND_TRUTH_ITEM	POST	/ground-truth-item
READ_GROUND_TRUTH_ITEM	GET	/ground-truth-item/{id}
UPDATE_GROUND_TRUTH_ITEM	PUT	/ground-truth-item/{id}
DELETE_GROUND_TRUTH_ITEM	DELETE	/ground-truth-item/{id}
LIST_GROUND_TRUTH_ITEMS	GET	/ground-truth-item
LIST_GROUND_TRUTH_ITEM_PROVENANCE_EVENTS	GET	/ground-truth-item/{id}/provenance

Table 28: API for accessing the ground-truth-item resource.

where {id} is the unique identifier of the ground-truth-item.

The next two sections show an example of the representation of the results.

C.26.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:ground-truth-item
    ims:identifier="gti1"
    ims:created="2012-09-13T18:28:51.811+02:00"
    ims:last-modified="2012-09-13T18:28:51.811+02:00">
    <ims:ground-truth ims:identifier="gt1" />
    <ims:user
      ims:identifier="user-1"
      ims:namespace="http://ims.dei.unipd.it/" />
    <ims:concept
      ims:identifier="assessment1"
      ims:namespace="http://ims.dei.unipd.it/" />
  </ims:ground-truth-item>
</ims:direct>
```

C.26.3 JSON Representation

```
{
   "direct":{
```

```
3       "ground-truth-item":{
4          "identifier":"gti1",
5          "created":"2012-09-13T18:28:51.811+02:00",
6          "last-modified":"2012-09-13T18:28:51.811+02:00",
7          "ground-truth":{
8             "identifier":"gt1"
9          },
10         "user":{
11            "identifier":"user-1",
12            "namespace":"http://ims.dei.unipd.it/"
13         },
14         "concept":{
15            "identifier":"assessment1",
16            "namespace":"http://ims.dei.unipd.it/"
17         }
18      }
19   }
20 }
```

C.27 Guerrilla Resource

The Guerrilla Resource is defined in Section **??** at page **??** as a use case to show how the DIRECT system handles innovative experiment types.

C.28 Information Unit Resource

Represents the object on which the evaluated system acts; e.g., the object which is retrieved by the system under evaluation.

C.28.1 API

Action	HTTP Method	URI
CREATE_INFORMATION_UNIT	POST	`/information-unit`
READ_INFORMATION_UNIT	GET	`/information-unit/{id}`
READ_INFORMATION_UNIT	GET	`/information-unit/{id}/content`
UPDATE_INFORMATION_UNIT	PUT	`/information-unit/{id}`
DELETE_INFORMATION_UNIT	DELETE	`/information-unit/{id}`
LIST_INFORMATION_UNITS	GET	`/information-unit`
LIST_INFORMATION_UNITS	GET	`/corpus/{id}/information-unit`
CREATE_INFORMATION_UNIT_PROVENANCE_PARTITION	GET	`/information-unit/provenance/{year}`
DETACH_INFORMATION_UNIT_PROVENANCE_PARTITION	DELETE	`/information-unit/provenance/{year}`

Action	HTTP Method	URI
LIST_INFORMATION_UNIT_PROVENANCE_EVENTS	GET	/information-unit/{id}/provenance

Table 29: API for accessing the information-unit resource.

where {id} is the unique identifier of the information-unit.

The next two sections show an example of the representation of the results.

C.28.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:information-unit
    ims:identifier="iu1"
    ims:created="2012-09-13T18:31:22.810+02:00"
    ims:last-modified="2012-09-13T18:31:22.810+02:00"
    ims:media-type="application/xml"
    ims:language="ita"
    ims:uri="http://www.uri1.com/">
    <ims:corpus ims:identifier="c1" />
    <ims:content>
      <DOC>
        <DOCNO>FT911-3</DOCNO>
        <PROFILE>AN-BEOA7AAIFT</PROFILE>
        <DATE>910514</DATE>
        <HEADLINE>FT 14 MAY 91 - International Company News: Contigas
          plans DM900m east German project</HEADLINE>
      </DOC>
    </ims:content>
  </ims:information-unit>
</ims:direct>
```

C.28.3 JSON Representation

```
{
   "direct":{
      "information-unit":{
         "identifier":"iu1",
         "created":"2012-09-13T18:31:22.810+02:00",
         "last-modified":"2012-09-13T18:31:22.810+02:00",
         "media-type":"application/xml",
         "language":"ita",
         "uri":"http://www.uri1.com/",
         "corpus":{
            "identifier":"c1"
         },
         "content":{
            "content":"<DOC><DOCNO>FT911-3</DOCNO>
            <PROFILE>AN-BEOA7AAIFT</PROFILE>
            <DATE>910514</DATE>
            <HEADLINE>FT 14 MAY 91 - International Company News: Contigas
```

```
                    plans DM900m east German project</HEADLINE>
                    </DOC>"
            }
        }
    }
}
```

C.29 Measure Resource

Represents the value of a Metric (which is represented by means of a Concept) calculated on some Experiment handled by the infrastructure.

C.29.1 API

Action	HTTP Method	URI
CREATE_MEASURE	POST	/measure
READ_MEASURE	GET	/measure/{id}
READ_MEASURE	GET	/run/{runid}/topic/{tpcid}/metric/
UPDATE_MEASURE	PUT	/measure/{id}
DELETE_MEASURE	DELETE	/measure/{id}
LIST_MEASURES	GET	/measure
LIST_MEASURES	GET	/task/{tskid}/topic/{tpcid}/measur
LIST_MEASURES	GET	/task/{tskid}/metric/{mtcid};{mtcn
LIST_MEASURES	GET	/run/{runid}/topic/{tpcid}/measure
LIST_MEASURES	GET	/experiment/{expid}/measure
LIST_MEASURES	GET	/run/{expid}/measure
LIST_MEASURES	GET	/experiment/{expid}/metric/{mtcid}
LIST_MEASURES	GET	/run/{expid}/metric/{mtcid};{mtcns
LIST_MEASURES	GET	/task/{tskid}/measure
LIST_MEASURES	GET	/task/{tskid}/topic/{tpcid}/metric
CREATE_MEASURE_PROVENANCE_PARTITION	GET	/measure/provenance/{year}
DETACH_MEASURE_PROVENANCE_PARTITION	DELETE	/measure/provenance/{year}
LIST_MEASURE_PROVENANCE_EVENTS	GET	/measure/{id}/provenance

Table 30: API for accessing the measure resource.

where {id} is the unique identifier of the measure.

The next two sections show an example of the representation of the results.

C.29.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
```

```
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:measure
    ims:identifier="m-1"
    ims:created="2012-09-13T18:32:37.874+02:00"
    ims:last-modified="2012-09-13T18:32:37.874+02:00">
    <ims:concept
      ims:identifier="mtc-1"
      ims:namespace="http://ims.dei.unipd.it/" />
    <ims:value>0.1</ims:value>
    <ims:experiment ims:identifier="exp-1" />
    <ims:topic ims:identifier="tpc-1" />
  </ims:measure>
</ims:direct>
```

C.29.3 JSON Representation

```
{
   "direct":{
      "measure":{
         "identifier":"m-1",
         "created":"2012-09-13T18:32:37.874+02:00",
         "last-modified":"2012-09-13T18:32:37.874+02:00",
         "value":"0.1",
         "concept":{
            "identifier":"mtc-1",
            "namespace":"http://ims.dei.unipd.it/"
         },
         "experiment":{
            "identifier":"exp-1"
         },
         "topic":{
            "identifier":"tpc-1"
         }
      }
   }
}
```

C.30 Pool Resource

Represents a container of assessments obtained through the pooling technique.

C.30.1 API

Action	HTTP Method	URI
CREATE_POOL	POST	/pool
READ_POOL	GET	/pool/{id}
UPDATE_POOL	PUT	/pool/{id}
DELETE_POOL	DELETE	/pool/{id}
LIST_POOLS	GET	/pool
LIST_POOL_PROVENANCE_EVENTS	GET	/pool/{id}/provenance
ADD_POOL_ITEM_TO_POOL	POST	/pool/{id}/pool-item/{id}

Action	HTTP Method	URI
REMOVE_POOL_ITEM_FROM_POOL	DELETE	/pool/{id}/ pool-item/{id}
LIST_POOL_ITEM_FROM_POOL	GET	/pool{id}/pool-item
ADD_RUN_TO_POOL	POST	/pool/{id}/run/{id}
REMOVE_RUN_FROM_POOL	DELETE	/pool/{id}/run/{id}
LIST_RUN_FROM_POOL	GET	/pool/{id}/run
SHARE_POOL	GET, POST, PUT	/pool/{id}/share/ {sharer-id}; {sharer-ns}/ permission/ {access-permission}
UNSHARE_POOL	DELETE	/pool/{id}/share/ {sharer-id}; {sharer-ns}

Table 31: API for accessing the pool resource.

where {id} is the unique identifier of the pool.

The next two sections show an example of the representation of the results.

C.30.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:pool
    ims:identifier="gt1"
    ims:description="Description of pool 1"
    ims:scope="SHARED"
    ims:created="2012-09-13T18:35:28.262+02:00"
    ims:last-modified="2012-09-13T18:35:28.262+02:00">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
      <ims:sharing>
        <ims:group
          ims:identifier="group-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>DENIED</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-2"
          ims:namespace="http://ims.dei.unipd.it/" />
```

```
28          <ims:access-permission>READ_ONLY</ims:access-permission>
29        </ims:sharing>
30        <ims:sharing>
31          <ims:group
32            ims:identifier="group-3"
33            ims:namespace="http://ims.dei.unipd.it/" />
34          <ims:access-permission>READ_WRITE</ims:access-permission>
35        </ims:sharing>
36      </ims:sharings>
37      <ims:links>
38        <ims:link>
39          <ims:metadata
40            ims:identifier="md-1"
41            ims:namespace="http://ims.dei.unipd.it/" />
42          <ims:relation>
43            <ims:concept
44              ims:identifier="isDescriptionOf"
45              ims:namespace="http://ims.dei.unipd.it/" />
46          </ims:relation>
47          <ims:pool ims:identifier="gt1" />
48        </ims:link>
49        <ims:link>
50          <ims:metadata
51            ims:identifier="md-2"
52            ims:namespace="http://ims.dei.unipd.it/" />
53          <ims:relation>
54            <ims:concept
55              ims:identifier="isCopyrightOf"
56              ims:namespace="http://ims.dei.unipd.it/" />
57          </ims:relation>
58          <ims:pool ims:identifier="gt1" />
59        </ims:link>
60        <ims:link>
61          <ims:metadata
62            ims:identifier="md-3"
63            ims:namespace="http://ims.dei.unipd.it/" />
64          <ims:relation>
65            <ims:concept
66              ims:identifier="isAdministrationOf"
67              ims:namespace="http://ims.dei.unipd.it/" />
68          </ims:relation>
69          <ims:pool ims:identifier="gt1" />
70        </ims:link>
71      </ims:links>
72    </ims:pool>
73  </ims:direct>
```

C.30.3 JSON Representation

```
1  {
2     "direct":{
3        "pool":{
4           "identifier":"gt1",
5           "description":"Description of pool 1",
6           "scope":"SHARED",
7           "created":"2012-09-13T18:35:28.262+02:00",
8           "last-modified":"2012-09-13T18:35:28.262+02:00",
9           "owner":{
10             "user":{
11                "identifier":"user-1",
```

```
            "namespace":"http://ims.dei.unipd.it/"
         }
      },
      "sharings":[
         {
            "sharing":{
               "group":{
                  "identifier":"group-1",
                  "namespace":"http://ims.dei.unipd.it/"
               },
               "access-permission":"DENIED"
            }
         },
         {
            "sharing":{
               "group":{
                  "identifier":"group-2",
                  "namespace":"http://ims.dei.unipd.it/"
               },
               "access-permission":"READ_ONLY"
            }
         },
         {
            "sharing":{
               "group":{
                  "identifier":"group-3",
                  "namespace":"http://ims.dei.unipd.it/"
               },
               "access-permission":"READ_WRITE"
            }
         }
      ],
      "links":[
         {
            "link":{
               "metadata":{
                  "identifier":"md-1",
                  "namespace":"http://ims.dei.unipd.it/"
               },
               "relation":{
                  "concept":{
                     "identifier":"isDescriptionOf",
                     "namespace":"http://ims.dei.unipd.it/"
                  }
               },
               "pool":{
                  "identifier":"gt1"
               }
            }
         },
         {
            "link":{
               "metadata":{
                  "identifier":"md-2",
                  "namespace":"http://ims.dei.unipd.it/"
               },
               "relation":{
                  "concept":{
                     "identifier":"isCopyrightOf",
                     "namespace":"http://ims.dei.unipd.it/"
```

```
                    }
                },
                "pool":{
                    "identifier":"gt1"
                }
            }
        },
        {
            "link":{
                "metadata":{
                    "identifier":"md-3",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"isAdministrationOf",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "pool":{
                    "identifier":"gt1"
                }
            }
        }
    ]
  }
 }
}
```

C.31 Pool Item Resource

Represents a relevance judgement provided on an Information Unit in the Ground Truth in the context of a given Topic.

C.31.1 API

Action	HTTP Method	URI
CREATE_POOL-ITEM	POST	`/pool-item`
READ_POOL-ITEM	GET	`/pool-item/{id}`
UPDATE_POOL-ITEM	PUT	`/pool-item/{id}`
DELETE_POOL-ITEM	DELETE	`/pool-item/{id}`
LIST_POOL-ITEMS	GET	`/pool-item`
LIST_POOL-ITEM_PROVENANCE_EVENTS	GET	`/pool-item/{id}/provenance`

Table 32: API for accessing the pool-item resource.

where `{id}` is the unique identifier of the pool-item.

The next two sections show an example of the representation of the results.

C.31.2 XML Representation

```xml
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:pool-item
    ims:identifier="pi1"
    ims:created="2012-09-13T18:33:41.787+02:00"
    ims:last-modified="2012-09-13T18:33:41.787+02:00">
    <ims:pool ims:identifier="gt1" />
    <ims:user
      ims:identifier="user-1"
      ims:namespace="http://ims.dei.unipd.it/" />
    <ims:concept
      ims:identifier="assessment1"
      ims:namespace="http://ims.dei.unipd.it/" />
    <ims:topic ims:identifier="t1" />
    <ims:information-unit ims:identifier="iu1" />
  </ims:pool-item>
</ims:direct>
```

C.31.3 JSON Representation

```json
{
   "direct":{
      "pool-item":{
         "identifier":"pi1",
         "created":"2012-09-13T18:33:41.787+02:00",
         "last-modified":"2012-09-13T18:33:41.787+02:00",
         "pool":{
            "identifier":"gt1"
         },
         "user":{
            "identifier":"user-1",
            "namespace":"http://ims.dei.unipd.it/"
         },
         "concept":{
            "identifier":"assessment1",
            "namespace":"http://ims.dei.unipd.it/"
         },
         "topic":{
            "identifier":"t1"
         },
         "information-unit":{
            "identifier":"iu1"
         }
      }
   }
}
```

C.32 Run Resource

Represents a part of the data produced by a system under evaluation.

C.32.1 API

Action	HTTP Method	URI
CREATE_RUN	POST	/run
READ_RUN	GET	/run/{id}
UPDATE_RUN	PUT	/run/{id}
DELETE_RUN	DELETE	/run/{id}
LIST_RUNS	GET	/run
LIST_RUNS	GET	/task/{id}/run
LIST_RUNS	GET	/system/{sysid}/run
CREATE_RUN_PROVENANCE_PARTITION	GET	/run/provenance/{year}
DETACH_RUN_PROVENANCE_PARTITION	DELETE	/run/provenance/{year}
LIST_RUN_PROVENANCE_EVENTS	GET	/run/{id}/provenance
ADD_ESTIMATE_TO_RUN ***** non presente nel restManager *****	POST	/run/{id}/estimate/{id}
REMOVE_ESTIMATE_FROM_RUN ***** non presente nel restManager *****	DELETE	/run/{id}/estimate/{id}
LIST_ESTIMATE_FROM_RUN ***** non presente nel restManager *****	GET	/run/{id}/estimate
ADD_RUN_ITEM_TO_RUN ***** non presente nel restManager *****	POST	/run/{id}/run-item/{id}
REMOVE_RUN_ITEM_FROM_RUN ***** non presente nel restManager *****	DELETE	/run/{id}/run-item/{id}
LIST_RUN_ITEM_FROM_RUN ***** non presente nel restManager *****	GET	/run/{id}/run-item
SHARE_RUN	GET, POST, PUT	/run/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_RUN	DELETE	/run/{id}/share/{sharer-id};{sharer-ns}

Action	HTTP Method	URI
RELATE_METADATA_TO_RUN	GET, POST, PUT	/run/{source-id}/link/{target-id};{target-ns}/relation/{relation-id};{relation-ns}
RELATE_METADATA_TO_RUN	GET, POST, PUT	/run/{source-id}/link/{target-id};{target-ns}
UNRELATE_METADATA_FROM_RUN	DELETE	/run/{source-id}/link/{target-id};{target-ns}/relation/{relation-id};{relation-ns}
UNRELATE_METADATA_FROM_RUN	DELETE	/run/{source-id}/link/{target-id};{target-ns}

Table 33: API for accessing the run resource.

where {id} is the unique identifier of the run.

The next two sections show an example of the representation of the results.

