CERIF Tutorial

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Strategic Membership Meeting
WWU, Münster, Germany
Research Information

= Information about research
Research Information

The process of research
- Research projects
- Funding
- Research infrastructures

The research actors
- Researchers
- Institutions
- Funders
- Publishers
- Facility operators
- Associations

Relationships

Research results
- Outputs (Publications, Research Datasets, Patents, ...)
- Outcomes, Impacts
Research Information is heavily interlinked
## Different viewpoints on Research Information

<table>
<thead>
<tr>
<th>Information perspective</th>
<th>Useful for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Researcher</strong>, his/her activities, results, ...</td>
<td>Researcher profile / CV system</td>
</tr>
<tr>
<td><strong>Project</strong>, its consortium, team, results, ...</td>
<td>Project webpage / report</td>
</tr>
<tr>
<td><strong>Organisational Unit</strong>, its activities, results, ...</td>
<td>Unit webpage / report / evaluation report</td>
</tr>
<tr>
<td><strong>Publication</strong></td>
<td>Bibliometrics / panel evaluations</td>
</tr>
<tr>
<td><strong>Research Facility</strong></td>
<td>Tracking &amp; reporting usage</td>
</tr>
</tbody>
</table>
What characterises a research project?
Social Media Analysis for Social Geography

Lead Research Organisation: Newcastle University
Department Name: Computing Sciences

Abstract

Many believe that social media data has the potential to give real insights into communities. However, there is a real challenge in unlocking this knowledge due to the enormous size and speed with which the data is generated, and a lack of understanding of issues such as ethics and the validity of conclusions drawn from the skewed sample of the population that social media users represent.

“A Tweet My Street” is tackling these problems with the overall goal of understanding how the knowledge gained can benefit socially excluded communities. It is a multi-disciplinary collaboration involving social geographers, computer scientists and statisticians, which aims to:

- design a scalable system for social media data analysis
- create a tool that makes it easy for social scientists to ask questions and visualise results
- explore the use of modern statistical techniques to derive understanding from the data
- drive and evaluate the system through case studies, including the use of the new tools to augment existing social science methods, and to understand the way third sector organisations can make effective use of social media
- explore how the use of the tools can help the private and public sector to make key decisions

Source: http://gtr.rcuk.ac.uk/project/A49CA721-687A-4D55-8FDF-9B60375B6EA8
The PROJECT entity has properties (attributes) and is linked to other entities.

The multilingual attributes are represented by a linked entity each.

* “start date” and “end date” are deprecated in v1.6
CERIF naming rule: in English, abbreviated, starting with cf

Example: Project title = cfProjTitle
Representation in Database

Format, Unicity, Not-null, Foreign Key (FK), composed Primary Key (set of PFK and PK)

<table>
<thead>
<tr>
<th>Key</th>
<th>Attribute Name</th>
<th>Domain</th>
<th>Data Type</th>
<th>Not Null</th>
<th>Unique</th>
<th>Check</th>
<th>Default</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFK</td>
<td>cfProjId</td>
<td>ID</td>
<td>Char(128 BYTE)</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PK</td>
<td>cfStartDate</td>
<td>Date</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PK</td>
<td>cfEndDate</td>
<td>Date</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
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</tr>
</tbody>
</table>

The project identifier (cfProjId) propagates to system-internal project-related entities:
- cfProjectTitle
- cfProjectAbstract
- cfProjectKeywords
- cfProject_Service
- cfProject_Event
- cfProject_Facility
- cfProject_Equipment
- cfProject_Classification
- cfProject_ResultProduct
- cfProject_ResponsiblePerson
- cfProject_Person
- cfProject_Funds
- cfProject_Funding
- cfProject_OrganisationUnit
- cfProject_Medium
- cfProject_Indicator
- cfProject_Contact

@deprecated 1.6: use the cfStartDate of an appropriate unary classification of this cfProject or an appropriate link between this cfProject and the project participant (cfOrganisationalUnit or cfPerson)

@deprecated 1.6: use the cfEndDate of an appropriate unary classification of this cfProject or an appropriate link between this cfProject and the project participant (cfOrganisationalUnit or cfPerson)
### CERIF Project

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Table</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>cfProjId</td>
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<td>base</td>
</tr>
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</table>

