OpenAIRE APIs for data access to third party services

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Abstract - The OpenAIRE infrastructure services populate and provide access to a graph of objects relative to publications, datasets, people, organizations, projects, and funders aggregated from a variety of data sources. Not only, objects in the graph are harmonized to achieve semantic homogeneity, de-duplicated and merged, and enriched by inference with missing properties and/or relationships. The aim of this technical report is to describe to third-party service managers (developers in the need of accessing data) how the OpenAIRE information space can be accessed and according to which combination of protocol and format. The document is organized according to a data centric view, where managers should first identify the typology of data they would like to access, and then verify which protocols and formats are available.

1 Exporting the OpenAIRE information space

The OpenAIRE information space provides metadata information about six main interconnected entities: publications, datasets, persons, organizations, projects and data sources (here intended as data providers for OpenAIRE).

Exporting objects conforming to the structure and relationships of the OpenAIRE entities to third-party consumers is one of the core goals of the OpenAIREplus project. In fact, opening up the OpenAIRE information space to institutions and organizations of the Member States and beyond is a key message of the project.

In the following sections we shall present the export data models and formats adopted in OpenAIRE and then the APIs devised to export objects of publication, dataset and project types. Due to the lack of use-cases, for the moment we do not provide access to the collection of organizations, persons, and data sources. Further APIs will be devised to export objects of other entities if and when this will become necessary.

2 Export Data Models and Formats

OpenAIRE objects may be exported according to several export data models and relative representation formats. In particular, all objects conforming to the OpenAIRE data model can be directly exported in two formats: the OpenAIRE XML schema, according to which such objects are visible in the OpenAIRE portal, and CERIF OpenAIRE XML profile. Moreover, the qualified Dublin Core data model and schema defined in the OpenAIRE Guidelines for Repository Managers is adopted to export publications in OpenAIRE

Unless specific consumer requirements are provided (e.g. OpenAIRE APIs for integration of EC project into DSpace and Eprints), we shall export using the format suggested by "the guidelines for CRIS managers".

2.1 CERIF data model and OpenAIRE profile

An important work, conducted in OpenAIRE under the supervision of EKT (EuroCRIS) is the document "guidelines for CRIS managers", whose aim is to specify how content conforming to the CERIF data model and stored into CRIS systems, should be exported to OpenAIRE. The document gives instructions on how the CERIF entities that are directly mappable onto OpenAIRE main entities should be exported in terms of data format, data granularity, and protocols. Specifically, the guidelines define:

- Export format: an XML schema for all entity structures is provided (see Tables in appendix A). For each entity, the schema includes the relative properties and relationships to objects of other entities (reflecting the relationship structure of the OpenAIRE data model).
- Export protocol: different ways to export collections of objects conforming to the entities using the OAI-PMH protocol are provided. In a nutshell, objects can be exported as collections corresponding to entities (e.g. the collection of persons, collection of publications, etc.) or can be exported in cross-entity collections (e.g.the collection of all objects).

The guidelines also provided a conceptual mapping from each CERIF entity to the respective OpenAIRE data model entity. As such, the CERIF OpenAIRE profile can be naturally adopted as an export format for OpenAIRE objects. In fact, all metadata objects in OpenAIRE are exported using the XML schema defined in the CRIS guidelines for CRIS managers.

2.2 OpenAIRE data model and schema

The OpenAIRE data model has an XML representation called the OpenAIRE XML schema. Such schema is a *choice* type (i.e. union type) of XML structures representing the individual entity schemas and including relationships across them. The OpenAIRE portal actually provides access to such XMLs supporting search and browse functionalities over such "typed" collection of objects. The OpenAIRE schema can therefore be adopted to export individual collections of objects according to several protocols.