C.32.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:run
    ims:identifier="r-1"
    ims:description="Description of Run, e.g. att98atdc"
    ims:query-construction="Query Constrution, e.g. title filtered run-0.282"
    ims:scope="SHARED"
    ims:created="2012-09-13T18:38:00.653+02:00"
    ims:last-modified="2012-09-13T18:38:00.653+02:00">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
      <ims:sharing>
        <ims:group
          ims:identifier="group-1"
```

```
22            ims:namespace="http://ims.dei.unipd.it/" />
23          <ims:access-permission>DENIED</ims:access-permission>
24        </ims:sharing>
25        <ims:sharing>
26          <ims:group
27            ims:identifier="group-2"
28            ims:namespace="http://ims.dei.unipd.it/" />
29          <ims:access-permission>READ_ONLY</ims:access-permission>
30        </ims:sharing>
31        <ims:sharing>
32          <ims:group
33            ims:identifier="group-3"
34            ims:namespace="http://ims.dei.unipd.it/" />
35          <ims:access-permission>READ_WRITE</ims:access-permission>
36        </ims:sharing>
37      </ims:sharings>
38      <ims:links>
39        <ims:link>
40          <ims:metadata
41            ims:identifier="md-1"
42            ims:namespace="http://ims.dei.unipd.it/" />
43          <ims:relation>
44            <ims:concept
45              ims:identifier="isDescriptionOf"
46              ims:namespace="http://ims.dei.unipd.it/" />
47          </ims:relation>
48          <ims:run ims:identifier="r-1" />
49        </ims:link>
50        <ims:link>
51          <ims:metadata
52            ims:identifier="md-2"
53            ims:namespace="http://ims.dei.unipd.it/" />
54          <ims:relation>
55            <ims:concept
56              ims:identifier="isCopyrightOf"
57              ims:namespace="http://ims.dei.unipd.it/" />
58          </ims:relation>
59          <ims:run ims:identifier="r-1" />
60        </ims:link>
61        <ims:link>
62          <ims:metadata
63            ims:identifier="md-3"
64            ims:namespace="http://ims.dei.unipd.it/" />
65          <ims:relation>
66            <ims:concept
67              ims:identifier="isAdministrationOf"
68              ims:namespace="http://ims.dei.unipd.it/" />
69          </ims:relation>
70          <ims:run ims:identifier="r-1" />
71        </ims:link>
72      </ims:links>
73      <ims:task ims:identifier="tsk-1" />
74      <ims:configuration ims:identifier="cnf-1" />
75      <ims:topic-fields>
76        <ims:concept
77          ims:identifier="isFieldOf"
78          ims:namespace="http://ims.dei.unipd.it/" />
79        <ims:concept
80          ims:identifier="isFieldOf2"
81          ims:namespace="http://ims.dei.unipd.it/" />
```

```
    </ims:topic-fields>
    <ims:system ims:identifier="sys-1" />
  </ims:run>
</ims:direct>
```

C.32.3 JSON Representation

```
{
   "direct":{
      "run":{
         "identifier":"r-1",
         "description":"Description of Run, e.g. att98atdc",
         "query-construction":"Query Constrution, e.g. title filtered run-0.282",
         "scope":"SHARED",
         "created":"2012-09-13T18:38:00.653+02:00",
         "last-modified":"2012-09-13T18:38:00.653+02:00",
         "owner":{
            "user":{
               "identifier":"user-1",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "sharings":[
            {
               "sharing":{
                  "group":{
                     "identifier":"group-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"DENIED"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-2",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_ONLY"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-3",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_WRITE"
               }
            }
         ],
         "links":[
            {
               "link":{
                  "metadata":{
                     "identifier":"md-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "relation":{
                     "concept":{
```

```
                        "identifier":"isDescriptionOf",
                        "namespace":"http://ims.dei.unipd.it/"
                     }
                  },
                  "run":{
                     "identifier":"r-1"
                  }
               }
            },
            {
               "link":{
                  "metadata":{
                     "identifier":"md-2",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "relation":{
                     "concept":{
                        "identifier":"isCopyrightOf",
                        "namespace":"http://ims.dei.unipd.it/"
                     }
                  },
                  "run":{
                     "identifier":"r-1"
                  }
               }
            },
            {
               "link":{
                  "metadata":{
                     "identifier":"md-3",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "relation":{
                     "concept":{
                        "identifier":"isAdministrationOf",
                        "namespace":"http://ims.dei.unipd.it/"
                     }
                  },
                  "run":{
                     "identifier":"r-1"
                  }
               }
            }
         ],
         "task":{
            "identifier":"tsk-1"
         },
         "configuration":{
            "identifier":"cnf-1"
         },
         "system":{
            "identifier":"sys-1"
         },
         "topic-fields":[
            {
               "concept":{
                  "identifier":"isFieldOf",
                  "namespace":"http://ims.dei.unipd.it/"
               }
            },
```

```
114                 {
115                     "concept":{
116                         "identifier":"isFieldOf2",
117                         "namespace":"http://ims.dei.unipd.it/"
118                     }
119                 }
120             ]
121         }
122     }
123 }
```

C.33 Run Item Resource

Represents an item of an Experiment of type Run, that is a retrieved information unit for a given Topic.

C.33.1 API

Action	HTTP Method	URI
CREATE_RUN_ITEM	POST	/run-item
READ_RUN_ITEM	GET	/run-item/{id}
UPDATE_RUN_ITEM	PUT	/run-item/{id}
DELETE_RUN_ITEM	DELETE	/run-item/{id}
LIST_RUN_ITEMS	GET	/run-item
LIST_RUN_ITEM_PROVENANCE_EVENTS	GET	/run-item/{id}/provenance

Table 34: API for accessing the run-item resource.

where {id} is the unique identifier of the run-item.

The next two sections show an example of the representation of the results.

C.33.2 XML Representation

```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <ims:direct
3    xmlns:ims="http://ims.dei.unipd.it/"
4    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
5    xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
6    <ims:run-item
7      ims:identifier="ri1"
8      ims:rank="4"
9      ims:score="5.4" >
10     <ims:run ims:identifier="run-1" />
11     <ims:topic ims:identifier="tpc-1" />
12     <ims:information-unit ims:identifier="iu-1" />
13   </ims:run-item>
14 </ims:direct>
```

C.33.3 JSON Representation

```
{
   "direct":{
      "run-item":{
         "identifier":"ri1",
         "rank":"4",
         "score":"5.4",
         "run":{
            "identifier":"run-1"
         },
         "topic":{
            "identifier":"tpc-1"
         },
         "information-unit":{
            "identifier":"iu-1"
         }
      }
   }
}
```

C.34 Snapshot Resource

Stores the snapshot of a visualization.

C.34.1 API

Action	HTTP Method	URI
ADD_SNAPSHOT_TO_VISUALIZATION	POST	`/snapshot`
READ_SNAPSHOT	GET	`/snapshot/{sid}`
READ_SNAPSHOT	GET	`/snapshot/{sid}/content`
UPDATE_SNAPSHOT	PUT	`/snapshot/{sid}`
UPDATE_SNAPSHOT	PUT, POST, DELETE	`/snapshot/{sid}/content`
DELETE_SNAPSHOT	DELETE	`/snapshot/{sid}`

Table 35: API for accessing the snapshot resource.

where `{sid}` is the unique identifier of the snapshot.

C.34.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
```

```
  <ims:snapshot
    ims:identifier="sn-1"
    ims:created="2012-09-13T18:39:07.632+02:00"
    ims:last-modified="2012-09-13T18:39:07.632+02:00"
    ims:media-type="application/x-gzip"
    ims:language="aze">
    <ims:content ims:content-transfer-encoding="base64">PGNvbnRlbnQ+c25hcHNob3QgaW1hZ2U8L2NvbnRlbnQ+
    </ims:content>
    <ims:visualization ims:identifier="v-1" />
  </ims:snapshot>
</ims:direct>
```

C.34.3 JSON Representation

```
{
   "direct":{
      "snapshot":{
         "identifier":"sn-1",
         "created":"2012-09-13T18:39:07.632+02:00",
         "last-modified":"2012-09-13T18:39:07.632+02:00",
         "media-type":"application/x-gzip",
         "language":"aze",
         "content":{
            "content-transfer-encoding":"base64",
            "content":"PGNvbnRlbnQ+c25hcHNob3QgaW1hZ2U8L2NvbnRlbnQ+"
         },
         "visualization":{
            "identifier":"v-1"
         }
      }
   }
}
```

C.34.4 Basic Usage

The basic usage is intended for the cases in which snapshots is reasonably small size.

Creation To create the snapshot, you have to POST at the following URI:

`/snapshot`

You may decide to not specify the identifier for the snapshot. In that case the system will automatically set a type 4 ***UUID!*** *(**UUID!**)* [ISO/IEC 9834-8, 2008; Leach et al., 2005] for the visualization and each of its snapshots.

Reading To read a whole snapshot, you have to GET the following URI:

`/snapshot/{sid}/content`

Update To update a snapshot, you have to PUT at the following URI:

`/snapshot/{sid}`

Deletion To delete a whole snapshot, you have to DELETE the following URI:

`/snapshot/{sid}`

C.34.5 Advanced Usage

The advanced use stems from the consideration that the payload of a snapshot can be of considerable size. The basic idea here is to allow to create, read, update, and delete snapshots avoiding the XML or JSON wrapping.

Creation To create a snapshot with empty content, you have to POST at the following URI:

`/snapshot`

as in the XML example below.

[********** TO BE ADDED **********]

Then, to add the actual payload of a snapshot, you have to POST at the following URI:

`/snapshot/{sid}/content`

directly in binary format and specifying its MIME media type in the HTTP headers.

Reading To read a snapshot, you have to GET the following URI:

`/snapshot/{sid}`

and it will return a representation of the snapshot without its payload, as in the XML example below.

[********** TO BE ADDED **********]

Then, you can read the actual content of snapshot separately via a GET at the following URI:

`/snapshot/{sid}/content`

Update To update a snapshot but not its content, you have to PUT at the following URI:

`/snapshot/{sid}`

a representation of the snapshot where the `content` element is not present, as in the XML example below.

[********** TO BE ADDED **********]

To update the content of one a snapshot, you have to PUT at the following URI:

`/snapshot/{sid}/content`

the actual payload of the snapshot, directly in binary format and specifying its MIME media type in the HTTP headers.

If you perform a DELETE on the same URI, you will empty the content of the snapshot but not delete the snapshot itself.

Deletion To delete a snapshot, you have to DELETE the following URI:

`/snapshot/{sid}`

C.35 Statistical Test Resource

Represents mechanism for making quantitative decisions about a process or processes.

C.35.1 API

Action	HTTP Method	URI
CREATE_STATISTICAL_TEST	POST	`/statistical-test`
READ_STATISTICAL_TEST	GET	`/statistical-test/{id}`
UPDATE_STATISTICAL_TEST	PUT	`/statistical-test/{id}`
DELETE_STATISTICAL_TEST	DELETE	`/statistical-test/{id}`
LIST_STATISTICAL_TESTS	GET	`/statistical-test`
LIST_STATISTICAL_TESTS	GET	`/task/{id}/statistical-test`
LIST_STATISTICAL_TESTS	GET	`/ground-truth/{id}/statistical-test`
LIST_STATISTICAL_TESTS	GET	`/experiment/{id}/statistical-test`
CREATE_STATISTICAL_TEST_PROVENANCE_PARTITION	GET	`/statistical-test/provenance/{year}`
DETACH_STATISTICAL_TEST_PROVENANCE_PARTITION	DELETE	`/statistical-test/provenance/{year}`
LIST_STATISTICAL_TEST_PROVENANCE_EVENTS	GET	`/statistical-test/{id}/provenance`

Action	HTTP Method	URI
SHARE_STATISTICAL_TEST	GET, POST, PUT	/statistical-test/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_STATISTICAL_TEST	DELETE	/statistical-test/{id}/share/{sharer-id};{sharer-ns}

Table 36: API for accessing the statistical-test resource.

where {id} is the unique identifier of the statistical-test.

The next two sections show an example of the representation of the results.

C.35.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:statistical-test
    ims:identifier="st-1"
    ims:created="2012-09-13T18:43:54.399+02:00"
    ims:last-modified="2012-09-13T18:43:54.399+02:00"
    ims:scope="SHARED">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
      <ims:sharing>
        <ims:group
          ims:identifier="group-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>DENIED</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_ONLY</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_WRITE</ims:access-permission>
```

```
34        </ims:sharing>
35      </ims:sharings>
36      <ims:parameters>
37        <ims:parameter>
38          <ims:concept
39            ims:identifier="parameterA"
40            ims:namespace="http://direct.dei.unipd.it/" />
41          <ims:value>value 1</ims:value>
42        </ims:parameter>
43        <ims:parameter>
44          <ims:concept
45            ims:identifier="parameterB"
46            ims:namespace="http://direct.dei.unipd.it/" />
47          <ims:value>value 2</ims:value>
48        </ims:parameter>
49        <ims:parameter>
50          <ims:concept
51            ims:identifier="parameterC"
52            ims:namespace="http://direct.dei.unipd.it/" />
53          <ims:value>value 3</ims:value>
54        </ims:parameter>
55      </ims:parameters>
56      <ims:concept
57        ims:identifier="test type, e.g. t-test"
58        ims:namespace="http://ims.dei.unipd.it/" />
59      <ims:metrics>
60        <ims:concept
61          ims:identifier="Mean average precision"
62          ims:namespace="http://ims.dei.unipd.it/" />
63        <ims:concept
64          ims:identifier="Fall-out"
65          ims:namespace="http://ims.dei.unipd.it/" />
66        <ims:concept
67          ims:identifier="F-measure"
68          ims:namespace="http://ims.dei.unipd.it/" />
69      </ims:metrics>
70      <ims:ground-truths>
71        <ims:ground-truth ims:identifier="gt-1" />
72        <ims:ground-truth ims:identifier="gt-2" />
73        <ims:ground-truth ims:identifier="gt-3" />
74      </ims:ground-truths>
75      <ims:tasks>
76        <ims:task ims:identifier="tsk-1" />
77        <ims:task ims:identifier="tsk-2" />
78        <ims:task ims:identifier="tsk-3" />
79      </ims:tasks>
80      <ims:measures>
81        <ims:measure ims:identifier="meas-1" />
82        <ims:measure ims:identifier="meas-2" />
83        <ims:measure ims:identifier="meas-3" />
84      </ims:measures>
85      <ims:experiments>
86        <ims:experiment ims:identifier="exp-1" />
87        <ims:experiment ims:identifier="exp-2" />
88        <ims:experiment ims:identifier="exp-3" />
89      </ims:experiments>
90    </ims:statistical-test>
91  </ims:direct>
```

C.35.3 JSON Representation

```
{
   "direct":{
      "statistical-test":{
         "identifier":"st-1",
         "created":"2012-09-13T18:40:32.055+02:00",
         "last-modified":"2012-09-13T18:40:32.055+02:00",
         "concept":{
            "identifier":"test type, e.g. t-test",
            "namespace":"http://ims.dei.unipd.it/"
         },
         "parameters":[
            {
               "parameter":{
                  "concept":{
                     "identifier":"parameterA",
                     "namespace":"http://direct.dei.unipd.it/"
                  },
                  "value":"value 1"
               }
            },
            {
               "parameter":{
                  "concept":{
                     "identifier":"parameterB",
                     "namespace":"http://direct.dei.unipd.it/"
                  },
                  "value":"value 2"
               }
            },
            {
               "parameter":{
                  "concept":{
                     "identifier":"parameterC",
                     "namespace":"http://direct.dei.unipd.it/"
                  },
                  "value":"value 3"
               }
            }
         ],
         "metrics":[
            {
               "concept":{
                  "identifier":"Mean average precision",
                  "namespace":"http://ims.dei.unipd.it/"
               }
            },
            {
               "concept":{
                  "identifier":"Fall-out",
                  "namespace":"http://ims.dei.unipd.it/"
               }
            },
            {
               "concept":{
                  "identifier":"F-measure",
                  "namespace":"http://ims.dei.unipd.it/"
               }
            }
```

```
        ],
        "ground-truths":[
           {
              "ground-truth":{
                 "identifier":"gt-1"
              }
           },
           {
              "ground-truth":{
                 "identifier":"gt-2"
              }
           },
           {
              "ground-truth":{
                 "identifier":"gt-3"
              }
           }
        ],
        "tasks":[
           {
              "task":{
                 "identifier":"tsk-1"
              }
           },
           {
              "task":{
                 "identifier":"tsk-2"
              }
           },
           {
              "task":{
                 "identifier":"tsk-3"
              }
           }
        ],
        "measures":[
           {
              "measure":{
                 "identifier":"meas-1"
              }
           },
           {
              "measure":{
                 "identifier":"meas-2"
              }
           },
           {
              "measure":{
                 "identifier":"meas-3"
              }
           }
        ],
        "experiments":[
           {
              "experiment":{
                 "identifier":"exp-1"
              }
           },
           {
              "experiment":{
```