<table>
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<th>Attribute</th>
<th>Table</th>
<th>Type</th>
</tr>
</thead>
<tbody>
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<td>cfProjId</td>
<td>cfProj</td>
<td>base</td>
</tr>
<tr>
<td>IST World</td>
<td>cfAcro</td>
<td>cfProj</td>
<td>base</td>
</tr>
<tr>
<td><a href="http://www.ist-world.org/">http://www.ist-world.org/</a></td>
<td>cfURI</td>
<td>cfProj</td>
<td>base</td>
</tr>
<tr>
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<tr>
<td>2007-11-30</td>
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<td>cfProj</td>
<td>base</td>
</tr>
</tbody>
</table>

#### Knowledge Base for RTD Competencies in IST

**cfProjTitle**: PK = cfProjID + cfLangCode + cfTrans

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Table</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>cfProjTitle</td>
<td>cfProj</td>
<td>[en,o]</td>
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</tbody>
</table>

#### Wissensbasis für RTD Kompetenzen im Bereich IST

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Table</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>cfKeyw</td>
<td>cfProjKeyw</td>
<td>[de,h]</td>
</tr>
</tbody>
</table>

#### The objective of the project is to set up and populate an information portal with innovative functionalities...

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Table</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>cfAbstr</td>
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<td>lang</td>
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</table>

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**Source:** [http://www.eurocris.org/Uploads/Web%20pages/CERIF-1.3/Specifications/CERIF1.3_FDM.pdf](http://www.eurocris.org/Uploads/Web%20pages/CERIF-1.3/Specifications/CERIF1.3_FDM.pdf)
Representation in XML

Enclosing XML element = CERIF entity physical name (cfProj)
Enclosed XML elements = CERIF entity’s attributes (cfProjId, cfAcro,...)

XML attributes are used for multilingual CERIF attributes

cfLang, cfTrans:
• o for original language
• h for human translation
• m for machine translation
Representation and example in Linked Data

CERIF entity

Attributes

Multilingual attributes

CERIF Base Entities

- Person
- OrganisationUnit
- Project
Project definition

A temporary endeavor undertaken to create a unique product, service or result. Source: the Project Management Institute, https://www.pmi.org/about/learn-about-pmi/what-is-project-management

In the research information domain, one typically tracks:
1. research projects, where the result is an addition to the body of knowledge of the mankind,
2. technology development projects, where the result is a particular technology or product,
3. innovation projects, where the result is an improvement of a product or process, and
4. projects that create or enhance infrastructure for research, technology development or innovation.

Depending on the scope one can also track finer levels of granularity: stages, work packages, sometimes even down to individual tasks. All such activities are also modelled using the Project entity and linked using the recursive link relationship.

The Project entity only captures details of the project scope and plan. Information about the resources needed to execute the project such as the funding (i.e., the grants received), the people and organisations involved, the supporting infrastructures, the outputs produced, etc. is contained in separate entities (the Funding entity, the Person entity, the OrgUnit entity, the infrastructure entities, the result entities respectively) and is linked to the Project.
OrgUnit definition

Organisation Unit: an organisation, a unit therein, a committee or any other group of people that has a collective goal. Organisation Units are not necessarily formalized as legal entities.

In the research information domain Organisation Units typically represents:
(1) organisations that perform research (universities, research institutes, corporations) and their subdivisions (faculties, schools, departments, research groups) and other associated bodies (boards, advisory bodies);
(2) organisations that fund research (funders, their divisions and evaluation panels);
(3) scientific associations and networks;
(4) publishers, facility operators and other service providers in the research space;
(5) authorities, such as patent offices and standardization or supervision bodies; and
(6) other bodies: editorial boards, evaluation panels, or committees of all kinds.
Person definition

A human being as an individual.
Source: https://en.oxforddictionaries.com/definition/person

The kind of involvement of a Person in the research ecosystem is specified in the links with the organisations, the services, etc. This typically includes:

(1) **researchers** (Persons performing research in an Organisation Unit as employees or students);
(2) **authors** and **contributors** (Persons signing a publication, creators of data sets, software developers, etc.);
(3) **investigators** and project **participants** (Persons involved in a Project as principal investigators, co investigators, project managers, consultants, etc.);
(4) **management** (directors, rectors, deans, department heads, etc.);
(5) **support** staffs (technicians, responsible for Equipment, librarians and digital asset curators, administrative staff, etc.).