Table 1 - Export Schemas

Schema name	**Schema URL**
OpenAIRE Schema, union of: OpenAIRE_publication_schema OpenAIRE_dataset_schema OpenAIRE_project_schema *OpenAIRE_person_schema* *OpenAIRE_organization_schema* *OpenAIRE_datasource_schema*	http://www.openaire.eu/schema/0.1/oaf.xsd
CERIF OpenAIRE Schema	To be provided
Dublin Core (OpenAIRE guidelines)	http://dublincore.org/documents/2003/04/02/dc-xml-guidelines/ (to be qualified according to OpenAIRE guidelines:

	https://guidelines.openaire.eu/wiki/OpenAIRE_Guidelines:_For_Literature_repositories)

2.3 Dublin Core

Since one of the OpenAIRE export APIs implements the OAI-PMH protocol specs, we shall also provide exports of publication objects according to Dublin Core data model and XML schema. The Dublin Core will be "qualified" as described by the OpenAIRE guidelines for repository managers.

3 Export APIs

When exporting objects we are typically serving consumers, e.g. developers or their resulting systems, in the need of accessing in full or part of the OpenAIRE information space, with the purpose of reusing locally such content. Their needs may be of two kinds: accessing content to process it in a later stage (e.g. aggregation services) or on-demand interaction for the purpose of real-time processing (e.g. portals). In order to address such requirements we identified the following two "technical" use-cases:

- **Bulk-export** of metadata records inclusive of context, i.e. realtionships to other objects. For example, all publication bilbiorgaphic records inclusive of project information (e.g. OpenAIRE project ID and project name), citations to papers and datasets (e.g. DOIs and titles);
- **Selective access** (i.e. search queries) to metadata records of a given entity type based on relevant parameters. For example, publication metadata records could be retrieved based on publication dates, association to project, and typology of publication.
- **Random access** of metadata records of an object given the relative identifier. For example the ORE aggregation relative to a publication in OpenAIRE.

In the following we list the protocols and formats implemented or to be implemented to export publication, datasets, and project objects in order to cover the two techniques above.

3.1 Publications

Publication entities are certainly the core of OpenAIRE infrastructure, being at the center of the evaluation of research impact. The following table summarizes the APIs available in the OpenAIRE infrastructure to support the use cases:

Protocol	Format	Schema	API	Status	Use-Case
OAI-PMH	XML	CERIF_Openaire_publications OpenAIRE Dublin Core (Guidelines for Repository managers) OpenAIRE_Publication_Schema	http://api.openaire.eu/oai_pmh set=publications	Done	Bulk access

HTTP	XML	OpenAIRE_Publication_Schema	http://api.openaire.eu/search/publications	Done	Selective access (max 1000 results)
OAI-ORE	XML	OpenAIRE_Publication_Schema	http://api.openaire.eu/oai_ore	To be done	Random access

3.2 **HTTP exports** Publications can be accessed from the base URL

http://api.openaire.eu/search/publications

The HTTP API has the following parameters. All parameters are optional and can be mixed up to build customized queries:

- format=<json|xml>
  Select the format of the response. Default is xml.
- page=<page number>
- size=<number of results per page>
- doi=<doi>|<doi1>,<doi2>,...,<doin>
  Gets the publication with the given doi, if any. If a comma-separated list of dois is given, then the publications with the given dois are returned.
- openairePublicationID=<id>
  Gets the publication with the given openaire identifier, if any.
- fromDateAccepted=<date>

  Gets the publications whose date of acceptance is greater than or equal the given date. Date should be formatted as YYY-MM-DD.
- toDateAccepted=<date>
  Gets the publications whose date of acceptance is less than or equal the given date. Date should be formatted as YYY-MM-DD.
- title=<titleKeywords>
  Gets the publications whose titles contain the given list of keywords. <titleKeywords> is a white-space separated list of keywords.
- author=<authorKeywords>
  Search for publications by authors. <authorKeywords> is a white-space separated list of names and/or surnames.
- openaireAuthorID=<id>
  Search for publications by author. <id> is the openaire identifier for the author.
- openaireProviderID=<id>
  Search for publications by data provider. <id> is the openaire identifier for the data provider.
- openaireProjectID=<id>
  Search for publications by project. <id> is the openaire identifier for the project.
- FP7ProjectID=<id>
  Search for publications by FP7 project grant agreement. <id> is the grant agreement number.