```
                    "identifier":"exp-2"
                }
            },
            {
                "experiment":{
                    "identifier":"exp-3"
                }
            }
        ]
    }
  }
}
```

C.36 System Resource

Represents a running software engine, which is under evaluation.

C.36.1 API

Action	HTTP Method	URI
CREATE_SYSTEM	POST	/system
READ_SYSTEM	GET	/system/{id}
READ_SYSTEM	GET	/run/{runid}/system
UPDATE_SYSTEM	PUT	/system/{id}
DELETE_SYSTEM	DELETE	/system/{id}
READ_SYSTEM _FROM_RUN	GET	/system/{id}/run
LIST_SYSTEMS	GET	/system
LIST_SYSTEMS	GET	/component/{cmpid}/system
LIST_SYSTEMS	GET	/application/{appid}/system
CREATE_SYSTEM_PROVENANCE_PARTITION	GET	/system/provenance/{year}
DETACH_SYSTEM_PROVENANCE_PARTITION	DELETE	/system/provenance/{year}
LIST_SYSTEM_PROVENANCE_EVENTS	GET	/system/{id}/provenance
ADD_APPLICATION_TO_SYSTEM	POST	/system/{id}/application/{id}
REMOVE_APPLICATION_FROM_SYSTEM	DELETE	/system/{id}/application/{id}
ADD_COMPONENT_TO_SYSTEM	POST	/system/{id}/component/{id}
REMOVE_COMPONENT_FROM_SYSTEM	DELETE	/system/{id}/component/{id}

Action	HTTP Method	URI
ADD_CONFIGURATION_TO_SYSTEM	POST	/system/{id}/configuration/{id}
REMOVE_CONFIGURATION_FROM_SYSTEM	DELETE	/system/{id}/configuration/{id}
ADD_RUN_TO_SYSTEM	POST	/system/{id}/run/{id}
REMOVE_RUN_FROM_SYSTEM	DELETE	/system/{id}/run/{id}
SHARE_SYSTEM	GET, POST, PUT	/system/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_SYSTEM	DELETE	/system/{id}/share/{sharer-id};{sharer-ns}
RELATE_METADATA_TO_SYSTEM	GET, POST, PUT	/system/{source-id}/link/{target-id};{target-ns}/relation/{relation-id};{relation-ns}
RELATE_METADATA_TO_SYSTEM	GET, POST, PUT	/system/{source-id}/link/{target-id};{target-ns}
UNRELATE_METADATA_FROM_SYSTEM	DELETE	/system/{source-id}/link/{target-id};{target-ns}/relation/{relation-id};{relation-ns}
UNRELATE_METADATA_FROM_SYSTEM	DELETE	/system/{source-id}/link/{target-id};{target-ns}

Table 37: API for accessing the system resource.

where `{id}` is the unique identifier of the system.

The next two sections show an example of the representation of the results.

C.36.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:system
    ims:identifier="sys-1"
    ims:name="Name of sys-1"
    ims:description="Description of sys-1"
    ims:scope="SHARED"
    ims:created="2012-09-13T18:41:29.831+02:00"
    ims:last-modified="2012-09-13T18:41:29.831+02:00">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
      <ims:sharing>
        <ims:group
          ims:identifier="group-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>DENIED</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_ONLY</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_WRITE</ims:access-permission>
      </ims:sharing>
    </ims:sharings>
    <ims:links>
      <ims:link>
        <ims:metadata
          ims:identifier="md-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isPartOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:system ims:identifier="sys-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isCopyrightOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
```

```
59          <ims:system ims:identifier="sys-1" />
60        </ims:link>
61        <ims:link>
62          <ims:metadata
63            ims:identifier="md-3"
64            ims:namespace="http://ims.dei.unipd.it/" />
65          <ims:relation>
66            <ims:concept
67              ims:identifier="isDescriptionOf"
68              ims:namespace="http://ims.dei.unipd.it/" />
69          </ims:relation>
70          <ims:system ims:identifier="sys-1" />
71        </ims:link>
72      </ims:links>
73      <ims:configuration ims:identifier="cnf-1" />
74    </ims:system>
75 </ims:direct>
```

C.36.3 JSON Representation

```
1 {
2    "direct":{
3       "system":{
4          "identifier":"sys-1",
5          "created":"2012-09-13T18:41:29.831+02:00",
6          "last-modified":"2012-09-13T18:41:29.831+02:00",
7          "name":"Name of sys-1",
8          "description":"Description of sys-1",
9          "scope":"SHARED",
10         "owner":{
11            "user":{
12               "identifier":"user-1",
13               "namespace":"http://ims.dei.unipd.it/"
14            }
15         },
16         "sharings":[
17            {
18               "sharing":{
19                  "group":{
20                     "identifier":"group-1",
21                     "namespace":"http://ims.dei.unipd.it/"
22                  },
23                  "access-permission":"DENIED"
24               }
25            },
26            {
27               "sharing":{
28                  "group":{
29                     "identifier":"group-2",
30                     "namespace":"http://ims.dei.unipd.it/"
31                  },
32                  "access-permission":"READ_ONLY"
33               }
34            },
35            {
36               "sharing":{
37                  "group":{
38                     "identifier":"group-3",
39                     "namespace":"http://ims.dei.unipd.it/"
40                  },
```

```
                "access-permission":"READ_WRITE"
            }
        }
    ],
    "links":[
        {
            "link":{
                "metadata":{
                    "identifier":"md-1",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"isPartOf",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "system":{
                    "identifier":"sys-1"
                }
            }
        },
        {
            "link":{
                "metadata":{
                    "identifier":"md-2",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"isCopyrightOf",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "system":{
                    "identifier":"sys-1"
                }
            }
        },
        {
            "link":{
                "metadata":{
                    "identifier":"md-3",
                    "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                    "concept":{
                        "identifier":"isDescriptionOf",
                        "namespace":"http://ims.dei.unipd.it/"
                    }
                },
                "system":{
                    "identifier":"sys-1"
                }
            }
        }
    ],
    "configuration":{
        "configuration":{
            "identifier":"cnf-1"
```

```
101                 }
102             }
103         }
104     }
105 }
```

C.37 Task Resource

Represents a piece of work that is undertaken within an EvaluationActivity and aims at testing a specific (research) hypothesis.

C.37.1 API

Action	HTTP Method	URI
CREATE_TASK	POST	/task
READ_TASK	GET	/task/{id}
READ_TASK	GET	/run/{id}/task
UPDATE_TASK	PUT	/task/{id}
DELETE_TASK	DELETE	/task/{id}
LIST_TASKS	GET	/task
LIST_TASKS	GET	/campaign/{id};{ns}/task
LIST_TASKS	GET	/track/{id}/task
LIST_TASKS	GET	/experimental-collection/{id}/task
CREATE_TASK_PROVENANCE_PARTITION	GET	/task/provenance/{year}
DETACH_TASK_PROVENANCE_PARTITION	DELETE	/task/provenance/{year}
LIST_TASK_PROVENANCE_EVENTS	GET	/task/{id}/provenance
ADD_TOPIC_FIELD_TO_TASK	POST	/task/{id}/topic-field/{id};{ns}
REMOVE_TOPIC_FIELD_FROM_TASK	DELETE	/task/{id}/topic-field/{id};{ns}
LIST_TOPIC_FIELD_FROM_TASK	GET	/task/{id}/topic-field

Action	HTTP Method	URI
SHARE_TASK	GET, POST, PUT	/task/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_TASK	DELETE	/task/{id}/share/{sharer-id};{sharer-ns}
RELATE_METADATA_TO_TASK	GET, POST, PUT	/task/{source-id}/link/{target-id};{target-ns}/relation/{relation-id};{relation-ns}
RELATE_METADATA_TO_TASK	GET, POST, PUT	/task/{source-id}/link/{target-id};{target-ns}
UNRELATE_METADATA_FROM_TASK	DELETE	/task/{source-id}/link/{target-id};{target-ns}/relation/{relation-id};{relation-ns}
UNRELATE_METADATA_FROM_TASK	DELETE	/task/{source-id}/link/{target-id};{target-ns}

Table 38: API for accessing the task resource.

where {id} is the unique identifier of the task.

The next two sections show an example of the representation of the results.

C.37.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:task
    ims:identifier="tsk-1"
    ims:created="2012-09-13T18:46:19.914+02:00"
    ims:last-modified="2012-09-13T18:46:19.915+02:00"
    ims:description="Description of task, e.g. diversity task"
```

```
    ims:maximum-experiments-allowed="100"
    ims:scope="SHARED">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
      <ims:sharing>
        <ims:group
          ims:identifier="group-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>DENIED</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_ONLY</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_WRITE</ims:access-permission>
      </ims:sharing>
    </ims:sharings>
    <ims:links>
      <ims:link>
        <ims:metadata
          ims:identifier="md-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isDescriptionOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:task ims:identifier="tsk-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isCopyrightOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:task ims:identifier="tsk-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isAdministrationOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:task ims:identifier="tsk-1" />
```

```
      </ims:link>
    </ims:links>
    <ims:campaign
      ims:identifier="c-1"
      ims:namespace="http://ims.dei.unipd.it/" />
    <ims:track ims:identifier="trk-1" />
    <ims:experimental-collection
      ims:identifier="ec-1" />
  </ims:task>
</ims:direct>
```

C.37.3 JSON Representation

```
{
   "direct":{
      "task":{
         "identifier":"tsk-1",
         "created":"2012-09-13T18:46:19.914+02:00",
         "last-modified":"2012-09-13T18:46:19.915+02:00",
         "description":"Description of task, e.g. diversity task",
         "maximum-experiments-allowed":"100",
         "scope":"SHARED",
         "owner":{
            "user":{
               "identifier":"user-1",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "sharings":[
            {
               "sharing":{
                  "group":{
                     "identifier":"group-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"DENIED"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-2",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_ONLY"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-3",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_WRITE"
               }
            }
         ],
         "links":[
            {
               "link":{
```

```
                "metadata":{
                   "identifier":"md-1",
                   "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                   "concept":{
                      "identifier":"isDescriptionOf",
                      "namespace":"http://ims.dei.unipd.it/"
                   }
                },
                "task":{
                   "identifier":"tsk-1"
                }
             }
          },
          {
             "link":{
                "metadata":{
                   "identifier":"md-2",
                   "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                   "concept":{
                      "identifier":"isCopyrightOf",
                      "namespace":"http://ims.dei.unipd.it/"
                   }
                },
                "task":{
                   "identifier":"tsk-1"
                }
             }
          },
          {
             "link":{
                "metadata":{
                   "identifier":"md-3",
                   "namespace":"http://ims.dei.unipd.it/"
                },
                "relation":{
                   "concept":{
                      "identifier":"isAdministrationOf",
                      "namespace":"http://ims.dei.unipd.it/"
                   }
                },
                "task":{
                   "identifier":"tsk-1"
                }
             }
          }
       ],
       "campaign":{
          "identifier":"c-1",
          "namespace":"http://ims.dei.unipd.it/"
       },
       "track":{
          "identifier":"trk-1"
       },
       "experimental-collection":{
          "identifier":"ec-1"
       }
```

```
108         }
109     }
110 }
```

C.38 Topic Group Resource

Represents a set of topics, which are grouped together because they are used to address a research task carried out in an evaluation activity.

C.38.1 API

Action	HTTP Method	URI
CREATE_TOPIC_GROUP	POST	/topic-group
READ_TOPIC_GROUP	GET	/topic-group/{id}
UPDATE_TOPIC_GROUP	PUT	/topic-group/{id}
DELETE_TOPIC_GROUP	DELETE	/topic-group/{id}
LIST_TOPIC_GROUPS	GET	/topic-group
CREATE_TOPIC_GROUP_PROVENANCE_PARTITION	GET	/topic-group/ provenance/{year}
DETACH_TOPIC_GROUP_PROVENANCE_PARTITION	DELETE	/topic-group/ provenance/{year}
LIST_TOPIC_GROUP_PROVENANCE_EVENTS	GET	/topic-group/{id}/ provenance
ADD_TOPIC_TO_TOPIC_GROUP	POST	/topic-group/{id}/ topic/{id}
REMOVE_TOPIC_FROM_TOPIC_GROUP	DELETE	/topic-group/{id}/ topic/{id}
SHARE_TOPIC_GROUP	GET, POST, PUT	/topic-group/{id}/ share/{sharer-id}; {sharer-ns}/ permission/ {access-permission}
UNSHARE_TOPIC_GROUP	DELETE	/topic-group/{id}/ share/{sharer-id}; {sharer-ns}
RELATE_METADATA_TO_TOPIC_GROUP	GET, POST, PUT	/topic-group/ {source-id}/ link/{target-id}; {target-ns}/ relation/ {relation-id}; {relation-ns}

Action	HTTP Method	URI
RELATE_METADATA_TO_TOPIC_GROUP	GET, POST, PUT	/topic-group/{source-id}/link/{target-id};{target-ns}
UNRELATE_METADATA_FROM_TOPIC_GROUP	DELETE	/topic-group/{source-id}/link/{target-id};{target-ns}/relation/{relation-id};{relation-ns}
UNRELATE_METADATA_FROM_TOPIC_GROUP	DELETE	/topic-group/{source-id}/link/{target-id};{target-ns}

Table 39: API for accessing the topic-group resource.

where {id} is the unique identifier of the topic-group.

The next two sections show an example of the representation of the results.

C.38.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:topic-group
    ims:identifier="tg-1"
    ims:description="description of topic group 1"
    ims:scope="SHARED"
    ims:created="2012-09-13T18:47:21.387+02:00"
    ims:last-modified="2012-09-13T18:47:21.387+02:00">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
      <ims:sharing>
        <ims:group
          ims:identifier="group-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>DENIED</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-2"
```

```
            ims:namespace="http://ims.dei.unipd.it/" />
          <ims:access-permission>READ_ONLY</ims:access-permission>
        </ims:sharing>
        <ims:sharing>
          <ims:group
            ims:identifier="group-3"
            ims:namespace="http://ims.dei.unipd.it/" />
          <ims:access-permission>READ_WRITE</ims:access-permission>
        </ims:sharing>
      </ims:sharings>
      <ims:links>
        <ims:link>
          <ims:metadata
            ims:identifier="md-1"
            ims:namespace="http://ims.dei.unipd.it/" />
          <ims:relation>
            <ims:concept
              ims:identifier="isDescriptionOf"
              ims:namespace="http://ims.dei.unipd.it/" />
          </ims:relation>
          <ims:topic-group ims:identifier="tg-1" />
        </ims:link>
        <ims:link>
          <ims:metadata
            ims:identifier="md-2"
            ims:namespace="http://ims.dei.unipd.it/" />
          <ims:relation>
            <ims:concept
              ims:identifier="isCopyrightOf"
              ims:namespace="http://ims.dei.unipd.it/" />
          </ims:relation>
          <ims:topic-group ims:identifier="tg-1" />
        </ims:link>
        <ims:link>
          <ims:metadata
            ims:identifier="md-3"
            ims:namespace="http://ims.dei.unipd.it/" />
          <ims:relation>
            <ims:concept
              ims:identifier="isAdministrationOf"
              ims:namespace="http://ims.dei.unipd.it/" />
          </ims:relation>
          <ims:topic-group ims:identifier="tg-1" />
        </ims:link>
      </ims:links>
      <ims:topics>
        <ims:topic ims:identifier="t1" />
        <ims:topic ims:identifier="t2" />
        <ims:topic ims:identifier="t3" />
        <ims:topic ims:identifier="t4" />
      </ims:topics>
    </ims:topic-group>
</ims:direct>
```

C.38.3 JSON Representation

```
{
   "direct":{
      "topic-group":{
         "identifier":"tg-1",
```

```
        "created":"2012-09-13T18:47:21.387+02:00",
        "last-modified":"2012-09-13T18:47:21.387+02:00",
        "description":"description of topic group 1",
        "scope":"SHARED",
        "owner":{
           "user":{
              "identifier":"user-1",
              "namespace":"http://ims.dei.unipd.it/"
           }
        },
        "sharings":[
           {
              "sharing":{
                 "group":{
                    "identifier":"group-1",
                    "namespace":"http://ims.dei.unipd.it/"
                 },
                 "access-permission":"DENIED"
              }
           },
           {
              "sharing":{
                 "group":{
                    "identifier":"group-2",
                    "namespace":"http://ims.dei.unipd.it/"
                 },
                 "access-permission":"READ_ONLY"
              }
           },
           {
              "sharing":{
                 "group":{
                    "identifier":"group-3",
                    "namespace":"http://ims.dei.unipd.it/"
                 },
                 "access-permission":"READ_WRITE"
              }
           }
        ],
        "links":[
           {
              "link":{
                 "metadata":{
                    "identifier":"md-1",
                    "namespace":"http://ims.dei.unipd.it/"
                 },
                 "relation":{
                    "concept":{
                       "identifier":"isDescriptionOf",
                       "namespace":"http://ims.dei.unipd.it/"
                    }
                 },
                 "topic-group":{
                    "identifier":"tg-1"
                 }
              }
           },
           {
              "link":{
                 "metadata":{
```

```
                        "identifier":"md-2",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "relation":{
                        "concept":{
                            "identifier":"isCopyrightOf",
                            "namespace":"http://ims.dei.unipd.it/"
                        }
                    },
                    "topic-group":{
                        "identifier":"tg-1"
                    }
                }
            },
            {
                "link":{
                    "metadata":{
                        "identifier":"md-3",
                        "namespace":"http://ims.dei.unipd.it/"
                    },
                    "relation":{
                        "concept":{
                            "identifier":"isAdministrationOf",
                            "namespace":"http://ims.dei.unipd.it/"
                        }
                    },
                    "topic-group":{
                        "identifier":"tg-1"
                    }
                }
            }
        ],
        "topics":[
            {
                "topic":{
                    "identifier":"t1"
                }
            },
            {
                "topic":{
                    "identifier":"t2"
                }
            },
            {
                "topic":{
                    "identifier":"t3"
                }
            },
            {
                "topic":{
                    "identifier":"t4"
                }
            }
        ]
    }
  }
}
```

C.39 Topic Resource

Represents the materialization of an information need.

C.39.1 API

Action	HTTP Method	URI
CREATE_TOPIC	POST	/topic
READ_TOPIC	GET	/topic/{id}
UPDATE_TOPIC	PUT	/topic/{id}
DELETE_TOPIC	DELETE	/topic/{id}
CREATE_TOPIC_PROVENANCE_PARTITION	GET	/topic/provenance/{year}
DETACH_TOPIC_PROVENANCE_PARTITION	DELETE	/topic/provenance/{year}
LIST_TOPICS	GET	/topic
LIST_TOPIC_PROVENANCE_EVENTS	GET	/topic/{id}/provenance
ADD_TOPIC_FIELD_TO_TOPIC	POST	/topic/{id}/topic-field
UPDATE_TOPIC_FIELD_FROM_TOPIC	PUT	/topic/{id}/topic-field/{id};{ns}
DELETE_TOPIC_FIELD_FROM_TOPIC	DELETE	/topic/{id}/topic-field/{id};{ns}
READ_TOPIC_FIELD_FROM_TOPIC	GET	/topic/{id}/topic-field/{id};{ns}

Table 40: API for accessing the topic resource.

where {id} is the unique identifier of the topic.

The next two sections show an example of the representation of the results.