One Person typically has many of these relationships.
ontology

CERIF Ontology 1.3

Authors: Iván Ruiz Rube, Keith G Jeffery, Jan Dvorak, Brigitte Joerg, Geert van Grootel, Miguel Ángel Sicilia

The Common European Research Information Format (CERIF) Ontology Specification provides basic concepts and properties for describing research information as semantic data. This document contains a friendly description of the Common European Research Information Format (CERIF) Ontology developed by EuroCRIS.

Namespace URI: http://www.eurocris.org/ontologies/cerif/1.3#

Terms: 26 Classes, 58 Properties

CERIF Semantic Vocabulary 1.3

Authors: Iván Ruiz Rube, Keith G Jeffery, Jan Dvorak, Brigitte Joerg, Geert van Grootel, Miguel Ángel Sicilia

The Common European Research Information Format (CERIF) Semantic Vocabulary provides general relationship and type terms for the research domain. This document contains a RDFa description of the Common European Research Information Format (CERIF) Semantics developed by EuroCRIS.

Namespace URI: http://www.eurocris.org/ontologies/semcerif/1.3#

Terms: 415 Classes

Figure 2 A simplified representation of individuals (CERIF1.6)
INTERMEDIATE SUMMARY

• CERIF is:
  – A conceptual model
  – A storage format in relational database
  – A set of exchange formats (XML, Linked Data)

• CERIF supports multilingual data, storing the original value of a literal attribute, and for any other language, a value translated by a machine and/or a human

• So far, we have seen the CERIF Entity “PROJECT” (cfProj)
We have seen how to represent, store or exchange metadata about research projects.

Similarly:

• What characterises a person (researcher, Ph.D.,...)?

• What characterises an organisation (research laboratory, institute,...)?
Common European Research Information Format
CERIF Result Entities

- ResultPublication
  - ResultPatent
  - ResultProduct
CERIF Result Entities

**ResultPublication**
- ID
- URI
- Title
- Subtitle
- Abstract
- Bibl. Note
- PublicationDate
- TotalPages
- StartPage
- EndPage
- Keywords
- Type
- Status
- Subject

**ResultPatent**
- ID
- URI
- PatentNumber
- Title
- CountryCode
- RegistrationDate
- ApprovalDate
- Description
- Keywords
- Type
- Status
- Subject

**ResultProduct**
- ID
- URI
- Type
- Status
- Subject
CERIF Infrastructure Entities

Facility

Equipment

Service
CERIF Infrastructure Entities
CERIF General Pattern

A typical CERIF entity has:
• Identifier (internal)
• Attributes
  • the basic ones
  • the multi-lingual ones
• External Identifiers
• Classifications
  • Type
  • Status
  • Subject area
  • + other
• Links
  • to other entities
  • recursive, a.k.a. self-referential
Some CERIF Link Entities

- Person_ResultPublication
  - role=author

- Person_OrganisationUnit
  - role=research assistant

- Person_Project
  - role=principal investigator

- ResultPublication

- OrganisationUnit_ResultPublication
  - role=author’s affiliation

- Project_ResultPublication
  - role=deliverable

- OrganisationUnit

- Project_OrganisationUnit
  - role=coordinator

- Person

- Project
Another example
(slide by Keith Jeffery)
CERIF Federated Identifiers

**Publication**
- ISBN
- ISSN
- DOI
- WoS Accession Number
- Scopus EID
- PubMed Central ID

**Person**
- Social Security Number
- ORCID
- Staff Id in HR system
- Author identifier
  - IdRef, DAI, Número Lattes, ResearcherID, Scopus Author ID

**Project/Grant**
- Funder’s reference number
- Organisation’s reference number

**Organisation**
- VAT Identification Number
- FundRefID
- GridID
- OrgID

**Classification**
- External Code
CERIF Federated Identifiers

• Records the “tag” by which an object is known elsewhere
• For any CERIF research entity
• “Identifier Types” classification scheme
• (optionally) Connects to a Service representing the issuer of the identifier
  • Usually an information system
CERIF Semantic Layer

Central place to store declared semantic classifications

Allows to capture any Schema or Structure
- Flat Lists
- Thesauri
- Classification Systems (e.g. SKOS, ...)
- Taxonomies
- Ontologies