- hasProject<true|false>
  If hasProject is true gets the publications that have a link to a project. If hasProject is false gets the publications with no links to projects.
- OA=<true|false>
  If OA is true gets Open Access publications. If OA is false gets the non Open Access publications
- hasECFunding=<true|false>
  If hasECFunding is true gets the publications related to projects funded by the EC. If hasECFunding is false gets the publications related to projects not funded by the EC.
- hasUKFunding=<true|false>
  If hasUKFunding is true gets the publications related to projects funded by the UK. If hasUKFunding is false gets the publications related to projects not funded by the UK.
- funder=<id>
  Search for publications by funder. <id> is the identifier of the funder. Currently available values are: wt, fp7, and h2020.
- fundingStream=<id>
  Search for publications by funding stream. <id> is the identifier of the funding stream (e.g. SP1, SP2).
- FP7scientificArea=<id>
  Search for FP7 publications by scientific area. <id> is the identifier of the scientific area (e.g. PEOPLE, IDEAS)

To be implemented:

- Selection of the API version to call via requests to http://api.openaire.eu/search/{API_VERSION}/publications
- Query parameters:
  - model=<dataModel>
    Select the data model of the response. Example: openaire, cerif, or dc. Default is openaire.
  - version=<version>
    Select the version of the data model implementation. For example, if format is xml, version is the version of the XML schema. Default is the last version.

3.3 Datasets

Datasets are increasingly becoming central in the scholarly communication chain. Although they are currently being introduced into OpenAIRE as experimentation, i.e. enrichment to the publication, they are soon going to play a central role in the OpenAIRE research impact measurement plans. Accordingly the OpenAIRE infrastructure supports both bulk and selective access to datasets.

Protocol	Format	Schema	API	Status	Use-Case
OAI-PMH	XML	CERIF_Openaire_datasets OpenAIRE_Dataset_S	http://api.openaire.eu/oai_pmh set=datasets	To be done	Bulk access

		chema			
HTTP	XML	OpenAIRE_Dataset_Schema	http://api.openaire.eu/search/datasets	To be done	Selective access (max 1000 results)

3.4 **HTTP exports** Publications can be accessed from the base URL

http://api.openaire.eu/search/datasets

The HTTP API has the following parameters. All parameters are optional and can be mixed up to build customized queries:

- format=<json|xml>
  Select the format of the response. Default is xml.
- page=<page number>
- size=<number of results per page>
- doi=<doi>
  Gets the dataset with the given doi, if any. If a comma-separated list of dois is given, then the publications with the given dois are returned.
- openaireDatasetID=<id>
  Gets the dataset with the given openaire identifier, if any.
- fromDateCollected=<date>

  Gets the datasets whose date of collection is greater than or equal the given date. Date should be formatted as YYY-MM-DD.
- toDateCollected=<date>
  Gets the datasets whose date of acceptance is less than or equal the given date. Date should be formatted as YYY-MM-DD.
- title=<titleKeywords>
  Gets the datasets whose titles contain the given list of keywords. <titleKeywords> is a white-space separated list of keywords.
- author=<authorKeywords>
  Search for datasets by authors. <authorKeywords> is a white-space separated list of names and/or surnames.
- openaireAuthorID=<id>
  Search for datasets by author. <id> is the openaire identifier for the author.
- openaireProviderID=<id>
  Search for datasets by data provider. <id> is the openaire identifier for the data provider.
- openaireProjectID=<id>
  Search for datasets by project. <id> is the openaire identifier for the project.
- hasProject<true|false>
  If hasProject is true gets the datasets that have a link to a project. If hasProject is false gets the datasets with no links to projects.
- OA=<true|false>
  If OA is true gets Open Access datasets. If OA is false gets the non Open Access datasets.