C.39.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:topic
    ims:identifier="tpc-1"
```

```
    ims:created="2012-09-13T18:48:25.056+02:00"
    ims:last-modified="2012-09-13T18:48:25.056+02:00">
    <ims:topic-fields>
      <ims:topic-field>
        <ims:concept
          ims:identifier="isFieldOf"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:topic-field-contents>
          <ims:topic-field-content
            ims:media-type="application/json"
            ims:language="abk">
            <ims:content>&lt;title&gt;title A&lt;/title&gt;</ims:content>
          </ims:topic-field-content>
          <ims:topic-field-content
            ims:media-type="application/pdf"
            ims:language="ada">
            <ims:content ims:content-transfer-encoding="base64">PGRlc2M+ZGVzY3JpcHRpb248L2Rlc2M+
            </ims:content>
          </ims:topic-field-content>
        </ims:topic-field-contents>
      </ims:topic-field>
      <ims:topic-field>
        <ims:concept
          ims:identifier="isFieldOf2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:topic-field-contents>
          <ims:topic-field-content
            ims:media-type="application/msword"
            ims:language="bik">
            <ims:content ims:content-transfer-encoding="base64">PHRpdGxlPnRpdGxlIEI8L3RpdGxlPg==
            </ims:content>
          </ims:topic-field-content>
        </ims:topic-field-contents>
      </ims:topic-field>
    </ims:topic-fields>
  </ims:topic>
</ims:direct>
```

C.39.3 JSON Representation

```
{
   "direct":{
      "topic":{
         "identifier":"tpc-1",
         "created":"2012-09-13T18:48:25.056+02:00",
         "last-modified":"2012-09-13T18:48:25.056+02:00",
         "topic-fields":[
            {
               "topic-field":{
                  "concept":{
                     "identifier":"isFieldOf",
                     "namespace":"http://ims.dei.unipd.it/"
                  }
               },
               "topic-field-contents":[
                  {
                     "topic-field-content":{
                        "media-type":"application/json",
                        "language":"abk",
                        "content":{
```

```
                        "content":"<title>title A</title>"
                    }
                }
            },
            {
                "topic-field-content":{
                    "media-type":"application/pdf",
                    "language":"ada",
                    "content":{
                        "content-transfer-encoding":"base64",
                        "content":"PGRlc2M+ZGVzY3JpcHRpb248L2Rlc2M+"
                    }
                }
            }
        ]
    },
    {
        "topic-field":{
            "concept":{
                "identifier":"isFieldOf2",
                "namespace":"http://ims.dei.unipd.it/"
            }
        },
        "topic-field-contents":[
            {
                "topic-field-content":{
                    "media-type":"application/msword",
                    "language":"bik",
                    "content":{
                        "content-transfer-encoding":"base64",
                        "content":"PHRpdGxlPnRpdGxlIEI8L3RpdGxlPg=="
                    }
                }
            }
        ]
    }
  ]
 }
}
```

C.40 Track Resource

Represents a group of Tasks carried within an Evaluation Activity of type campaign.

C.40.1 API

Action	HTTP Method	URI
CREATE_TRACK	POST	/track
READ_TRACK	GET	/track/{id}
READ_TRACK	GET	/task/{id}/track
UPDATE_TRACK	PUT	/track/{id}
DELETE_TRACK	DELETE	/track/{id}
LIST_TRACKS	GET	/track

Action	HTTP Method	URI
CREATE_TRACK_PROVENANCE_PARTITION	GET	/track/provenance/{year}
DETACH_TRACK_PROVENANCE_PARTITION	DELETE	/track/provenance/{year}
LIST_TRACK_PROVENANCE_EVENTS	GET	/track/{id}/provenance
ADD_TASK_TO_TRACK	GET, POST, PUT	/track/{id}/task/{id}
REMOVE_TASK_FROM_TRACK	DELETE	/track/{id}/task/{id}
LIST_TASK_FROM_TRACK	GET	/track/{id}/task
SHARE_TRACK	GET, POST, PUT	/track/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_TRACK	DELETE	/track/{id}/share/{sharer-id};{sharer-ns}
RELATE_METADATA_TO_TRACK	GET, POST, PUT	/track/{source-id}/link/{target-id};{target-ns}/relation/{relation-id};{relation-ns}
RELATE_METADATA_TO_TRACK	GET, POST, PUT	/track/{source-id}/link/{target-id};{target-ns}
UNRELATE_METADATA_FROM_TRACK	DELETE	/track/{source-id}/link/{target-id};{target-ns}/relation/{relation-id};{relation-ns}
UNRELATE_METADATA_FROM_TRACK	DELETE	/track/{source-id}/link/{target-id};{target-ns}

Table 41: API for accessing the track resource.

where {id} is the unique identifier of the track.

The next two sections show an example of the representation of the results.

C.40.2 XML Representation

```
<?xml version="1.0" encoding="UTF-8"?>
<ims:direct
  xmlns:ims="http://ims.dei.unipd.it/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ims.dei.unipd.it/ http://ims.dei.unipd.it/data/xml/direct.3.00.xsd">
  <ims:track
    ims:identifier="trk-1"
    ims:created="2012-09-13T18:49:42.367+02:00"
    ims:last-modified="2012-09-13T18:49:42.367+02:00"
    ims:description="Description of track, e.g. CLEF 2012 Ad-Hoc Track"
    ims:submission-deadline="2012-09-13"
    ims:scope="SHARED">
    <ims:owner>
      <ims:user
        ims:identifier="user-1"
        ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
      <ims:sharing>
        <ims:group
          ims:identifier="group-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>DENIED</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-2"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_ONLY</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group
          ims:identifier="group-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_WRITE</ims:access-permission>
      </ims:sharing>
    </ims:sharings>
    <ims:links>
      <ims:link>
        <ims:metadata
          ims:identifier="md-1"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isDescriptionOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:track ims:identifier="trk-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-2"
          ims:namespace="http://ims.dei.unipd.it/" />
```

```
        <ims:relation>
          <ims:concept
            ims:identifier="isCopyrightOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:track ims:identifier="trk-1" />
      </ims:link>
      <ims:link>
        <ims:metadata
          ims:identifier="md-3"
          ims:namespace="http://ims.dei.unipd.it/" />
        <ims:relation>
          <ims:concept
            ims:identifier="isAdministrationOf"
            ims:namespace="http://ims.dei.unipd.it/" />
        </ims:relation>
        <ims:track ims:identifier="trk-1" />
      </ims:link>
    </ims:links>
    <ims:campaign
      ims:identifier="ea-1"
      ims:namespace="http://ims.dei.unipd.it/" />
  </ims:track>
</ims:direct>
```

C.40.3 JSON Representation

```
{
   "direct":{
      "track":{
         "identifier":"trk-1",
         "description":"Description of track, e.g. CLEF 2012 Ad-Hoc Track",
         "submission-deadline":"2012-09-13",
         "scope":"SHARED",
         "created":"2012-09-13T18:49:42.367+02:00",
         "last-modified":"2012-09-13T18:49:42.367+02:00",
         "owner":{
            "user":{
               "identifier":"user-1",
               "namespace":"http://ims.dei.unipd.it/"
            }
         },
         "sharings":[
            {
               "sharing":{
                  "group":{
                     "identifier":"group-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"DENIED"
               }
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-2",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_ONLY"
               }
```

```
            },
            {
               "sharing":{
                  "group":{
                     "identifier":"group-3",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "access-permission":"READ_WRITE"
               }
            }
         ],
         "links":[
            {
               "link":{
                  "metadata":{
                     "identifier":"md-1",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "relation":{
                     "concept":{
                        "identifier":"isDescriptionOf",
                        "namespace":"http://ims.dei.unipd.it/"
                     }
                  },
                  "track":{
                     "identifier":"trk-1"
                  }
               }
            },
            {
               "link":{
                  "metadata":{
                     "identifier":"md-2",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "relation":{
                     "concept":{
                        "identifier":"isCopyrightOf",
                        "namespace":"http://ims.dei.unipd.it/"
                     }
                  },
                  "track":{
                     "identifier":"trk-1"
                  }
               }
            },
            {
               "link":{
                  "metadata":{
                     "identifier":"md-3",
                     "namespace":"http://ims.dei.unipd.it/"
                  },
                  "relation":{
                     "concept":{
                        "identifier":"isAdministrationOf",
                        "namespace":"http://ims.dei.unipd.it/"
                     }
                  },
                  "track":{
                     "identifier":"trk-1"
```

```
                    }
                }
            }
        ],
        "campaign":{
            "identifier":"ea-1",
            "namespace":"http://ims.dei.unipd.it/"
        }
    }
  }
}
```

C.41 Visualization Resource

Refers to the information used by the infrastructure to store and recover whichever visualization of the data that the users do.

C.41.1 API

Action	HTTP Method	URI
CREATE_VISUALIZATION	POST	/visualization
READ_VISUALIZATION	GET	/visualization/{id}
READ_VISUALIZATION	GET	/visualization/{id}/content
UPDATE_VISUALIZATION	PUT	/visualization/{id}
DELETE_VISUALIZATION	DELETE	/visualization/{id}
LIST_VISUALIZATIONS	GET	/visualization
CREATE_VISUALIZATION_PROVENANCE_PARTITION	GET	/visualization/provenance/{year}
DETACH_VISUALIZATION_PROVENANCE_PARTITION	DELETE	/visualization/provenance/{year}
LIST_VISUALIZATION_PROVENANCE_EVENTS	GET	/visualization/{id}/provenance
SHARE_VISUALIZATION	GET, PUT, POST	/visualization/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}
UNSHARE_VISUALIZATION	DELETE	/visualization/{id}/share/{sharer-id};{sharer-ns}
ADD_SNAPSHOT_TO_VISUALIZATION	POST	/visualization/{id}/snapshot
READ_SNAPSHOT	GET	/visualization/{id}/snapshot/{sid}

Action	HTTP Method	URI
READ_SNAPSHOT	GET	/visualization/{id}/snapshot/{sid}/content
UPDATE_SNAPSHOT	PUT	/visualization/{id}/snapshot/{sid}
DELETE_SNAPSHOT	DELETE	/visualization/{id}/snapshot/{sid}
UPDATE_SNAPSHOT	POST, PUT	/visualization/{id}/snapshot/{sid}/content
UPDATE_SNAPSHOT	DELETE	/visualization/{id}/snapshot/{sid}/content
READ_VISUALIZATION_FROM_TASK	GET	/task/{id}/content
READ_VISUALIZATION_FROM_GROUND_TRUTH	GET	/ground-truth/{id}/content
READ_VISUALIZATION_FROM_EXPERIMENT	GET	/experiment/{id}/content
READ_VISUALIZATION_FROM_RUN	GET	/run/{id}/content

Table 42: API for accessing the visualization resource.

where {id} is the unique identifier of the visualization; {sharer-id} and {sharer-ns} are the identifier and namespace of the group which shares the visualization; {access-permission} is the access permission to the visualization for the group, namely DENIED, READ_ONLY, READ_WRITE; {sid} is the identifier of a snapshot.

C.41.2 XML Representation

```
<?xml version="1.0" encoding="utf-8"?>
<ims:direct xmlns:ims="http://ims.dei.unipd.it/" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  <ims:visualization ims:identifier="v-1" ims:created="2012-09-24T13:33:39.323+02:00" ims:last-modified
    <ims:owner>
      <ims:user ims:identifier="user-1" ims:namespace="http://ims.dei.unipd.it/" />
    </ims:owner>
    <ims:sharings>
      <ims:sharing>
        <ims:group ims:identifier="group-1" ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>DENIED</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group ims:identifier="group-2" ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_ONLY</ims:access-permission>
      </ims:sharing>
      <ims:sharing>
        <ims:group ims:identifier="group-3" ims:namespace="http://ims.dei.unipd.it/" />
        <ims:access-permission>READ_WRITE</ims:access-permission>
      </ims:sharing>
    </ims:sharings>
    <ims:parameters>
      <ims:parameter>
        <ims:concept ims:identifier="parameterA" ims:namespace="http://direct.dei.unipd.it/" />
```

```
        <ims:value>value 1</ims:value>
      </ims:parameter>
      <ims:parameter>
        <ims:concept ims:identifier="parameterB" ims:namespace="http://direct.dei.unipd.it/" />
        <ims:value>value 2</ims:value>
      </ims:parameter>
      <ims:parameter>
        <ims:concept ims:identifier="parameterC" ims:namespace="http://direct.dei.unipd.it/" />
        <ims:value>value 3</ims:value>
      </ims:parameter>
    </ims:parameters>
    <ims:concept ims:identifier="type-1, e.g. Scatterplot" ims:namespace="http://ims.dei.unipd.it/" />
    <ims:measures>
      <ims:measure ims:identifier="m-1">
        <ims:concept ims:identifier="precision" ims:namespace="http://ims.dei.unipd.it/" />
        <ims:value>4.0E-1</ims:value>
      </ims:measure>
      <ims:measure ims:identifier="m-2">
        <ims:concept ims:identifier="recall" ims:namespace="http://ims.dei.unipd.it/" />
        <ims:value>3.0E-1</ims:value>
      </ims:measure>
    </ims:measures>
    <ims:estimates>
      <ims:estimate ims:identifier="est-1" ims:value="0.0" />
      <ims:estimate ims:identifier="est-2" ims:value="0.0" />
      <ims:estimate ims:identifier="est-3" ims:value="0.0" />
    </ims:estimates>
    <ims:snapshots>
      <ims:snapshot ims:identifier="snp-1" />
      <ims:snapshot ims:identifier="snp-2" />
      <ims:snapshot ims:identifier="snp-3" />
    </ims:snapshots>
    <ims:experiments>
      <ims:experiment ims:identifier="exp-1" />
      <ims:experiment ims:identifier="exp-2" />
      <ims:experiment ims:identifier="exp-3" />
    </ims:experiments>
    <ims:ground-truths>
      <ims:ground-truth ims:identifier="gt-1" />
      <ims:ground-truth ims:identifier="gt-2" />
      <ims:ground-truth ims:identifier="gt-3" />
    </ims:ground-truths>
    <ims:tasks>
      <ims:task ims:identifier="tsk-1" />
      <ims:task ims:identifier="tsk-2" />
      <ims:task ims:identifier="tsk-3" />
    </ims:tasks>
    <ims:statistical-tests>
      <ims:statistical-test ims:identifier="st-1" />
      <ims:statistical-test ims:identifier="st-2" />
      <ims:statistical-test ims:identifier="st-3" />
    </ims:statistical-tests>
  </ims:visualization>
</ims:direct>
```

C.41.3 JSON Representation

```
{
   "direct":{
      "visualization":{
```

```
        "identifier":"v-1",
        "created":"2012-09-13T18:50:45.531+02:00",
        "last-modified":"2012-09-13T18:50:45.531+02:00",
        "parameters":[
           {
              "parameter":{
                 "concept":{
                    "identifier":"parameterA",
                    "namespace":"http://direct.dei.unipd.it/"
                 },
                 "value":"value 1"
              }
           },
           {
              "parameter":{
                 "concept":{
                    "identifier":"parameterB",
                    "namespace":"http://direct.dei.unipd.it/"
                 },
                 "value":"value 2"
              }
           },
           {
              "parameter":{
                 "concept":{
                    "identifier":"parameterC",
                    "namespace":"http://direct.dei.unipd.it/"
                 },
                 "value":"value 3"
              }
           }
        ],
        "concept":{
           "identifier":"type-1, e.g. Scatterplot",
           "namespace":"http://ims.dei.unipd.it/"
        },
        "measures":[
           {
              "measure":{
                 "identifier":"meas-1"
              }
           },
           {
              "measure":{
                 "identifier":"meas-2"
              }
           },
           {
              "measure":{
                 "identifier":"meas-3"
              }
           }
        ],
        "estimates":[
           {
              "estimate":{
                 "identifier":"est-1"
              }
           },
           {
```

```
                "estimate":{
                    "identifier":"est-2"
                }
            },
            {
                "estimate":{
                    "identifier":"est-3"
                }
            }
        ],
        "snapshots":[
            {
                "snapshot":{
                    "identifier":"snp-1"
                }
            },
            {
                "snapshot":{
                    "identifier":"snp-2"
                }
            },
            {
                "snapshot":{
                    "identifier":"snp-3"
                }
            }
        ],
        "experiments":[
            {
                "experiment":{
                    "identifier":"exp-1"
                }
            },
            {
                "experiment":{
                    "identifier":"exp-2"
                }
            },
            {
                "experiment":{
                    "identifier":"exp-3"
                }
            }
        ],
        "ground-truths":[
            {
                "ground-truth":{
                    "identifier":"gt-1"
                }
            },
            {
                "ground-truth":{
                    "identifier":"gt-2"
                }
            },
            {
                "ground-truth":{
                    "identifier":"gt-3"
                }
            }
```