Open / Extensible in all directions
- New Schemas
- New Concepts / Terms
- New Relationships

Enables to manage
- Roles, Types, Statuses, ... Semantics
- Subject Headings
- Versioning and archiving (start+end dates)

Allows for Mappings between Schemes
- skos:closeMatch, skos:exactMatch or any other mapping you need
CERIF 1.6

cfFunding

cfEquipment

cfFacility

cfService

cfResultPublication

cfResultProduct

cfProject

cfCitation

cfPerson

cfOrganisationUnit

cfResultPatent

cfResultProduct

cfResultPublication

cfIndicator

cfMeasurement

cfGeographicBoundingBox

cfPostalAddress

cfElectronicAddress

cfCountry

cfCurrency

cfLanguage

cfPostalAddress

cfElectronicAddress

cfCountry

cfCurrency

cfLanguage
CERIF highlights

• Right level of abstraction
• Normalized model
  – Record information only once
  – Reference rather than copy
• Versatile Semantic Layer
• Time-based relationships
• Clean design, regular structure
Metadata Layers

Discovery metadata
- DC, VIVO, MODS, METS, eGMS, DCAT, ...

Generate

Contextual metadata
- CERIF

Reference

Detailed metadata
- Domain-specific standards
Current Research Information System

- Ongoing
- Past, of current interest
- Currently planned or decided upon
CERIF development

By the CERIF Task Group of euroCRIS

Adopting open-source software projects tools & best practices:

→ https://github.com/EuroCRIS/CERIF-DataModel

→ CC BY license

Two branches:
- master: latest official release (1.6.1)
- develop: on-going development
## Model Info

### Basic Information

<table>
<thead>
<tr>
<th>Project</th>
<th>CERIF: the Common European Research Information Format</th>
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<tbody>
<tr>
<td>Model</td>
<td>CERIF Data Model</td>
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<tr>
<td>Version</td>
<td>CERIF current development DM</td>
</tr>
<tr>
<td>Company</td>
<td>euroCRIS</td>
</tr>
<tr>
<td>Author</td>
<td>CERIF Task Group</td>
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<tr>
<td>Created</td>
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<td>Last Modified</td>
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### Statistic Information

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<tr>
<td>Notes</td>
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</table>
Common European Research Information Format

- CERIF is an EU Recommendation to Member States

- The European Commission (EC) has authorised euroCRIS to maintain and develop CERIF and its usage

http://cordis.europa.eu/cerif/
Interoperability

1. Agreed Semantics
2. Agreed Format
3. Agreed Protocol
CERIF XML Interchange Format

XML Schema
Based on the ER model
Undergone a big update
OpenAIRE Guidelines for CRIS Managers 1.1


- Introduction

- CRIS Information elements relevant for OpenAIRE
  - CERIF, CERIF XML

- Technical implementation guidelines
  - CERIF XML as payload of OAI-PMH 2.0
Version 1.1: Aligned vocabularies

- COAR Resource Types
- COAR Access Rights
- ISSN Media List
Information scope of the OpenAIRE Guidelines for CRIS Managers 1.1

The Core:
- The CRIS as a Service
- Organisations
- Researchers

Activities:
- Projects
- Funding
- Events

Outputs:
- Publications
- Datasets, Software & other Products
- Patents

Infrastructure:
- Equipment
Scope: Institutional CRIS

- Publications
  - Publishing Channels
    - Item in Document
    - Article in Journal

- Institution's Academic Staff
- External Persons
- Publication Authors, Editors
- Product Creators
- Patent Inventors, Holders
  - Conferences
  - Workshops
  - Seminars
  - Meetings

- Research Datasets
- Research Software
- Images, Sounds, Videos
- Websites

- The Institution
  - Organisation Hierarchy
  - Other Organisations
  - Funders
  - Publishers
  - Product Contributors
  - Patent Holders

- The CRIS
  (OAI-PMH Identify)

- The projects the institution participates in

since OpenAIRE CERIF Guidelines 1.0
added in OpenAIRE CERIF Guidelines 1.1
Scope: Funder CRIS

- Publications
  - Publishing Channels
    - Item in Document
    - Article in Journal