- hasECFunding=<true|false>
  If hasECFunding is true gets the datasets related to projects funded by the EC. If hasECFunding is false gets the datasets related to projects not funded by the EC.
- hasUKFunding=<true|false>
  If hasUKFunding is true gets the datasets related to projects funded by the UK. If hasUKFunding is false gets the datasets related to projects not funded by the UK.
- funder=<id>
  Search for datasets by funder. <id> is the identifier of the funder. Currently available values are: wt, fp7, and h2020.
- fundingStream=<id>
  Search for datasets by funding stream. <id> is the identifier of the funding stream (e.g. SP1, SP2).
- FP7scientificArea=<id>
  Search for FP7 datasets by scientific area. <id> is the identifier of the scientific area (e.g. PEOPLE, IDEAS)

On going:

- Selection of the API version to call via requests to http://api.openaire.eu/search/{API_VERSION}/datasets
- Query parameters:
  - model=<dataModel>
    Select the data model of the response. Example: openaire, cerif, or dc. Default is openaire.
  - version=<version>
    Select the version of the data model implementation. For example, if format is xml, version is the version of the XML schema. Default is the last version.

3.5 Projects

Protocol	Format	Schema	API	Status	Use-Case
OAI-PMH	XML	CERIF_Openaire_projects OpenAIRE_Project_Schema	http://api.openaire.eu/oai_pmh set=projects	Done	Bulk access
HTTP	HTML	DSpace Web pages	http://api.openaire.eu/projects/dspace/${FundingProgramme}/ALL/ALL	Done	Selective access for DSpace repository
HTTP	HTML	Eprints Web pages	http://api.openaire.eu/projects/eprints/${FundingProgramme}/ALL/ALL	Done	Selective access for Eprints repository
HTTP	XML	OpenAIRE_Project_Schema	http://api.openaire.eu/search/projects	To be done	Selective access (max 1000 results)

Dspace and Eprint web pages exports The APIs offer custom access to EC/UK projects information for the DSpace and EPrints platforms. The URLs embed the parameters needed to collect sub-portions of the projects, where the pattern is FundingProgramme/SpecificProgramme/Subdivision. For example to get projects of the specific programme "SP2-IDEAS" of FP7 for Eprints:

http://api.openaire.eu/projects/eprints/FP7/SP2/ALL

Furthermore, date parameters can be concatenated to the URL, following the pattern:

?startFrom= &startUntil= &endFrom= &endUntil=

Where the date format is YYYY-MM-GG. For example:

http://api.openaire.eu/projects/dspace/FP7/ALL/ALL?startFrom=2011-01-01

returns all FP7 projects for Dspace that started after the given date.

For Wellcome Trust projects:

http://api.openaire.eu/projects/eprints/WT/ALL/ALL

Note that for Wellcome Trust there are no subdivisions, hence the third variable of the URL will always be "ALL".

3.6 **HTTP exports** Projects can be accessed from the base URL

http://api.openaire.eu/search/projects
The HTTP API has the following parameters. All parameters are optional and can be mixed up to build customized queries:

- format=<json|xml>
  Select the format of the response. Default is xml.
- page=<page number>
- size=<number of results per page>
- grantID=<id>
  Gets the project with the given grant identifier, if any.
- name=<nameKeywords>
  Gets the projects whose names contain the given list of keywords. <nameKeywords> is a white-space separated list of keywords.
- acronym=<acronym>
  Gets the project with the given acronym, if any.
- callID=<callID>
  Search for projects by call identifier.
- keywords=<terms>
  Search for projects whose name, title, description or keywords match the given terms. <terms> is a list of white-space separated words.
- startYear=<year>
  Gets the projects that started in the given year. <year> should be formatted as YYYY.
- endYear=<year>
  Gets the projects that ended in the given year. <year> should be formatted as YYYY.
- participantCountries=<countryCodes>
  Search for projects by participants' countries. <countryCodes> is a white-space separated list of country codes in ISOxxxx.
- participantAcronyms=<acronyms>
  Search for projects by participant institutions. <acronyms> is a white-space separated list of acronyms of institutions.
- hasECFunding=<true|false>
  If hasECFunding is true gets the projects funded by the EC. If hasECFunding is false gets the projects not funded by the EC.
- hasUKFunding=<true|false>
  If hasUKFunding is true gets the projects funded by the UK. If hasUKFunding is false gets the projects not funded by the UK.
- funder=<id>
  Search for projects by funder. <id> is the identifier of the funder. Currently available values are: wt, fp7, and h2020.
- fundingStream=<id>
  Search for projects by funding stream. <id> is the identifier of the funding stream (e.g. SP1, SP2).
- FP7scientificArea=<id>
  Search for FP7 projects by scientific area. <id> is the identifier of the scientific area (e.g. PEOPLE, IDEAS)