```
124             ],
125             "tasks":[
126                 {
127                     "task":{
128                         "identifier":"tsk-1"
129                     }
130                 },
131                 {
132                     "task":{
133                         "identifier":"tsk-2"
134                     }
135                 },
136                 {
137                     "task":{
138                         "identifier":"tsk-3"
139                     }
140                 }
141             ],
142             "statistical-tests":[
143                 {
144                     "statistical-test":{
145                         "identifier":"st-1"
146                     }
147                 },
148                 {
149                     "statistical-test":{
150                         "identifier":"st-2"
151                     }
152                 },
153                 {
154                     "statistical-test":{
155                         "identifier":"st-3"
156                     }
157                 }
158             ]
159         }
160     }
161 }
```

C.41.4 Basic Usage

The basic usage is intended for the cases in which the visualization consists mainly snapshots of reasonably small size. This means that the visualization can be processed as a whole.

Creation To create the visualization, you have to POST at the following URI:

`/visualization`

You may decide to not specify the identifier for the visualization and for the snapshots contained in the visualization. In that case the system will automatically set a type 4 **UUID!** [ISO/IEC 9834-8, 2008; Leach et al., 2005] for the visualization and each of its snapshots.

Note that, even if you create a shared visualization, this is not automatically shared with the groups at creation time but, for each group you want to share the visualization with, you need a separate call to the following URI:

`/visualization/{id}/share/{sharer-id};{sharer-ns}/permission/{access-permission}`

Reading To read a whole visualization, you have to GET the following URI:

`/visualization/{id}/content`

Update To update the scope and/or the owner and/or the parameters of an visualization, you have to PUT at the following URI:

`/visualization/{id}`

To update one of the snapshots of the visualization, you have to PUT at the following URI:

`/visualization/{id}/snapshot/{sid}`

Deletion To delete a whole visualization, you have to DELETE the following URI:

`/visualization/{id}`

C.41.5 Advanced Usage

The advanced use stems from the consideration that the payload of a snapshot can be of considerable size, and so a more efficient way of dealing with this use of visualizations is needed. The basic idea here is to allow to create, read, update, and delete the visualization and snapshots separately and, when possible, to avoid the XML or JSON wrapping.

Creation To create the visualization, without any snapshot, you have to POST at the following URI:

`/visualization`

a visualization where its representation does not contain any snapshots, as in the XML example below.

[********** TO BE ADDED **********]

Then, to add each snapshot separately to the visualization, you have to POST at the following URI:

`/visualization/{id}/snapshot`

a representation of a snapshot, as in the XML example below.

[********** TO BE ADDED **********]

If the payload of your snapshot is really huge, you may decide to add the snapshot to the visualization via a POST at the following URI:

`/visualization/{id}/snapshot`

using representation of a snapshot without the `content` element, as in the XML example below. [********** TO BE ADDED **********]

and then upload the actual payload of the snapshot, directly in binary format and specifying its MIME media type in the HTTP headers, via a PUT or POST at the following URI:

`/visualization/{id}/snapshot/{sid}/content`

Reading To read an visualization, you have to GET the following URI:

`/visualization/{id}`

and it will return a representation of the visualization where all its snapshots are listed without reporting their content, as in the XML example below.

[********** TO BE ADDED **********]

Then, you can read the actual content of each snapshot separately via a GET at the following URI:

`/visualization/{id}/snapshot/{sid}/content`

Update To update the scope and/or the owner and/or parameters of an visualization, you have to PUT at the following URI:

`/visualization/{id}`

To update one of the snapshots of the visualization but not its content, you have to PUT at the following URI:

`/visualization/{id}/snapshot/{sid}`

a representation of the snapshot where the `content` element is not present, as in the XML example below.

[********** TO BE ADDED **********]

To update the content of one of the snapshots of the visualization, you have to POST or PUT at the following URI:

`/visualization/{id}/snapshot/{sid}/content`

the actual payload of the snapshot, directly in binary format and specifying its MIME media type in the HTTP headers.

If you perform a DELETE on the same URI, you will empty the content of the snapshot but not delete the snapshot itself.

Deletion To delete a snapshot of an visualization, you have to DELETE the following URI:

`/visualization/{id}/snapshot/{sid}`

To delete a whole visualization, you have to DELETE the following URI:

`/visualization/{id}`

D The CQL Context Set

The DIRECT Context Set (version 1.0) has been defined in order to provide a uniform query syntax to DIRECT by using the *Contextual Query Language (CQL)* [OASIS Search Web Services Technical Committee, 2012], developed and maintained by the Library of Congress in the context of the Z39.50 Next Generation (ZING) project.

The DIRECT Context Set implements all the search capabilities discussed in Section **??**.

DIRECT provides conformance to CQL up to Level 2, since:

- Level 0:
  1. it is able to process a term-only query;
  2. if an unsupported query is supplied, it is able to respond with a diagnostic to say that the query is not supported;
- Level 1:
  1. it supports Level 0;
  2. it is able to parse both:
     (a) search clauses consisting of “index relation searchTerm"; and
     (b) queries where search terms are combined with Boolean operators;
  3. it supports both (a) and (b) above;
- Level 2:
  1. it supports Level 1;
  2. it is able to parse all of CQL and respond with appropriate diagnostics for the parts not supported.

D.1 Indexes

This section describes the indexes available in the DIRECT context set for searching and accessing the different resources managed by the system.

In the following there is a table summarizing all the indexes available for a given resource. The table contains:

- the full index name and an alias that can be used for convenience in writing queries;
- the type of the index – whether exact or best match;
- the relations allowed for the index;
- the wildcards that can be used with the index, if any;
- a short description of the matching criteria of the index.

This is presented in Sections from D.1.1 to D.1.6.

D.1.1 Log Event Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
ici.logEvent.identifier	ici.le.id	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches log events with respect to their identifier (a positive integer)
ici.logEvent.level	ici.le.level	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches metadata sets with respect to their level, which is defined as the following enumeration: TRACE, DEBUG, INFO, WARN, ERROR, FATAL
ici.logEvent.created	ici.le.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches log events with respect to their creation timestamp
ici.logEvent.thread	ici.le.thread	Exact Match	=, ==, <>	* and ?	Matches log events with respect to the thread generating them
ici.logEvent.className	ici.le.clsName	Exact Match	=, ==, <>	* and ?	Matches log events with respect to the name of the class generating them
ici.logEvent.classFileName	ici.le.clsFileName	Exact Match	=, ==, <>	* and ?	Matches log events with respect to the name of the file of the class generating them

Index Name	Alias	Type	Relations	Wildcards	Description
ici.logEvent.classLine	ici.le.clsLine	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches log events with respect to the line of the file of the class generating them (a positive integer)
ici.logEvent.methodName	ici.le.methodName	Exact Match	=, ==, <>	* and ?	Matches log events with respect to the name of the method generating them
ici.logEvent.ip	ici.le.ip	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches log events with respect to IP address of the client generating them
ici.logEvent.user.identifier	ici.le.u.id	Exact Match	=, ==, <>	* and ?	Matches log events with respect to the identifier of the user generating them
ici.logEvent.user.namespace.identifier	ici.le.u.ns.id	Exact Match	=, ==, <>	* and ?	Matches log events with respect to the identifier of the namespace of the user generating them
ici.logEvent.action	ici.le.action	Exact Match	=, ==, <>	* and ?	Matches log events with respect to the action generating them
ici.logEvent.resource.identifier	ici.le.r.id	Exact Match	=, ==, <>	* and ?	Matches log events with respect to the identifier of the resource involved by them

Index Name	Alias	Type	Relations	Wildcards	Description
ici.logEvent.resource.namespace.identifier	ici.le.r.ns.id	Exact Match	=, ==, <>	* and ?	Matches log events with respect to the identifier of the namespace of the resource involved by them
ici.logEvent.resource.class	ici.le.r.cls	Exact Match	=, ==, <>	* and ?	Matches log events with respect to the class of the resource involved by them
ici.logEvent.message	ici.le.msg	Best Match	=, ==, <>	*	Matches log events with respect to their message
ici.logEvent.exception	ici.le.ex	Best Match	=, ==, <>	*	Matches log events with respect to the exception described in them
ici.logEvent.general	ici.le.gen	Best Match	=, ==, <>	*	Matches log events with respect to the content of all their attributes

Table 43: Indexes for searching the log event resource.

D.1.2 Namespace Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
ici.namespace.identifier	ici.ns.id	Exact Match	=, ==, <>	* and ?	Matches namespaces with respect to their identifier
ici.namespace.prefix	ici.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches namespaces with respect to their prefix

Index Name	Alias	Type	Relations	Wildcards	Description
ici.namespace.description	ici.ns.desc	Best Match	=, ==, <>	*	Matches namespaces with respect to their description
ici.namespace.general	ici.ns.gen	Best Match	=, ==, <>	*	Matches namespaces with respect to the content of all their attributes
ici.namespace.created	ici.ns.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches namespaces with respect to their creation timestamp
ici.namespace.lastModified	ici.ns.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches namespaces with respect to their last modification timestamp

Table 44: Indexes for searching the namespace resource.

D.1.3 Concept Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
ici.concept.identifier	ici.c.id	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to their identifier
ici.concept.namespace.identifier	ici.c.ns.id	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the identifier of their namespace
ici.concept.namespace.prefix	ici.c.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the prefix of their namespace
ici.concept.description	ici.c.desc	Best Match	=, ==, <>	*	Matches concepts with respect to their description
ici.concept.general	ici.c.gen	Best Match	=, ==, <>	*	Matches concepts with respect to the content of all their attributes

Index Name	Alias	Type	Relations	Wildcards	Description
ici.concept.created	ici.c.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches concepts with respect to their creation timestamp
ici.concept.lastModified	ici.c.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches concepts with respect to their last modification timestamp
ici.concept.source.identifier	ici.c.s.id	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the identifier of the concepts that are linking to this concept, i.e. they act as source in a relation with this concept
ici.concept.source.namespace.identifier	ici.c.s.ns.id	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the identifier of the namespace of the concepts that are linking to this concept, i.e. they act as source in a relation with this concept
ici.concept.source.namespace.prefix	ici.c.s.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the prefix of the namespace of the concepts that are linking to this concept, i.e. they act as source in a relation with this concept

Index Name	Alias	Type	Relations	Wildcards	Description
ici.concept.source.relation.identifier	c.s.r.id	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the identifier of the relation of the concepts that are linking to this concept, i.e. they act as source in a relation with this concept
ici.concept.source.relation.namespace.identifier	c.s.r.ns.id	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the identifier of the namespace of the relation of the concepts that are linking to this concept, i.e. they act as source in a relation with this concept
ici.concept.source.relation.namespace.prefix	c.s.r.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the identifier of the namespace of the relation of the concepts that are linking to this concept, i.e. they act as source in a relation with this concept
ici.concept.source.relation.score	ici.u.s.r.score	Exact Match	=, ==, <, >, <=, >=	No	Matches source concepts with respect to the score of the relation between a source concept and the target one

Index Name	Alias	Type	Relations	Wildcards	Description
ici.concept.target.namespace.identifier	ici.c.s.ns.id	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the identifier of the namespace of the concepts that are linked by this concept, i.e. they act as target in a relation with this concept
ici.concept.target.namespace.prefix	ici.c.s.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the prefix of the namespace of the concepts that are linked by this concept, i.e. they act as target in a relation with this concept
ici.concept.target.relation.identifier	c.s.r.id	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the identifier of the relation of the concepts that are linked by this concept, i.e. they act as target in a relation with this concept
ici.concept.target.relation.score	ici.u.t.r.score	Exact Match	=, ==, <, >, <=, >=	No	Matches target concepts with respect to the score of the relation between a source concept and the target one

Index Name	Alias	Type	Relations	Wildcards	Description
ici.concept.measure.created	ici.c.m.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches concepts with respect to the associated measure creation timestamp
ici.concept.measure.value	ici.c.m.m.value	Exact Match	=, ==, <, >, <=, >=	No	Matches concept with respect to their measure value
ici.concept.measure.year	ici.u.m.m.year	Exact Match	=, ==, <, >, <=, >=	No	Matches concept with respect to their measure year
ici.concept.measure.metric.identifier	ici.c.m.m.identifier	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the identifier of the metric associated to them
ici.concept.measure.metric.namespace.identifier	ici.c.m.m.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the namespace identifier of the metric associated to them
ici.concept.measure.metric.namespace.prefix	ici.c.m.m.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the namespace prefix of the metric associated to them
ici.concept.featured.user.identifier	ici.c.featured.u.identifier	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the identifier of the featured user
ici.concept.featured.user.namespace.identifier	ici.c.featured.u.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the namespace identifier of the featured user

Index Name	Alias	Type	Relations	Wildcards	Description
ici.concept.featured.user.namespace.prefix	ici.c.featured.u.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the namespace prefix of the featured user
ici.concept.featured.user.score	ici.c.featured.u.score	Exact Match	=, ==, <, >, <=, >=	No	Matches concepts with respect to the score of the relation between a concept and a user
ici.concept.featured.user.backwardScore	ici.c.featured.u.backwardScore	Exact Match	=, ==, <, >, <=, >=	No	Matches concepts with respect to the score of the relation between a user and a concept
ici.concept.featured.contribution.identifier	ici.c.featured.cnt.identifier	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the identifier of the featured contribution
ici.concept.featured.contribution.score	ici.c.featured.cnt.score	Exact Match	=, ==, <, >, <=, >=	No	Matches concepts with respect to the score of the relation between a concept and a contribution
ici.concept.stastistic.created	ici.c.s.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches concepts with respect to the associated stastistic creation timestamp
ici.concept.stastistic.value	ici.c.s.value	Exact Match	=, ==, <, >, <=, >=	No	Matches concept with respect to their stastistic value
ici.concept.stastistic.year	ici.c.m.m.year	Exact Match	=, ==, <, >, <=, >=	No	Matches concept with respect to their stastistic year

Index Name	Alias	Type	Relations	Wildcards	Description
ici.concept.stastistic.metric.identifier	ici.c.s.m.identifier	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the identifier of the metric associated to them
ici.concept.stastistic.metric.namespace.identifier	ici.c.s.m.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the namespace identifier of the metric associated to them
ici.concept.stastistic.metric.namespace.prefix	ici.c.s.m.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the namespace prefix of the metric associated to them
ici.concept.stastistic.descriptiveStatistic.identifier	ici.c.s.ds.identifier	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the identifier of the descriptiveStatistic associated to them
ici.concept.stastistic.descriptiveStatistic.namespace.identifier	ici.c.s.ds.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the namespace identifier of the descriptiveStatistic associated to them
ici.concept.stastistic.descriptiveStatistic.namespace.prefix	ici.c.s.ds.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches concepts with respect to the namespace prefix of the descriptiveStatistic associated to them

Table 45: Indexes for searching the concept resource.

D.1.4 Group Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
ici.group.identifier	ici.g.id	Exact Match	=, ==, <>	* and ?	Matches groups with respect to their identifier
ici.group.namespace.identifier	ici.g.ns.id	Exact Match	=, ==, <>	* and ?	Matches groups with respect to the identifier of their namespace
ici.group.namespace.prefix	ici.g.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches groups with respect to the prefix of their namespace
ici.group.description	ici.g.desc	Best Match	=, ==, <>	*	Matches groups with respect to their description
ici.group.general	ici.g.gen	Best Match	=, ==, <>	*	Matches groups with respect to the content of all their attributes
ici.group.user.identifier	ici.g.u.id	Exact Match	=, ==, <>	* and ?	Matches groups with respect to the identifier of the users belonging to them
ici.group.user.namespace.identifier	ici.g.u.ns.id	Exact Match	=, ==, <>	* and ?	Matches groups with respect to the identifier of the namespace of the users belonging to them
ici.group.user.namespace.prefix	ici.g.u.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches groups with respect to the prefix of the namespace of the users belonging to them
ici.group.created	ici.g.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches groups with respect to their creation timestamp

Index Name	Alias	Type	Relations	Wildcards	Description
ici.group.lastModified	ici.g.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches groups with respect to their last modification timestamp
ici.group.user.identifier	ici.g.u.id	Exact Match	=, ==, <>	* and ?	Matches groups with respect to the identifier of the users belonging to them
ici.group.user.namespace.identifier	ici.g.u.ns.id	Exact Match	=, ==, <>	* and ?	Matches groups with respect to the identifier of the namespace of the users belonging to them
ici.group.user.namespace.prefix	ici.g.u.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches groups with respect to the prefix of the namespace of the users belonging to them

Table 46: Indexes for searching the group resource.

D.1.5 Role Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
ici.role.identifier	ici.r.id	Exact Match	=, ==, <>	* and ?	Matches roles with respect to their identifier
ici.role.namespace.identifier	ici.r.ns.id	Exact Match	=, ==, <>	* and ?	Matches roles with respect to the identifier of their namespace
ici.role.namespace.prefix	ici.r.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches roles with respect to the prefix of their namespace

Index Name	Alias	Type	Relations	Wildcards	Description
ici.role.description	ici.r.desc	Best Match	=, ==, <>	*	Matches roles with respect to their description
ici.role.general	ici.r.gen	Best Match	=, ==, <>	*	Matches roles with respect to the content of all their attributes
ici.role.user.identifier	ici.r.u.id	Exact Match	=, ==, <>	* and ?	Matches roles with respect to the identifier of the users belonging to them
ici.role.user.namespace.identifier	ici.r.u.ns.id	Exact Match	=, ==, <>	* and ?	Matches roles with respect to the identifier of the namespace of the users belonging to them
ici.role.user.namespace.prefix	ici.r.u.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches roles with respect to the prefix of the namespace of the users belonging to them
ici.role.created	ici.r.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches roles with respect to their creation timestamp