- Applicants
- Principal Investigators
- Organisation Contacts
- Publication Authors, Editors
- Product Creators
- Patent Inventors, Holders

- Conferences
- Workshops
- Seminars
- Meetings

- The projects the funder funds

- Funding Programme
- Call
- Project Funding
- Research Datasets
- Research Software
- Images, Sounds, Videos
- Websites

- The CRIS (OAI-PMH Identify)

- The Funder
  - Organisation Hierarchy
  - Applicants
  - Supported Organisations
  - Other Organisations
  - Publishers
  - Product Contributors
  - Patent Holders

since OpenAIRE CERIF Guidelines 1.0
added in OpenAIRE CERIF Guidelines 1.1
Identifiers

- **Publication:**
  - DOI
  - Handle
  - PMCID
  - ISI Number (WoS Accession Number)
  - SCP Number
  - ISSN
  - ISBN
  - URL
  - URN

- **Persons:**
  - ORCID
  - ResearcherID
  - Scopus Author ID
  - ISNI

- **Products:**
  - ARK
  - DOI
  - Handle
  - URL
  - URN

Elsewhere generic
Supporting artifacts

• XML Schema
  – Namespace https://www.openaire.eu/cerif-profile/1.1/
  – A few Schematron integrity rules embedded

• Comprehensive set of examples

• Prototype validator
A Research Graph: The example set from the OpenAIRE Guidelines for CRIS Managers 1.1
The examples for the OpenAIRE Guidelines for CRIS Managers v.1.1: An overview

The examples depict some real-world objects in their (limited) contexts. Dashed lines and edges denote illustrative claims that are there for the sake of the example.

1. **The European Commission**
   - Funding ID: http://europa.eu/10.3398/c0110000070D
   - Intergovernmental

2. **EUFAIR**
   - Project Reference: 227 158
   - URL & Website: http://www.eufair.net

3. **Airborne In-situ Atmospheric Instruments and Hyperspectral Instruments Data from the Projects Funded Under The European Facility for Airborne Research in Environmental and Geo-sciences (EUFAR) Project**
   - URL: http://catalogue.ceo.eo.aii/aii/aii/112345

4. **Cessna T207A operated by Freie Universität Berlin**
   - Institution assigned unique identification number: 5006-15063-111A

5. **SkyArrow 650 TCNS operated by IBlMET CNR**
   - Institution assigned unique identification number: 669340-24091-1099

6. **Int J Digital Curation**
   - Contribution to Journal: SJN: 1746-0346
   - Linking Data and Publications: Towards a Cross-Disciplinary Approach

7. **The Data Model of the OpenAIRE Scientific Communication e-Infrastructure**
   - Springer, Berlin, Heidelberg

8. **CNR**
   - Institution assigned unique identification number: 312345

9. **Research Infrastructures**
   - Funding Programme

10. **FP7**
    - Funding Programme
    - Contract
    - OA mandated

11. **FP7 funding for the EUFAIR project**
    - Grant Reference: 227 158

12. **FP7 funding for the OpenAIREPlus project**
    - Grant Reference: 24099

13. **OpenAIRE**
    - URL & Website: http://www.openaire.eu
    - OA mandated

14. **NIKA**
    - Grant Reference: 24099

15. **CNR**
    - Grant Reference: 24099

16. **Partnership**
    - Springer, Berlin, Heidelberg
    - OA mandated
Strong selection against hybrids maintains a narrow contact zone between morphologically cryptic lineages in a rainforest lizard.
<Publication xmlns="https://www.openaire.eu/cerif-profile/1.1/" id="852734">
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        <!-- [ ... ] -->
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    </Affiliation>  <!-- [ ... ] -->
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hybrid zones

phylogeography

Phenotypically cryptic lineages comprise an important yet understudied part of biodiversity;

Data from: Strong selection against hybrids maintains a narrow contact zone between morphologically cryptic lineages in a rainforest lizard

10.5061/DRYAD.4GH6HF5G
CERIF Profiles in general

Useful subsets of CERIF for specific research information interchange scenarios

- Entities & attributes:
  - Profile ⊂ CERIF
- Semantic vocabularies:
  - Profile – specific choices
  - Sources: CERIF & beyond
- Integrity constraints:
  - Profile ⊃ CERIF
CERIF Profiles in general

Producers know what to include

Consumers know what to expect