To be implemented:

- Selection of the API version to call via requests to http://api.openaire.eu/search/{API_VERSION}/datasets
- Query parameters:
    - model=<dataModel>
      Select the data model of the response. Example: openaire, cerif, or dc. Default is openaire.
    - version=<version>
      Select the version of the data model implementation. For example, if format is xml, version is the version of the XML schema. Default is the last version.

3.7 The full information space

Other third-party systems may be interested in accessing the whole information space, in either bulk or selective fashion.

Protocol	Format	Schema	API	Status	Use-Case
OAI-PMH	XML	CERIF_Openaire OpenAIRE_Object_Schema	http://api.openaire.eu/oai_pmh no set specified	Done	Bulk access
HTTP/SPARQL	RDF	OpenAIRE_Object_Schema	http://api.openaire.eu/lod/	To be done	Selective access Random access
OAI-ORE	XML	OpenAIRE_Object_Schema	http://api.openaire.eu/oai_ore/	To be done	Random access

4 Appendix A: OpenAIRE entities exported via CERIF

This section describes the XML elements to be found in the schemas:

- CERIF_OpenAIRE_publications
- CERIF_OpenAIRE_datasets
- CERIF_OpenAIRE_projects

The tables below are taken from the CRIS guidelines document and are relative to: Publications (Table 2: The CERIF XML Publication Object in the OpenAIRE contextTable 2), Persons (Table 3), Organizations (Table 4), Projects (Table 5), and Products/Datasets (Table 6).

Table 2: The CERIF XML Publication Object in the OpenAIRE context

Publication (cfResPubl)

cfResPubl is used in the context of OpenAIRE to represent research results that are classified as text publications. Metadata about scientific journals are also represented using the cfResPubl entity. Articles can be related with the journal they appear in using the cfResPubl_ResPubl link entity with the "Part" classification term (eda28bc1-34c5-11e1-b86c-0800200c9a66)		
Attributes	**Applicable Vocabularies**	**Multiplicity**
Internal Identifier *cfResPublId*		1
Publication Date *cfResPublDate*		0..1
Federated Identifiers *cfFedId*		0..N
Title *cfTitle*		1
Subtitle *cfSubTitle*		0..1
Description *cfResPublAbstr*		1
Subject *cfResPublKeyw, cfResPubl_Class*	cfResPublKeyw may contain free-text keywords (many keywords must be included in one instance of the cfResPublKeyw field as a semi-colon separated list). cfResPubl_Class may contain subject classification according to a controlled vocabulary. No single specific controlled vocabulary is enforced by the guidelines.	0..N
Languague *cfResPubl_Class*	Use ISO 639-x, where x can be 1, 2 or 3. Best Practice: use ISO 639-3. If ISO 639-2 and 639-1 are sufficient for the contents of a CRIS data source they can be used alternatively. Since there is a unique mapping this can be done during an aggregation process.	1
Publication Types *cfResPubl_Class*	Use terms from the CERIF Semantics 1.5 (classification scheme: Output Types)	1
Publication subjects *cfResPubl_Class*	Use terms from the CERIF Semantics 1.5 (classification scheme: Output Types)	0..N
OA Types *cfResPubl_Class*	Use terms from the info:eu-repo-Access-Terms vocabulary, see http://purl.org/REP/standards/info-eu-repo#info-eu-repo-AccessRights. The allowed values are the following: • info:eu-repo/semantics/closedAccess • info:eu-repo/semantics/embargoedAccess • info:eu-repo/semantics/restrictedAccess • info:eu-repo/semantics/openAccess In the case of embargoedAccess, the endDate of the	1