ici.role.lastModified	ici.r.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches roles with respect to their last modification timestamp
ici.role.user.identifier	ici.r.u.id	Exact Match	=, ==, <>	* and ?	Matches roles with respect to the identifier of the users belonging to them

Index Name	Alias	Type	Relations	Wildcards	Description
ici.role.user.namespace.identifier	ici.r.u.ns.id	Exact Match	=, ==, <>	* and ?	Matches roles with respect to the identifier of the namespace of the users belonging to them
ici.role.user.namespace.prefix	ici.r.u.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches roles with respect to the prefix of the namespace of the users belonging to them

Table 47: Indexes for searching the role resource.

D.1.6 User Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
ici.user.identifier	ici.u.id	Exact Match	=, ==, <>	* and ?	Matches users with respect to their identifier
ici.user.namespace.identifier	ici.u.ns.id	Exact Match	=, ==, <>	* and ?	Matches users with respect to the identifier of their namespace
ici.user.namespace.prefix	ici.u.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches users with respect to the prefix of their namespace
ici.user.lastName	ici.u.lastName	Exact Match	=, ==, <>	* and ?	Matches users with respect to their last/family name
ici.user.firstName	ici.u.firstName	Exact Match	=, ==, <>	* and ?	Matches users with respect to their first name
ici.user.affiliation	ici.u.affiliation	Best Match	=, ==, <>	*	Matches users with respect to their affiliation

Index Name	Alias	Type	Relations	Wildcards	Description
ici.user.email	ici.u.email	Exact Match	=, ==, <>	* and ?	Matches users with respect to their email address
ici.user.country	ici.u.country	Exact Match	=, ==, <>	* and ?	Matches users with respect to their country expressed using ISO 3166-1:2006 three letters codes
ici.user.language	ici.u.lang	Exact Match	=, ==, <>	* and ?	Matches users with respect to their language expressed using ISO 639-2:1998 three letters codes
ici.user.birthDate	ici.u.birthDate	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches users with respect to their birth date
ici.user.gender	ici.u.gender	Exact Match	=, ==, <>	*	Matches users with respect to their gender (MALE or FEMALE).
ici.user.address	ici.u.address	Best Match	=, ==, <>	*	Matches users with respect to their address
ici.user.city	ici.u.city	Exact Match	=, ==, <>	* and ?	Matches users with respect to their city
ici.user.state	ici.u.state	Exact Match	=, ==, <>	* and ?	Matches users with respect to their state/province/region
ici.user.zip	ici.u.zip	Exact Match	=, ==, <>	* and ?	Matches users with respect to their ZIP code

Index Name	Alias	Type	Relations	Wildcards	Description
ici.user.phone	ici.u.phone	Exact Match	=, ==, <>	* and ?	Matches users with respect to their telephone number
ici.user.facsimile	ici.u.facsimile	Exact Match	=, ==, <>	* and ?	Matches users with respect to their facsimile number
ici.user.mobile	ici.u.mobile	Exact Match	=, ==, <>	* and ?	Matches users with respect to their mobile telephone number
ici.user.voipCallerId	ici.u.voip	Exact Match	=, ==, <>	* and ?	Matches users with respect to their VoIP caller identifier
ici.user.homepage	ici.u.homepage	Exact Match	=, ==, <>	* and ?	Matches users with respect to their home page address.
ici.user.general	ici.u.gen	Best Match	=, ==, <>	*	Matches users with respect to the content of all their attributes
ici.user.group.identifier	ici.u.g.id	Exact Match	=, ==, <>	* and ?	Matches users with respect to the identifier of the groups they belong to
ici.user.group.namespace.identifier	ici.u.g.ns.id	Exact Match	=, ==, <>	* and ?	Matches users with respect to the identifier of the namespace of the groups they belong to

Index Name	Alias	Type	Relations	Wildcards	Description
ici.user.group.namespace.prefix	ici.u.g.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches users with respect to the prefix of the namespace of the groups they belong to
ici.user.role.identifier	ici.u.r.id	Exact Match	=, ==, <>	* and ?	Matches users with respect to the identifier of the roles they belong to
ici.user.role.namespace.identifier	ici.u.r.ns.id	Exact Match	=, ==, <>	* and ?	Matches users with respect to the identifier of the namespace of the roles they belong to
ici.user.role.namespace.prefix	ici.u.r.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches users with respect to the prefix of the namespace of the roles they belong to
ici.user.created	ici.u.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches users with respect to their creation timestamp
ici.user.lastModified	ici.u.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches users with respect to their last modification timestamp
ici.user.source.identifier	ici.u.s.identifier	Exact Match	=, ==, <>	* and ?	Matches users with respect to the identifier of the source user they are related to

Index Name	Alias	Type	Relations	Wildcards	Description
ici.user.source.namespace.identifier	ici.u.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches users with respect to the namespace identifier of the source user they are related to
ici.user.source.namespace.prefix	ici.u.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches users with respect to the namespace prefix of the source user they are related to
ici.user.source.relation.identifier	ici.u.s.r.identifier	Exact Match	=, ==, <>	* and ?	Matches source users with respect to the identifier of the relation connecting two users
ici.user.source.relation.namespace.identifier	ici.u.s.r.identifier	Exact Match	=, ==, <>	* and ?	Matches source users with respect to the namespace identifier of the relation connecting two users
ici.user.source.relation.namespace.prefix	ici.u.s.r.prefix	Exact Match	=, ==, <>	* and ?	Matches source users with respect to the namespace prefix of the relation connecting two users
ici.user.source.relation.score	ici.u.s.r.score	Exact Match	=, ==, <, >, <=, >=	No	Matches source users with respect to the score of the relation connecting two users
ici.user.target.identifier	ici.u.t.identifier	Exact Match	=, ==, <>	* and ?	Matches users with respect to the identifier of the target user they are related to

Index Name	Alias	Type	Relations	Wildcards	Description
ici.user.target.namespace.identifier	ici.u.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches users with respect to the namespace identifier of the target user they are related to
ici.user.target.namespace.prefix	ici.u.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches users with respect to the namespace prefix of the target user they are related to
ici.user.target.relation.identifier	ici.u.target.r.identifier	Exact Match	=, ==, <>	* and ?	Matches target users with respect to the identifier of the relation connecting two users
ici.user.target.relation.namespace.identifier	ici.u.t.r.identifier	Exact Match	=, ==, <>	* and ?	Matches target users with respect to the namespace identifier of the relation connecting two users
ici.user.target.relation.namespace.prefix	ici.u.t.r.prefix	Exact Match	=, ==, <>	* and ?	Matches target users with respect to the namespace prefix of the relation connecting two users
ici.user.target.relation.score	ici.u.t.r.score	Exact Match	=, ==, <, >, <=, >=	No	Matches target users with respect to the score of the relation connecting two users

Index Name	Alias	Type	Relations	Wildcards	Description
ici.user.feature.concept.identifier	ici.u.feature.c.identifier	Exact Match	=, ==, <>	* and ?	Matches users features with respect to the identifier of the concept defining the feature
ici.user.feature.concept.namespace.identifier	ici.u.feature.c.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches users features with respect to the namespace identifier of the concept defining the feature
ici.user.feature.concept.namespace.prefix	ici.u.feature.c.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches users features with respect to the namespace prefix of the concept defining the feature
ici.user.feature.concept.score	ici.u.feature.c.score	Exact Match	=, ==, <, >, <=, >=	No	Matches user features with respect to the score of the user with respect to the feature
ici.user.feature.concept.backwardScore	ici.u.feature.c.backwardScore	Exact Match	=, ==, <, >, <=, >=	No	Matches user features with respect to the score of the feature with respect to the user
ici.user.measure.created	ici.u.measure.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches users with respect to the associated measure creation timestamp
ici.user.measure.value	ici.u.measure.value	Exact Match	=, ==, <, >, <=, >=	No	Matches user with respect to their measure value

Index Name	Alias	Type	Relations	Wildcards	Description
ici.user.measure.year	ici.u.measure.year	Exact Match	=, ==, <, >, <=, >=	No	Matches user with respect to their measure year
ici.user.metric.identifier	ici.u.metric.identifier	Exact Match	=, ==, <>	* and ?	Matches users with respect to the identifier of the metric associated to them
ici.user.metric.namespace.identifier	ici.u.metric.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches users with respect to the namespace identifier of the metric associated to them
ici.user.metric.namespace.prefix	ici.u.metric.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches users with respect to the namespace prefix of the metric associated to them
ici.user.stastistic.created	ici.u.s.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches users with respect to the associated stastistic creation timestamp
ici.user.stastistic.value	ici.u.s.value	Exact Match	=, ==, <, >, <=, >=	No	Matches user with respect to their stastistic value
ici.user.stastistic.year	ici.u.m.m.year	Exact Match	=, ==, <, >, <=, >=	No	Matches user with respect to their stastistic year
ici.user.stastistic.metric.identifier	ici.u.s.m.identifier	Exact Match	=, ==, <>	* and ?	Matches users with respect to the identifier of the metric associated to them

Index Name	Alias	Type	Relations	Wildcards	Description
ici.user.stastistic.metric.namespace.identifier	ici.u.s.m.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches users with respect to the namespace identifier of the metric associated to them
ici.user.stastistic.metric.namespace.prefix	ici.u.s.m.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches users with respect to the namespace prefix of the metric associated to them
ici.user.stastistic.descriptiveStatistic.identifier	ici.u.s.ds.identifier	Exact Match	=, ==, <>	* and ?	Matches users with respect to the identifier of the descriptiveStatistic associated to them
ici.user.stastistic.descriptiveStatistic.namespace.identifier	ici.u.s.ds.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches users with respect to the namespace identifier of the descriptiveStatistic associated to them
ici.user.stastistic.descriptiveStatistic.namespace.prefix	ici.u.s.ds.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches users with respect to the namespace prefix of the descriptiveStatistic associated to them

Table 48: Indexes for searching the user resource.

D.1.7 Metadata Set Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
ici.metadataSet.identifier	ici.ms.id	Exact Match	=, ==, <>	* and ?	Matches metadata sets with respect to their identifier
ici.metadataSet.namespace.identifier	ici.ms.ns.id	Exact Match	=, ==, <>	* and ?	Matches metadata sets with respect to the identifier of their namespace
ici.metadataSet.namespace.prefix	ici.ms.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches metadata sets with respect to the prefix of their namespace
ici.metadataSet.name	ici.ms.name	Exact Match	=, ==, <>	* and ?	Matches metadata sets with respect to their name
ici.metadataSet.description	ici.ms.desc	Best Match	=, ==, <>	*	Matches metadata sets with respect to their description
ici.metadataSet.general	ici.ms.gen	Best Match	=, ==, <>	*	Matches metadata sets with respect to the content of all their attributes
ici.metadataSet.superset.identifier	ici.ms.superset.id	Exact Match	=, ==, <>	* and ?	Matches metadata sets with respect to the identifier of the supersets they belong to
ici.metadataSet.superset.name	ici.ms.superset.name	Exact Match	=, ==, <>	* and ?	Matches metadata sets with respect to the identifier of the supersets they belong to
ici.metadataSet.superset.namespace.identifier	ici.ms.superset.ns.id	Exact Match	=, ==, <>	* and ?	Matches metadata sets with respect to the identifier of the namespace of the supersets they belong to

Index Name	Alias	Type	Relations	Wildcards	Description
ici.metadataSet.superset.namespace.prefix	ici.ms.superset.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches metadata sets with respect to the prefix of the namespace of the supersets they belong to
ici.metadataSet.subset.identifier	ici.ms.subset.id	Exact Match	=, ==, <>	* and ?	Matches metadata sets with respect to the identifier of the subsets belonging to them
ici.metadataSet.subset.name	ici.ms.subset.name	Exact Match	=, ==, <>	* and ?	Matches metadata sets with respect to the identifier of the subsets belonging to them
ici.metadataSet.subset.namespace.identifier	ici.ms.subset.ns.id	Exact Match	=, ==, <>	* and ?	Matches metadata sets with respect to the identifier of the namespace of the subsets belonging to them
ici.metadataSet.subset.namespace.prefix	ici.ms.subset.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches metadata sets with respect to the prefix of the namespace of the subsets belonging to them
ici.metadataSet.created	ici.ms.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches metadata sets with respect to their creation timestamp
ici.metadataSet.lastModified	ici.ms.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches metadata sets with respect to their last modification timestamp

Table 49: Indexes for searching the metadata set resource.

D.1.8 Metadata Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
ici.metadata.identifier	ici.md.id	Exact Match	=, ==, <>	* and ?	Matches metadata with respect to their identifier
ici.metadata.namespace.identifier	ici.md.ns.id	Exact Match	=, ==, <>	* and ?	Matches metadata with respect to the identifier of their namespace
ici.metadata.namespace.prefix	ici.md.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches metadata with respect to the prefix of their namespace
ici.metadata.general	ici.md.gen	Best Match	=, ==, <>	*	Matches metadata with respect to their textual content
ici.metadata.metadataSet.identifier	ici.md.ms.id	Exact Match	=, ==, <>	* and ?	Matches metadata with respect to the identifier of the metadata sets they belong to
ici.metadata.metadataSet.name	ici.md.ms.name	Exact Match	=, ==, <>	* and ?	Matches metadata with respect to the name of the metadata sets they belong to
ici.metadata.metadataSet.namespace.identifier	ici.md.ms.ns.id	Exact Match	=, ==, <>	* and ?	Matches metadata with respect to the identifier of the namespace of the metadata sets they belong to
ici.metadata.metadataSet.namespace.prefix	ici.md.ms.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches metadata with respect to the prefix of the namespace of the metadata sets they belong to

Index Name	Alias	Type	Relations	Wildcards	Description
ici.metadata.created	ici.md.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches metadata with respect to their creation timestamp
ici.metadata.lastModified	ici.md.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches metadata with respect to their last modification timestamp

Table 50: Indexes for searching the metadata resource.

The following table summarizes indexes that concern all the metadata resources in the Simple *Dublin Core (DC)* format according to the Dublin Core Context Set [OASIS Search Web Services Technical Committee, 2012].

Index Name	Alias	Type	Relations	Wildcards	Description
dc.contributor	dc.contributor	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their contributor element
dc.coverage	dc.coverage	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their coverage element
dc.creator	dc.creator	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their creator element
dc.date	dc.date	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their date element
dc.description	dc.description	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their description element

Index Name	Alias	Type	Relations	Wildcards	Description
dc.format	dc.format	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their format element
dc.identifier	dc. identifier	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their identifier element
dc.language	dc.language	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their language element
dc.publisher	dc.publisher	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their publisher element
dc.relation	dc.relation	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their relation element
dc.rights	dc.rights	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their rights element
dc.source	dc.source	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their source element
dc.subject	dc.subject	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their subject element

Index Name	Alias	Type	Relations	Wildcards	Description
dc.title	dc.title	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their title element
dc.type	dc.type	Best Match	=, ==, <>	*	Matches Dublin Core metadata with respect to their type element

Table 51: Indexes for searching the metadata resource according to the Dublin Core context set.

D.1.9 Application Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct. applications. identifier	direct.app. id	Exact Match	=, ==, <>	* and ?	Matches applications with respect to their identifier
direct. applications. description	direct.app. desc	Best Match	=, ==, <>	*	Matches applications with respect to their description
direct. applications. name	direct.app. name	Exact Match	=, ==, <>	* and ?	Matches applicationss with respect to their name
direct. applications. general	direct.app. gen	Best Match	=, ==, <>	*	Matches application swith respect to the content of all their attributes
direct. applications. created	direct.app. created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches applications with respect to their creation timestamp
direct. applications. lastModified	direct.app. lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches applications with respect to their last modification timestamp
direct. applications. configuration. identifier	direct.app. conf.id	Exact Match	=, ==, <>	* and ?	Matches applications with respect to the identifier of the configuration which they use.

Index Name	Alias	Type	Relations	Wildcards	Description

Table 52: Indexes for searching the application resource.

D.1.10 Component Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.components.identifier	direct.cmp.id	Exact Match	=, ==, <>	* and ?	Matches components with respect to their identifier
direct.components.description	direct.cmp.desc	Best Match	=, ==, <>	*	Matches components with respect to their description
direct.components.name	direct.cmp.name	Exact Match	=, ==, <>	* and ?	Matches components with respect to their name
direct.components.general	direct.cmp.gen	Best Match	=, ==, <>	*	Matches components with respect to the content of all their attributes
direct.components.created	direct.cmp.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches components with respect to their creation timestamp
direct.components.lastModified	direct.cmp.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches components with respect to their last modification timestamp
direct.components.configuration.identifier	direct.cmp.conf.id	Exact Match	=, ==, <>	* and ?	Matches components with respect to the identifier of the configuration which they use.
ici.components.namespace.identifier	ici.cmp.ns.id	Exact Match	=, ==, <>	* and ?	Matches components with respect to the identifier of their namespace

Index Name	Alias	Type	Relations	Wildcards	Description
ici.components.namespace.prefix	ici.cmp.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches components with respect to the prefix of their namespace

Table 53: Indexes for searching the component resource.

D.1.11 Configuration Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.configurations.identifier	direct.cnf.id	Exact Match	=, ==, <>	* and ?	Matches configurations with respect to their identifier
direct.configurations.description	direct.cnf.desc	Best Match	=, ==, <>	*	Matches configurations with respect to their description
direct.configurations.general	direct.cnf.gen	Best Match	=, ==, <>	*	Matches configurations with respect to the content of all their attributes

Table 54: Indexes for searching the configuration resource.

D.1.12 Contribution Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
ici.contributions.identifier	ici.cnt.id	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their identifier
ici.contributions.mediaType	ici.cnt.mediaType	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their media type
ici.contributions.language	ici.cnt.language	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their language

Index Name	Alias	Type	Relations	Wildcards	Description
ici.contributions.link	ici.cnt.link	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their link
ici.contributions.scope	ici.cnt.scope	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their scope
ici.contributions.description	ici.cnt.desc	Best Match	=, ==, <>	*	Matches contributions with respect to their description
ici.contributions.title	ici.cnt.title	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their title
ici.contributions.content	ici.cnt.cont	Best Match	=, ==, <>	*	Matches contributions with respect to the content of all their attributes
ici.contributions.general	ici.cnt.gen	Best Match	=, ==, <>	*	Matches contributions with respect to the content of all their attributes
ici.contributions.created	ici.cnt.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches contributions with respect to their creation timestamp