	classification specifies the embargo end date for the publication. If the material is licensed under a Creative Commons license then you should provide links to applicable Creative Commons licenses, e.g.: http://creativecommons.org/licenses/zero/1.0/ http://creativecommons.org/licenses/by/3.0/	
Relationship with	**Applicable Vocabularies**	
Person *cfPers_ResPubl*	The range of allowed values is limited to the following controlled vocabulary: Author (as defined in CERIF Semantics 1.5)	0..N
Organisation *cfOrgUnit_ResPubl*	The range of allowed values is limited to the following controlled vocabulary: Author Publisher (as defined in CERIF Semantics 1.5)	0..N
Project *cfProj_ResPubl*	The range of allowed values is limited to the following controlled vocabulary: Originator (as in the CERIF Semantics 1.5), i.e. Publication has originator Project	0..N
Product (Dataset) *cfResPubl_ResProd*	As in the CERIF Semantics 1.5 (Inter-Output Relations scheme)	0..N
Publication *cfResPubl_ResPubl*	As in the CERIF Semantics 1.5 (Inter-Output Relations scheme)	0..N

Table 3: The CERIF XML Person Object in the OpenAIRE context

Person (cfPers)		
cfPers is used in the context of OpenAIRE to represent persons that are related with publications (e.g. authors, etc.), datasets (e.g. creators, maintainers, etc.) or projects (e.g. contact person for organisation in project)		
Attributes / Relationships	**Applicable Vocabularies**	**Multiplicity**
Internal Identifier *cfPersId*		1
Federated Identifiers *cfFedId*		0..N
First Names *cfFirstNames*		1
Family Name		1..N

cfFamilyName		
Electronic Addresses (Email, Fax, Phone) *cfPers_EAddr*	The range of allowed values is limited to the following controlled vocabulary (adopted from the CERIF Semantics 1.5, Person Contact Details classification scheme): Email Fax Phone	1..N
Nationality of Persons *cfPers_Class*	ISO 3166-1 standard list of country codes	0..1
Relationship with	**Applicable Vocabularies**	
Publications *cfPers_ResPubl*	The range of allowed values is limited to the following controlled vocabulary: Author (as defined in CERIF Semantics 1.5)	0..N
Products *cfPers_ResProd*	The range of allowed values is limited to the following controlled vocabulary: Author (as defined in CERIF Semantics 1.5)	0..N
Project *cfProj_Pers*	The range of allowed values is limited to the following controlled vocabulary: OrganisationContactInProject	0..N
Organisation *cfPers_OrgUnit*	The range of allowed values is limited to the following controlled vocabulary: Affiliation (as defined in CERIF Semantics 1.5)	0..N

Table 4: The CERIF XML Organisation Object in the OpenAIRE context

Organisation (cfOrgUnit)		
cfOrgUnit is used in the context of OpenAIRE to represent research performing organizations producing research results and/or involved in funded projects (e.g. coordinators, participants) or funder organisations.		
Attributes / Relationships	**Applicable Vocabularies**	**Multiplicity**
Internal Identifier *cfOrgUnitId*		1
Federated Identifiers *cfFedId*		0..N
Legal short name *cfAcro*		1
Legal name *cfName*		1
Web site URL *cfURI*		1
Organisation classification *cfOrgUnit_Class*	The range of allowed values is limited to the following controlled vocabulary:	0..1

	Higher Education Private non-profit Company Government SME Intergovernmental Research Institute	
NUTS code classification *cfOrgUnit_Class*	The range of allowed values is limited to the NUTS vocabulary (http://simap.europa.eu/codes-and-nomenclatures/codes-nuts/)	
Country *cfOrgUnit_Class*	ISO 3166-1 standard list of country codes	0..1
Relationship with	**Applicable Vocabularies**	
Project *cfProj_OrgUnit*	The range of allowed values is limited to the following controlled vocabulary (adopted from the CERIF Semantics 1.5): Coordinator Partner Contractor Funder Inkind-Contributor Applicant_	0..N
Funding *cfOrgUnit_Fund*	The range of allowed values is limited to the following controlled vocabulary (adopted from the CERIF Semantics 1.5): Manager Contributor Contact Applicant Issuer Responsible Financier	0..N

Table 5: The CERIF XML Project Object in the OpenAIRE context

Project (cfProj)		
cfProj in the context of OpenAIRE is used to represent funded projects.		
Attributes / Relationships	**Applicable Vocabularies**	**Multiplicity**
Internal Identifier		1

cfProjId		
Federated Identifiers *cfFedId*		0..N
Acronym *cfAcronym*		1
Title *cfProjTitle.cfTitle*		1
Keywords *cfProjKeyw.cfKeyw*		0..N
Web site URL *cfURI*		0..1
Start Date *cfStartDate*		1
End Date *cfEndDate*		1
Open Access Requirements *cfProj_Class*	The range of allowed values is limited to the following controlled vocabulary: EC_SC39	0..1
Relationshipwith	**Applicable Vocabularies**	
Publication *cfProj_ResPubl*	The range of allowed values is limited to the following controlled vocabulary: Originator (as in the CERIF Semantics 1.5), i.e. Project is originator of Publication	0..N
Organisation *cfProj_OrgUnit*	See Organisation - Project	1..N
Relationship with Person *cfProj_Pers*	The range of allowed values is limited to the following controlled vocabulary: OrganisationContactInProject	0..N
Relationship with Funding *cfProj_Fund*	The range of allowed values is limited to the following controlled vocabulary (as defined in CERIF Semantics 1.5, Activity Funding Types classification scheme): Award Grant Contract	0..N

Table 6: The CERIF XML Product Object in the OpenAIRE context

Product / Dataset (cfResProd)		
cfResProd is used in the context of OpenAIRE to represent research results that are classified as datasets. Datasets are linked with publications using cfResPubl_ResProd and with funded project using cfProj_ResProd.		
Attributes / Relationships	**Applicable Vocabularies**	**Multiplicity**
Internal Identifier *cfResProdId*		1
Federated		0..N

Identifiers *cfFedId*		
Name *cfResProdName*		1
Description *cfResProdDescr*		1
Languague *cfResProd _Class*	Use ISO 639-x, where x can be 1,2 or 3. Best Practice: use ISO 639-3. If ISO 639-2 and 639-1 are sufficient for the contents of a CRIS data source they can be used alternatively. Since there is a unique mapping this can be done during an aggregation process.	1
License Types *cfResProd_Class*	Use terms from the info:eu-repo-Access-Terms vocabulary, see http://purl.org/REP/standards/info-eu-repo#info-eu-repo-AccessRights. The allowed values are the following: • info:eu-repo/semantics/closedAccess • info:eu-repo/semantics/embargoedAccess • info:eu-repo/semantics/restrictedAccess • info:eu-repo/semantics/openAccess If the material is licensed under a Creative Commons license then you should provide links to applicable Creative Commons licenses, e.g.: http://creativecommons.org/licenses/zero/1.0/ http://creativecommons.org/licenses/by/3.0/	1
Types of Products (Datasets) *cfResProd_Class*	The range of allowed values is limited to the following controlled vocabulary: Audiovisual Collection Dataset Event Image InteractiveResource Model PhysicalObject Service Software Sound Text Workflow Other	1
Relationship	**Applicable Vocabularies**	

with		
(Recursive) Product / Dataset *cfResProd_ResProd*	The range of allowed values is limited to the following controlled vocabulary: IsCitedBy Cites IsSupplementTo IsSupplementedBy IsContinuedBy Continues HasMetadata IsMetadataFor IsNewVersionOf IsPreviousVersionOf IsPartOf HasPart IsReferencedBy References IsDocumentedBy Documents IsCompiledBy Compiles IsVariantFormOf IsOriginalFormOf IsIdenticalTo	0..N
Publication *cfResPubl_ResProd*	As in the CERIF Semantics 1.5 (Inter-Output Relations scheme)	0..N

Table 7: The CERIF XML Federated Identifier Object in the OpenAIRE context