ici.contributions.lastModified	ici.cnt.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches contributions with respect to their last modification timestamp
ici.contributions.owner.identifier	ici.cnt.owner.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their owner identifier
ici.contributions.owner.namespace.identifier	ici.cnt.owner.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their owner namespace identifier

Index Name	Alias	Type	Relations	Wildcards	Description
ici.contributions.owner.namespace.prefix	ici.cnt.owner.namespace.prefix	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their owner namespace prefix
ici.contributions.sharingGroup.identifier	ici.cnt.sharingGroup.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their sharing group identifier
ici.contributions.sharingGroup.namespace.identifier	ici.cnt.sharingGroup.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their sharing group namespace identifier
ici.contributions.sharingGroup.namespace.prefix	ici.cnt.sharingGroup.namespace.prefix	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their sharing group namespace prefix
ici.contributions.metadata.identifier	ici.cnt.metadata.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their metadata identifier
ici.contributions.metadata.namespace.identifier	ici.cnt.metadata.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their metadata namespace identifier
ici.contributions.metadata.namespace.prefix	ici.cnt.metadata.namespace.prefix	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their metadata namespace prefix
ici.contributions.metadata.relation.identifier	ici.cnt.metadata.relation.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their metadata relation identifier

Index Name	Alias	Type	Relations	Wildcards	Description
ici.contributions.metadata.relation.namespace.identifier	ici.cnt.metadata.relation.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their metadata relation namespace identifier
ici.contributions.metadata.relation.namespace.prefix	ici.cnt.metadata.relation.namespace.prefix	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their metadata relation namespace prefix
ici.contributions.metadata.relation.score	ici.cnt.metadata.relation.score	Exact Match	=, ==, <>	No	Matches contributions with respect to their metadata relation score
ici.contributions.contributionYear	ici.cnt.cntYear	Exact Match	=, ==, <>	No	Matches contributions with respect to their year
ici.contributions.type.identifier	ici.cnt.type.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their type identifier
ici.contributions.type.namespace.identifier	ici.cnt.type.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their type namespace identifier
ici.contributions.type.namespace.prefix	ici.cnt.type.namespace.prefix	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their type namespace prefix
ici.contributions.author.identifier	ici.cnt.author.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their author identifier

Index Name	Alias	Type	Relations	Wildcards	Description
ici.contributions.author.namespace.identifier	ici.cnt.author.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their author namespace identifier
ici.contributions.author.namespace.prefix	ici.cnt.author.namespace.prefix	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their author namespace prefix
ici.contributions.author.firstName	ici.cnt.author.firstName	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their author first name
ici.contributions.author.namespace.lastName	ici.cnt.author.lastName	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their author last name
ici.contributions.publisher.identifier	ici.cnt.publisher.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their publisher identifier
ici.contributions.publisher.namespace.identifier	ici.cnt.publisher.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their publisher namespace identifier
ici.contributions.publisher.namespace.prefix	ici.cnt.publisher.namespace.prefix	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their publisher namespace prefix
ici.contributions.measure.created	ici.cnt.m.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches contributions with respect to their measure creation timestamp

Index Name	Alias	Type	Relations	Wildcards	Description
ici.contributions.measure.value	ici.cnt.m.value	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches contributions with respect to their measure value
ici.contributions.measure.year	ici.cnt.m.year	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches contributions with respect to their measure year
ici.contributions.measure.metric.identifier	ici.cnt.m.m.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their measure metric identifier
ici.contributions.measure.metric.namespace.identifier	ici.cnt.m.m.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their measure metric namespace identifier
ici.contributions.measure.metric.namespace.prefix	ici.cnt.m.m.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their measure metric namespace prefix
ici.contributions.source.identifier	ici.cnt.source.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their source identifier
ici.contributions.source.relation.identifier	ici.cnt.source.relation.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their source relation identifier
ici.contributions.source.relation.namespace.identifier	ici.cnt.source.relation.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their source relation namespace identifier

Index Name	Alias	Type	Relations	Wildcards	Description
ici.contributions.source.relation.namespace.prefix	ici.cnt.source.relation.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their source relation namespace prefix
ici.contributions.source.relation.score	ici.cnt.source.relation.score	Exact Match	=, ==, <>	No	Matches contributions with respect to their source relation score
ici.contributions.source.relation.frequency	ici.cnt.source.relation.frequency	Exact Match	=, ==, <>	No	Matches contributions with respect to their source relation frequency
ici.contributions.target.identifier	ici.cnt.target.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their target identifier
ici.contributions.target.relation.identifier	ici.cnt.target.relation.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their target relation identifier
ici.contributions.target.relation.namespace.identifier	ici.cnt.target.relation.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their target relation namespace identifier
ici.contributions.target.relation.namespace.prefix	ici.cnt.target.relation.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their target relation namespace prefix
ici.contributions.target.relation.score	ici.cnt.target.relation.score	Exact Match	=, ==, <>	No	Matches contributions with respect to their target relation score

Index Name	Alias	Type	Relations	Wildcards	Description
ici.contributions.target.relation.frequency	ici.cnt.target.relation.frequency	Exact Match	=, ==, <>	No	Matches contributions with respect to their target relation frequency
ici.contributions.feature.concept.identifier	ici.cnt.feature.concept.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their feature concept identifier
ici.contributions.feature.concept.namespace.identifier	ici.cnt.feature.concept.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their feature concept namespace identifier
ici.contributions.feature.concept.namespace.prefix	ici.cnt.feature.concept.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their feature concept namespace prefix
ici.contributions.feature.concept.score	ici.cnt.feature.concept.score	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their feature concept score
ici.contributions.statistic.created	ici.cnt.m.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches contributions with respect to their statistic creation timestamp
ici.contributions.statistic.value	ici.cnt.m.value	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches contributions with respect to their statistic value
ici.contributions.statistic.metric.identifier	ici.cnt.m.m.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their statistic metric identifier

Index Name	Alias	Type	Relations	Wildcards	Description
ici.contributions.statistic.metric.namespace.identifier	ici.cnt.m.m.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their statistic metric namespace identifier
ici.contributions.statistic.metric.namespace.prefix	ici.cnt.m.m.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their statistic metric namespace prefix
ici.contributions.statistic.descriptiveStatistic.identifier	ici.cnt.m.m.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their statistic descriptive identifier
ici.contributions.statistic.descriptiveStatistic.namespace.identifier	ici.cnt.m.m.ns.identifier	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their descriptive statistic namespace identifier
ici.contributions.statistic.descriptiveStatistic.namespace.prefix	ici.cnt.m.m.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches contributions with respect to their descriptive statistic namespace prefix

Table 55: Indexes for searching the contribution resource.

D.1.13 Corpus Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.corpora.identifier	direct.crp.id	Exact Match	=, ==, <>	* and ?	Matches corpora with respect to their identifier

Index Name	Alias	Type	Relations	Wildcards	Description
direct.corpora.description	direct.crp.desc	Best Match	=, ==, <>	*	Matches corpora with respect to their description
direct.corpora.general	direct.crp.gen	Best Match	=, ==, <>	*	Matches corpora with respect to the content of all their attributes
direct.corpora.created	direct.crp.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches corpora with respect to their creation timestamp
direct.corpora.lastModified	direct.crp.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches corpora with respect to their last modification timestamp
direct.corpora.lang	direct.crp.lang	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches corpora with respect to their language
direct.corpora.mediaType	direct.crp.mediaType	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches corpora with respect to their media Type

Table 56: Indexes for searching the corpus resource.

D.1.14 Estimate Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.estimates.identifier	direct.est.id	Exact Match	=, ==, <>	* and ?	Matches estimates with respect to their identifier
direct.estimates.value	direct.est.value	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches estimates with respect to their value
direct.estimates.created	direct.est.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches estimates with respect to their creation timestamp

Index Name	Alias	Type	Relations	Wildcards	Description
direct.estimates.lastModified	direct.est.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches estimates with respect to their last modification timestamp
direct.estimates.metric.identifier	direct.est.mtr.id	Exact Match	=, ==, <>	* and ?	Matches estimates with respect to their concepts (metrics) identifier
direct.estimates.metric.namespace.identifier	direct.est.mtr.ns	Exact Match	=, ==, <>	* and ?	Matches estimates with respect to their concepts (metrics) namespace identifier
direct.estimates.metric.namespace.prefix	direct.est.mtr.ns	Exact Match	=, ==, <>	* and ?	Matches estimates with respect to their concepts (metrics) namespace prefix
direct.estimates.descriptivestatistics.identifier	direct.est.dst.id	Exact Match	=, ==, <>	* and ?	Matches estimates with respect to their concepts (descriptive statistics) identifier
direct.estimates.descriptivestatistics.namespace.identifier	direct.est.dst.ns	Exact Match	=, ==, <>	* and ?	Matches estimates with respect to their concepts (descriptive statistics) namespace identifier
direct.estimates.descriptivestatistics.namespace.prefix	direct.est.dst.ns	Exact Match	=, ==, <>	* and ?	Matches estimates with respect to their concepts (descriptive statistics) namespace prefix

Index Name	Alias	Type	Relations	Wildcards	Description
direct.estimates.task.identifier	direct.mtr.tsk.id	Exact Match	=, ==, <>	* and ?	Matches estimates with respect to their tasks identifier
direct.estimates.topic.identifier	direct.mtr.tpc.id	Exact Match	=, ==, <>	* and ?	Matches estimates with respect to their topics identifier
direct.estimates.experiment.identifier	direct.mtr.exp.id	Exact Match	=, ==, <>	* and ?	Matches estimates with respect to their experiments identifier

Table 57: Indexes for searching the estimate resource.

D.1.15 Evaluation Activity Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.evaluationactivities.identifier	direct.evl.id	Exact Match	=, ==, <>	* and ?	Matches evaluation activities with respect to their identifier
direct.evaluationactivities.namespace.identifier	direct.evl.id	Exact Match	=, ==, <>	* and ?	Matches evaluation activities with respect to their namespace identifier
direct.evaluationactivities.namespace.prefix	direct.evl.id	Exact Match	=, ==, <>	* and ?	Matches evaluation activities with respect to their namespace prefix
direct.evaluationactivities.description	direct.evl.desc	Best Match	=, ==, <>	*	Matches evaluation activities with respect to their description
direct.evaluationactivities.name	direct.evl.name	Exact Match	=, ==, <>	* and ?	Matches evaluation activities with respect to their name

Index Name	Alias	Type	Relations	Wildcards	Description
direct.evaluationactivities.general	direct.evl.gen	Best Match	=, ==, <>	*	Matches evaluation activities with respect to the content of all their attributes
direct.evaluationactivities.created	direct.evl.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches evaluation activities with respect to their creation timestamp
direct.evaluationactivities.lastModified	direct.evl.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches evaluation activities with respect to their last modification timestamp
direct.evaluationactivities.type	direct.evl.type	Exact Match	=, ==, <>	* and ?	Matches evaluation activities with respect to their type
direct.evaluationactivities.status	direct.evl.status	Exact Match	=, ==, <>	* and ?	Matches evaluation activities with respect to their status

Table 58: Indexes for searching the evaluation activity resource.

D.1.16 Experimental Collection Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.experimentalcollections.identifier	direct.expcl.id	Exact Match	=, ==, <>	* and ?	Matches experimental collections with respect to their identifier
direct.experimentalcollections.description	direct.expcl.desc	Best Match	=, ==, <>	*	Matches experimental collections with respect to their description

Index Name	Alias	Type	Relations	Wildcards	Description
direct.experimentalcollections.general	direct.expcl.gen	Best Match	=, ==, <>	*	Matches experimental collections with respect to the content of all their attributes
direct.experimentalcollections.created	direct.expcl.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches experimental collections with respect to their creation timestamp
direct.experimentalcollections.lastModified	direct.expcl.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches experimental collections with respect to their last modification timestamp
direct.experimentalcollections.groundtruth.identifier	direct.expcl.grdtrt.id	Exact Match	=, ==, <>	* and ?	Matches experimental collections with respect to their ground truth identifier
direct.experimentalcollections.topicgroup.identifier	direct.expcl.tpcgrp.id	Exact Match	=, ==, <>	* and ?	Matches experimental collections with respect to their topic group identifier

Table 59: Indexes for searching the experimental collection resource.

D.1.17 Experiment Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.experiments.identifier	direct.exp.id	Exact Match	=, ==, <>	* and ?	Matches experiments with respect to their identifier
direct.experiments.description	direct.exp.desc	Best Match	=, ==, <>	*	Matches experiments with respect to their description

Index Name	Alias	Type	Relations	Wildcards	Description
direct.experiments.general	direct.exp.gen	Best Match	=, ==, <>	*	Matches experiments with respect to the content of all their attributes
direct.experiments.created	direct.exp.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches experiments with respect to their creation timestamp
direct.experiments.lastModified	direct.exp.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches experiments with respect to their last modification timestamp
direct.experiments.configuration.identifier	direct.exp.cnf.id	Exact Match	=, ==, <>	* and ?	Matches experiments with respect to their configuration identifier
direct.experiments.task.identifier	direct.exp.tsk.id	Exact Match	=, ==, <>	* and ?	Matches experiments with respect to their task identifier
direct.experiments.experimentType.identifier	direct.exp.exp.type.id	Exact Match	=, ==, <>	* and ?	Matches experiments with respect to their experiment type identifier
direct.experiments.experimentType.namespace.identifier	direct.exp.exp.type.ns.id	Exact Match	=, ==, <>	* and ?	Matches experiments with respect to their experiment type namespace identifier
direct.experiments.experimentType.namespace.prefix	direct.exp.exp.type.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches experiments with respect to their experiment type namespace prefix

Table 60: Indexes for searching the experiment resource.

D.1.18 Ground Truth Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.groundTruth.identifier	direct.grt.id	Exact Match	=, ==, <>	* and ?	Matches groundTruth with respect to their identifier
direct.groundTruth.description	direct.grt.desc	Best Match	=, ==, <>	*	Matches ground truths with respect to their description
direct.groundTruth.general	direct.grt.gen	Best Match	=, ==, <>	*	Matches ground truths with respect to the content of all their attributes
direct.groundTruth.created	direct.grt.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches ground truth with respect to their creation timestamp
direct.groundTruth.lastModified	direct.grt.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches ground truth with respect to their last modification timestamp

Table 61: Indexes for searching the ground truth resource.

D.1.19 Pool Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.pool.identifier	direct.p.id	Exact Match	=, ==, <>	* and ?	Matches pools with respect to their identifier
direct.pool.description	direct.p.desc	Best Match	=, ==, <>	*	Matches pools with respect to their description
direct.pool.general	direct.p.gen	Best Match	=, ==, <>	*	Matches pools with respect to the content of all their attributes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.pool.created	direct.p.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches pools with respect to their creation timestamp
direct.pool.lastModified	direct.p.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches pools with respect to their last modification timestamp
direct.pool.experimentalcollection identifier	direct.p.expc.id	Exact Match	=, ==, <>	* and ?	Matches pools with respect to their experimental collection identifier

Table 62: Indexes for searching the pool resource.

D.1.20 Information Unit Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.informationUnit.identifier	direct.iu.id	Exact Match	=, ==, <>	* and ?	Matches Information Units with respect to their identifier
direct.informationUnit.description	direct.iu.desc	Best Match	=, ==, <>	*	Matches Information Units with respect to their description
direct.informationUnit.general	direct.iu.gen	Best Match	=, ==, <>	*	Matches Information Units with respect to the content of all their attributes
direct.informationUnit.created	direct.iu.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches Information Units with respect to their creation timestamp
direct.informationUnit.lastModified	direct.iu.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches Information Units with respect to their last modification timestamp

Index Name	Alias	Type	Relations	Wildcards	Description
direct.informationUnit.corpus.identifier	direct.iu.crp.id	Exact Match	=, ==, <>	* and ?	Matches Information Units with respect to their corpus identifier

Table 63: Indexes for searching the Information Unit resource.

D.1.21 Measure Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.measures.identifier	direct.msr.id	Exact Match	=, ==, <>	* and ?	Matches measures with respect to their identifier
direct.measures.value	direct.msr.value	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches measures with respect to their value
direct.measures.created	direct.msr.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches measures with respect to their creation timestamp
direct.measures.lastModified	direct.msr.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches measures with respect to their last modification timestamp
direct.measures.metric.identifier	direct.msr.mtr.id	Exact Match	=, ==, <>	* and ?	Matches measures with respect to their concepts (metrics) identifier
direct.measures.metric.namespace.identifier	direct.msr.mtr.ns	Exact Match	=, ==, <>	* and ?	Matches measures with respect to their concepts (metrics) namespace identifier
direct.measures.metric.namespace.prefix	direct.msr.mtr.ns	Exact Match	=, ==, <>	* and ?	Matches measures with respect to their concepts (metrics) namespace prefix

Index Name	Alias	Type	Relations	Wildcards	Description
direct.measures.topic.identifier	direct.msr.tpc.id	Exact Match	=, ==, <>	* and ?	Matches measures with respect to their topics identifier
direct.measures.experiment.identifier	direct.msr.exp.id	Exact Match	=, ==, <>	* and ?	Matches measures with respect to their experiments identifier

Table 64: Indexes for searching the measure resource.

D.1.22 Run Item Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.runItem.identifier	direct.rni.id	Exact Match	=, ==, <>	* and ?	Matches run items with respect to their identifier
direct.runItem.rank	direct.rni.rank	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches run items with respect to their rank
direct.runItem.score	direct.rni.score	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches run items with respect to their score
direct.runItem.topic.identifier	direct.rni.tpc.id	Exact Match	=, ==, <>	* and ?	Matches run items with respect to their topics identifier
direct.runItem.experiment.identifier	direct.rni.exp.id	Exact Match	=, ==, <>	* and ?	Matches run items with respect to their experiments identifier
direct.runItem.informationunit.identifier	direct.rni.iu.id	Exact Match	=, ==, <>	* and ?	Matches run items with respect to their information units identifier

Table 65: Indexes for searching the run item resource.

D.1.23 Snapshot Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.snapshots.identifier	direct.snp.id	Exact Match	=, ==, <>	* and ?	Matches snapshots with respect to their identifier
direct.snapshots.created	direct.snp.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches snapshots with respect to their creation timestamp
direct.snapshots.lastModified	direct.snp.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches snapshots with respect to their last modification timestamp
direct.snapshots.visualization.identifier	direct.snp.vsl.id	Exact Match	=, ==, <>	* and ?	Matches snapshots with respect to their visualization identifier

Table 66: Indexes for searching the snapshot resource.

D.1.24 Statistical Test Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.statisticalTests.identifier	direct.stt.id	Exact Match	=, ==, <>	* and ?	Matches statistical tests with respect to their identifier
direct.statisticalTests.created	direct.stt.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches statistical tests with respect to their creation timestamp
direct.statisticalTests.lastModified	direct.stt.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches statistical tests with respect to their last modification timestamp
direct.statisticalTests.visualization.identifier	direct.stt.vsl.id	Exact Match	=, ==, <>	* and ?	Matches statistical tests with respect to their visualization identifier
direct.statisticalTests.statisticalAnalysis.identifier	direct.stt.vsl.id	Exact Match	=, ==, <>	* and ?	Matches statistical tests with respect to their statistical analysis identifier

Index Name	Alias	Type	Relations	Wildcards	Description
direct.statisticalTests.statisticalAnalysis.namespace.identifier	direct.stt.vsl.id	Exact Match	=, ==, <>	* and ?	Matches statistical tests with respect to their statistical analysis namespace identifier
direct.statisticalTests.statisticalAnalysis.namespace.prefix	direct.stt.vsl.id	Exact Match	=, ==, <>	* and ?	Matches statistical tests with respect to their statistical analysis namespace prefix

Table 67: Indexes for searching the statistical test resource.

D.1.25 System Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.systems.identifier	direct.sys.id	Exact Match	=, ==, <>	* and ?	Matches systems with respect to their identifier
direct.systems.name	direct.sys.name	Exact Match	=, ==, <>	* and ?	Matches systems with respect to their name
direct.systems.description	direct.sys.desc	Best Match	=, ==, <>	*	Matches systems with respect to their description
direct.systems.created	direct.sys.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches systems with respect to their creation timestamp
direct.systems.lastModified	direct.sys.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches systems with respect to their last modification timestamp
direct.statisticalTests.configuration.identifier	direct.sys.cnf.id	Exact Match	=, ==, <>	* and ?	Matches systems with respect to their configuration identifier

Table 68: Indexes for searching the system resource.

D.1.26 Task Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.tasks.identifier	direct.tsk.id	Exact Match	=, ==, <>	* and ?	Matches tasks with respect to their identifier
direct.tasks.description	direct.tsk.desc	Best Match	=, ==, <>	*	Matches tasks with respect to their description
direct.tasks.created	direct.tsk.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches tasks with respect to their creation timestamp
direct.tasks.lastModified	direct.tsk.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches tasks with respect to their last modification timestamp
direct.tasks.type	direct.tsk.type	Exact Match	=, ==, <>	* and ?	Matches tasks with respect to their type
direct.tasks.evaluationActivity.identifier	direct.tsk.eva.id	Exact Match	=, ==, <>	* and ?	Matches systems with respect to their evaluation activity identifier
direct.tasks.evaluationActivity.namespace.identifier	direct.tsk.eva.ns.id	Exact Match	=, ==, <>	* and ?	Matches systems with respect to their evaluation activity namespace identifier
direct.tasks.evaluationActivity.namespace.prefix	direct.tsk.eva.ns.prefix	Exact Match	=, ==, <>	* and ?	Matches systems with respect to their evaluation activity namespace prefix
direct.tasks.track.identifier	direct.tsk.trk.id	Exact Match	=, ==, <>	* and ?	Matches systems with respect to their track identifier

Index Name	Alias	Type	Relations	Wildcards	Description
direct.tasks.experimentalCollection.identifier	direct.tsk.expc.id	Exact Match	=, ==, <>	* and ?	Matches systems with respect to their experimental collection identifier

Table 69: Indexes for searching the task resource.

D.1.27 Topic Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.topics.identifier	direct.tpc.id	Exact Match	=, ==, <>	* and ?	Matches topics with respect to their identifier
direct.topics.created	direct.tpc.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches topics with respect to their creation timestamp
direct.topics.lastModified	direct.tpc.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches topics with respect to their last modification timestamp
direct.topics.content	direct.tpc.content	Best Match	=, ==, <>	*	Matches topics with respect to their content
direct.topics.general	direct.tpc.general	Best Match	=, ==, <>	*	Matches topics with respect to their content

Table 70: Indexes for searching the topic resource.

D.1.28 Topic Group Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.topicGroups.identifier	direct.tpcg.id	Exact Match	=, ==, <>	* and ?	Matches topic groups with respect to their identifier

Index Name	Alias	Type	Relations	Wildcards	Description
direct.topicGroups.description	direct.tpcg.desc	Best Match	=, ==, <>	*	Matches topic groups with respect to their description
direct.topicGroups.general	direct.tpcg.gen	Best Match	=, ==, <>	*	Matches topic groups with respect to the content of all their attributes
direct.topicGroups.created	direct.tpcg.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches topic groups with respect to their creation timestamp
direct.topicGroups.lastModified	direct.tpcg.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches topic groups with respect to their last modification timestamp

Table 71: Indexes for searching the topic group resource.

D.1.29 Track Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.tracks.identifier	direct.trk.id	Exact Match	=, ==, <>	* and ?	Matches tracks with respect to their identifier
direct.tracks.description	direct.trk.desc	Best Match	=, ==, <>	*	Matches tracks with respect to their description
direct.tracks.created	direct.trk.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches tracks with respect to their creation timestamp
direct.tracks.lastModified	direct.trk.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches tracks with respect to their last modification timestamp

Index Name	Alias	Type	Relations	Wildcards	Description
direct.tracks.submissionDeadline	direct.trk.subddl	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches tracks with respect to their submission deadline
direct.tracks.evalact.identifier	direct.trk.evalact.id	Exact Match	=, ==, <>	* and ?	Matches tracks with respect to their evaluation activity identifier
direct.tracks.evalact.namespace.identifier	direct.trk.evalact.namespace.id	Exact Match	=, ==, <>	* and ?	Matches tracks with respect to their evaluation activity namespace identifier
direct.tracks.evalact.namespace.prefix	direct.trk.evalact.namespace.prefix	Exact Match	=, ==, <>	* and ?	Matches tracks with respect to their evaluation activity namespace prefix

Table 72: Indexes for searching the track resource.

D.1.30 Visualization Indexes

Index Name	Alias	Type	Relations	Wildcards	Description
direct.visualizations.identifier	direct.vsl.id	Exact Match	=, ==, <>	* and ?	Matches visualizations with respect to their identifier
direct.visualizations.description	direct.vsl.desc	Best Match	=, ==, <>	*	Matches visualizations with respect to their description
direct.visualizations.created	direct.vsl.created	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches visualizations with respect to their creation timestamp
direct.visualizations.lastModified	direct.vsl.lastModified	Exact Match	=, ==, <>, >, <, >=, <=	No	Matches visualizations with respect to their last modification timestamp

Index Name	Alias	Type	Relations	Wildcards	Description
direct.visualizations.type.identifier	direct.vsl.type.id	Exact Match	=, ==, <>	* and ?	Matches visualizations with respect to their type identifier
direct.visualizations.type.namespace.identifier	direct.vsl.type.namespace.id	Exact Match	=, ==, <>	* and ?	Matches visualizations with respect to their type namespace identifier
direct.visualizations.type.namespace.prefix	direct.vsl.type.namespace.prefix	Exact Match	=, ==, <>	* and ?	Matches visualizations with respect to their type namespace prefix

Table 73: Indexes for searching the visualization resource.

D.2 Relations

The DIRECT context set does not define relations but relies on those defined in the grammar of CQL. Anyway, it gives the semantics of the relations defined:

- =
  This is the default relation and it is treated as equivalent to ==.
- ==
  This relation is used for exact equality matching. The term in the data is exactly equal to the term in the search.
- <>
  This relation means “not equal to" and matches anything which is not exactly equal to the search term.
- <, >, <=, >=
  These relations retain their regular meanings as pertaining to ordered terms (less than, greater than, less than or equal to, greater than or equal to).

D.3 Relation Modifiers

The following relation modifiers are defined for the DIRECT context set:

- `limit=value`
  Specifies the maximum number of items to return.
  `value` can assume a positive integer numerical value.

- `offset=value`
  Specifies the number of items to skip before starting to return items.
  `value` can assume a positive integer numerical value.

As far as masking rules are concerned, the following wildcards characters apply to relations:

- a **single asterisk (`*`)** is used to mask zero or more characters. This can be applied with both exact and best match indexes.
- a **single question mark (`?`)** is used to mask a single character, thus N consecutive question-marks means mask N characters. This can be applied only with exact match indexes.

D.4 Boolean Operators

The DIRECT context set does not define Boolean operators, as these can only be defined by the CQL grammar. Anyway, it gives the semantics of the Boolean operators defined:

- `AND`
  The combination of two sets of records with `AND` will result in the set of records that appear in both of the sets. Therefore, it is the intersection of the two sets.
- `OR`
  The combination of two sets of records with `OR` will result in the set of records that appear in either or both of the sets. Therefore, it is the union of the two sets.
- `NOT`
  The combination of two sets of records with `NOT` will result in the set of records that appear in the left set, but not in the right hand set. Therefore, it is the difference of the two sets. It cannot be used as a unary operator.
- `PROX`
  The `PROX` operator is not supported but it is parsed and appropriate diagnostic is provided in case of incorrect queries using it.

Note that only indexes with the same target resource can be combined by Boolean operators, since the records in each set must be of the same type, i.e. namespaces can be combined with namespaces and users can be combined with users while combining namespaces and users is not allowed.

D.5 Boolean Modifiers

The following Boolean modifiers are defined for the DIRECT context set:

- `match=value`
  The kind of matching to be applied when computing the Boolean expression, according to the different match strategies discussed in Section **??**. This modifier can be used only with the

`AND`, `OR`, and `NOT` boolean operators.

`value` can assume one of the following values:

- `best`: a best matching has to be performed;
- `loose`: a very approximate matching has to be performed;
- `fuzzy`: a fuzzy matching has to be performed;
- `exact`: a strict boolean matching has to be performed.

D.6 Examples

- `fast.annotation.general == giotto`
  Searches for annotations about Giotto.
- `fast.annotation.general ==/thread==half giotto`
  Searches for annotations about Giotto, taking into consideration also the annotations annotating them.
- `fast.annotation.general ==/limit==100 giotto`
  Searches for annotations about Giotto and returns only the first 100 items
- `ici.user.email == ‘‘ferro@dei.unipd.it"`
  Searches for users whose e-mail address is `ferro@dei.unipd.it`.
- `ici.user.email == *ferro*`
  Searches for users whose e-mail address contains the substring `ferro`, e.g. (`nicola.ferro`, `ferro.nicola`).
- `ici.user.group.identifier == admin*`
  Searches for users who belong to groups whose identifier starts with `admin`.
- `ici.user.country == ITA`
  Searches for Italian users.
- `(ici.user.email == *ferro*) and/match==fuzzy`
  `(ici.user.country == ITA)`
  Searches for users whose e-mail address contains the substring `ferro` and may be Italian.
- `ici.logEvent.created >/limit==100 2011-05-01`
  Searches for last 100 log events created after 1st May 2011.
- `ici.logEvent.identifier >/limit==100 1`
  Searches for last 100 log events.

References

Agosti, M., Braschler, M., Di Buccio, E., Dussin, M., Ferro, N., Granato, G. L., Masiero, I., Pianta, E., Santucci, G., Silvello, G., and Tino, G. (2011). Deliverable D3.2 – Specification of the evaluation infrastructure based on user requirements. PROMISE Network of Excellence, EU 7FP, Contract N. 258191. http://www.promise-noe.eu/documents/10156/fdf43394-0997-4638-9f99-38b2e9c63802.

Agosti, M., Di Buccio, E., Ferro, N., Masiero, I., Nicchio, M., Peruzzo, S., and Silvello, G. (2012). Deliverable D3.3 – Prototype of the Evaluation Infrastructure. PROMISE Network of Excellence, EU 7FP, Contract N. 258191. http://www.promise-noe.eu/documents/10156/3783730a-bce3-481b-83df-48e209c6286a.

Angelini, M., Ferro, N., Santucci, G., and Silvello, G. (2013). Deliverable D4.5 – Rank Analysis Techniques for Interactive Environments. PROMISE Network of Excellence, EU 7FP, Contract N. 258191. http://www.promise-noe.eu/documents/10156/5cdd2029-4189-46af-a7b7-98069aa5e639.

Angelini, M. and Santucci, G. (2013). Deliverable D5.4 – Revised Collaborative User Interface Prototype with Annotation Functionalities. PROMISE Network of Excellence, EU 7FP, Contract N. 258191. http://www.promise-noe.eu/documents/10156/8c475e6c-36b5-4822-9fbc-d7d116b3a897.

Armstrong, T. G., Moffat, A., Webber, W., and Zobel, J. (2009). Improvements that don't add up: ad-hoc retrieval results since 1998. In *CIKM '09: Proceeding of the 18th ACM conference on Information and knowledge management*, pages 601–610. ACM.

Berners-Lee, T., Fielding, R., and Masinter, L. (2005). Uniform Resource Identifier (URI): Generic Syntax. RFC 3986.

Bizer, C., Heath, T., and Berners-Lee, T. (2009). Linked Data - The Story So Far. *International Journal on Semantic Web and Information Systems (IJSWIS)*, 5(3):1–22.

Bordea, G., Buitelaar, P., Silvello, G., Ferro, N., and Bogers, T. (2013). Deliverable D3.6 – Semantic Representation and Enrichment of Information Retrieval Experimental Data. PROMISE Network of Excellence, EU 7FP, Contract N. 258191. http://www.promise-noe.eu/documents/10156/ff9a8133-1751-46bc-882a-d6a05051d526.

Buneman, P. (2013). The providence of provenance. pages 7–12.

Cheney, J., Chiticariu, L., and Tan, W. C. (2009). Provenance in Databases: Why, How, and Where. *Foundations and Trends in Databases*, 1(4):379–474.

Cleverdon, C. (1967). The cranfield tests on index language devices. In *Aslib proceedings*, volume 19, pages 173–194. MCB UP Ltd.

Crockford, D. (2006). The application/json Media Type for JavaScript Object Notation (JSON). RFC 4627.

Eastlake, D. and Jones, P. (2001). US Secure Hash Algorithm 1 (SHA1). RFC 3174.

Ferro, N. and Harman, D. (2010). CLEF 2009: Grid@CLEF Pilot Track Overview. In Peters, C., Di Nunzio, G. M., Kurimo, M., Mandl, T., Mostefa, D., Peñas, A., and Roda, G., editors, *Multilingual Information Access Evaluation Vol. I Text Retrieval Experiments – Tenth Workshop of the Cross–Language Evaluation Forum (CLEF 2009). Revised Selected Papers*, pages 552–565. Lecture Notes in Computer Science (LNCS) 6241, Springer, Heidelberg, Germany.

Fielding, R., Gettys, Y., Mogul, J., Frystyk, H., Masinter, L., Leach, P., and Berners-Lee, T. (1999). Hypertext Transfer Protocol – HTTP/1.1. RFC 2616.

Fielding, R. T. and Taylor, R. N. (2002). Principled Design of the Modern Web Architecture. *ACM Transactions on Internet Technology (TOIT)*, 2(2):115–150.

Franks, J., Hallam-Baker, P. M., Hostetler, J., Lawrence, S., Leach, P., Luotonen, A., and Stewart, L. (1999). HTTP Authentication: Basic and Digest Access Authentication HTTP Authentication: Basic and Digest Access Authentication. RFC 2617.

Freed, N. and Borenstein, N. (1996a). Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies. RFC 2045.

Freed, N. and Borenstein, N. (1996b). Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types. RFC 2046.

Hanbury, A. and Müller, H. (2010). Automated component–level evaluation: Present and future. In *International Conference of the Cross–Language Evaluation Forum (CLEF)*, volume 6360 of *Lecture Notes in Computer Science (LNCS)*, pages 124–135. Springer.

Heath, T. and Bizer, C. (2011). *Linked Data: Evolving the Web into a Global Data Space. Synthesis Lectures on the Semantic Web: Theory and Technology*. Morgan & Claypool Publishers, USA.

Ingwersen, P. and Järvelin, K. (2005). *The turn: Integration of information seeking and retrieval in context*, volume 18 of *The Information Retrieval Series*. Springer.

ISO/IEC 9834-8 (2008). Information technology – Open Systems Interconnection – Procedures for the operation of OSI Registration Authorities: Generation and registration of Universally Unique Identifiers (UUIDs) and their use as ASN.1 Object Identifier components. Recommendation ISO/IEC 9834-8:2008.

Leach, P., Mealling, M., and Salz, R. (2005). A Universally Unique IDentifier (UUID) URN Namespace. RFC 4122.

Metzler, D. and Kurland, O. (2012). Experimental methods for information retrieval. In *Proceedings of the 35th international ACM SIGIR conference on Research and development in information retrieval*, pages 1185–1186. ACM.

Moffat, A. and Zobel, J. (2004). What does it mean to "measure performance"? In Zhou, X., Su, S., Papazoglou, M., Orlowska, M., and K.G., J., editors, *Proceedings of the 5th International Conference on Web Information Systems–WISE 2004*, pages 1–12. Springer.

Müller, H., Clough, P., Deselaers, T., and Caputo, B., editors (2010). *ImageCLEF – Experimental Evaluation in Visual Information Retrieval*, volume 32 of *The Springer International Series On Information Retrieval*. Springer, Berlin Heidelberg.

OASIS Search Web Services Technical Committee (2012). searchRetrieve: Part 5. CQL: The Contextual Query Language Version 1.0. http://docs.oasis-open.org/search-ws/searchRetrieve/v1.0/searchRetrieve-v1.0-part5-cql.pdf.

Richardson, L. and Ruby, S. (2007). *RESTful Web Services*. O'Reilly Media, Inc., Sebastopol (CA), USA.

Rivest, R. (1992). The MD5 Message-Digest Algorithm. RFC 1321.

Robertson, S. E. (1981). The methodology of information retrieval experiment. In Jones, K. S., editor, *Information Retrieval Experiment*, pages 9–31. Butterworths.

Tague-Sutcliffe, J. (1997). The pragmatics of information retrieval experimentation, revisited. In Jones, K. S. and Willett, P., editors, *Readings in Information Retrieval*, Multimedia Information and Systems, chapter 4, pages 205–216. Morgan Kaufmann, 340 Pine Street, San Francisco, USA.

Trotman, A., Clarke, C. L., Ounis, I., Culpepper, S., Cartright, M.-A., and Geva, S. (2012). Open source information retrieval: a report on the sigir 2012 workshop. In *ACM SIGIR Forum*, volume 46, pages 95–101. ACM.

Tsikrika, T., Larsen, B., Bordea, G., and Buitelaar, P. (2013). Deliverable D6.4 – Report on the Impact Analysis for the CLEF Initiative. PROMISE Network of Excellence, EU 7FP, Contract N. 258191. http://www.promise-noe.eu/documents/10156/9d42701f-7d2f-4450-b6a8-5dec5444a757.

Voorhees, E. M. and Harman, D. K. (2005). *TREC: Experiment and evaluation in information retrieval*. MIT press Cambridge.

W3C (2004). Resource Description Framework (RDF): Concepts and Abstract Syntax – W3C Recommendation 10 February 2004. http://www.w3.org/TR/rdf-concepts/ [last visited 2007, March 23].

W3C (2006). Extensible Markup Language (XML) 1.1 (Second Edition) – W3C Recommendation 16 August 2006, edited in place 29 September 2006. http://www.w3.org/TR/xml11/.

W3C (2008). Extensible Markup Language (XML) 1.0 (Fifth Edition) – W3C Recommendation 26 November 2008. http://www.w3.org/TR/xml/.

W3C (2009a). SKOS Simple Knowledge Organization System Primer – W3C Working Group Note 18 August 2009. http://www.w3.org/TR/skos-primer.

W3C (2009b). SKOS Simple Knowledge Organization System Reference – W3C Recommendation 18 August 2009. http://www.w3.org/TR/skos-reference.