CERIF Tutorial

Jan Dvořák
November 30th, 2022
euroCRIS Strategic Membership Meeting
Nijmegen, the Netherlands
Jan Dvořák

**euroCRIS**
- CERIF TG Leader since 2013

**Charles University**, Institute of Information Studies and Librarianship
- Researcher & Lecturer

**Czech Technical University in Prague**, Computing and Information Centre
- IS Analyst: V3S+EZOP – the in-house built institutional CRIS

**InfoScience Praha** (2004–2016)
- Leader of the team: Research, Development & Innovation Information System (the national CRIS for [CZ])
- In other roles for the system since 1997

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*This deck of slides is based on the CERIF Tutorial by Brigitte Jörg, CERIF TG Leader 2004–2012, and contains slides by Valérie Brasse, euroCRIS Executive for projects 2011–2015.*
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
Who needs Research Information?

- **Researchers**
  - visibility, finding collaborations, competitors, CV generation

- **Decision Makers**
  - performance, strategic decisions, priorities, comparisons

- **Funding Organisations**
  - distribution of programs, evaluation of results, finding reviewers

- **Research Organisations**
  - integration and interoperability, strategic management

- **Intermediaries / Brokers**
  - finding research results of potential market or innovative value

- **Enterprises**
  - finding information for participation in projects, partnerships, usage of results

- **Libraries**
  - acquisition, dissemination

- **Project Managers**
  - overview of ongoing activities

- **Publishers**
  - finding reviewers, editors

- **Educators**
  - integration of relevant findings into lectures and training

- **General Public**
  - information and education, interest

- **Media**
  - distribution and communication
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>Research Project</strong>, its consortium, team, funding, 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?
A name or title
A (planned) start date
A (planned) end date or duration
A code (identifier), for example a Grant number
A short or long description (abstract)
An acronym
A web page (URI)
[A source of funding]
[A few scientific publications]
[A project coordinator]
[A research domain]

Source: http://cordis.europa.eu/project/rcn/106635_en.html
A name or title

A short or long description (abstract)

A (planned) start date

A (planned) end date or duration

A code (identifier), for ex a Grant number

A web page (URI)

Source: http://gtr.rcuk.ac.uk/project/A49CA721-687A-4D55-8FDF-9B60375B6EA8

[A project coordinator]

[A source of funding]

[A research domain]

A few keywords
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

<table>
<thead>
<tr>
<th>cfProjld</th>
<th>ID</th>
<th>NN (PK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>cfLangCode</td>
<td>Char(5 BYTE)</td>
<td>NN (PK)</td>
</tr>
<tr>
<td>cfTrans</td>
<td>NChar(1)</td>
<td>NN (PK)</td>
</tr>
<tr>
<td>cfTitle</td>
<td>Char(255 BYTE)</td>
<td>NN</td>
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</table>

<table>
<thead>
<tr>
<th>cfProjld</th>
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<tbody>
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<td>cfLangCode</td>
<td>Char(5 BYTE)</td>
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<tr>
<td>cfTrans</td>
<td>NChar(1)</td>
<td>NN (PK)</td>
</tr>
<tr>
<td>cAbstr</td>
<td>NClob</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>cfProjld</th>
<th>ID</th>
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<tr>
<td>cfTrans</td>
<td>NChar(1)</td>
<td>NN (PK)</td>
</tr>
<tr>
<td>cKeyw</td>
<td>Char(255 BYTE)</td>
<td>NN</td>
</tr>
</tbody>
</table>

**PROJECT**
- Acronym
- Code (identifier)
- (Planned) start date
- (Planned) end date or duration
- Web page

**Keywords**
- Language
- Translation (original-machine-human)

**Project abstract**
- Abstract
- Language
- Translation (o-m-h)

**Project title**
- Title
- Language
- Translation (o-m-h)
### Example in DB

<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>
<tr>
<td>cfStartDate</td>
<td>cfProj</td>
<td>base</td>
</tr>
<tr>
<td>cfEndDate</td>
<td>cfProj</td>
<td>base</td>
</tr>
</tbody>
</table>

**cfProjTitle, PK = cfProjId + cfLangCode + cfTrans**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Table</th>
<th>Type</th>
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</thead>
<tbody>
<tr>
<td>cfProjTitle</td>
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</tr>
<tr>
<td>cfKeyw</td>
<td>cfProjKeyw</td>
<td>lang[de,h]</td>
</tr>
<tr>
<td>cfAbstr</td>
<td>cfProjAbstr</td>
<td>lang</td>
</tr>
</tbody>
</table>

**cfProjKeyw, PK = cfProjId + cfLangCode + cfTrans**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Table</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>cfProjID</td>
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<td>cfTrans</td>
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<td>EN</td>
<td>O</td>
</tr>
<tr>
<td>project-ist-world</td>
<td>DE</td>
<td>H</td>
</tr>
</tbody>
</table>

**cfProjAbstr, PK = cfProjId + cfLangCode + cfTrans**

<table>
<thead>
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<th>Table</th>
<th>Type</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>project-ist-world</td>
<td>EN</td>
<td>O</td>
</tr>
</tbody>
</table>

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 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.
Definitions of Person:

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.
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

**cfResultPublication**
- cfID
- cfURI
- cfNumber
- cfPublicationDate
- cfStartPage
- cfEndPage
- cfTotalPages
- cfEdition
- cfSeries
- cfIssue
- cfVolume

**cfResultPatent**
- cfID
- cfURI
- cfPatentNumber
- cfCountryCode
- cfRegistrationDate
- cfApprovalDate

**cfResultProduct**
- cfID
- cfURI
- cfName
- cfDescription
- cfKeywords
- cfVersionInfo

**cfBibliographic Note**

**cfVersionInfo**

**cfAbbreviation**

**cfTitle**

**cfSubtitle**

**cfAbstract**

**cfKeywords**

**Type**

**Subject**

**Status**
CERIF Infrastructure Entities

- Facility
- Equipment
- Service
### CERIF Infrastructure Entities

<table>
<thead>
<tr>
<th>Facility</th>
<th>Service</th>
<th>Equipment</th>
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<tr>
<td>ID</td>
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</tr>
<tr>
<td>Subject</td>
<td>Subject</td>
<td>Subject</td>
</tr>
</tbody>
</table>
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**
  - **Person_ResultPublication**
    - role=author
  - **Person_Project**
    - role=principal investigator
  - **Person_OrganisationUnit**
    - role=research assistant

- **OrganisationUnit**
  - **OrganisationUnit_ResultPublication**
    - role=author’s affiliation
  - **OrganisationUnit_Project**
    - role=coordinator

- **Project**
  - **Project_ResultPublication**
    - role=deliverable
  - **Project_OrganisationUnit**
    - role=coordinator

- **ResultPublication**
Another example
(slide by Keith Jeffery)

- Person A
  - member of OrgUnit M
  - project leader
- Project P
  - deliverable
- OrgUnit M
  - member of OrgUnit O
  - employee
- OrgUnit N
  - partner of OrgUnit O
  - author of Publication X
  - owns IPR
- Publication X
  - has associated Measurement Z
Generic Linking Entity Structure

Base object 1 (FK)

role: cfClassification (FK)

cfClassId

Base object 2 (FK)

cfClassSchemeId

cfStartDate

cfEndDate

cfFraction

Fraction (optional)

Time range of validity

Proportion or Intensity
Example: The Principal Investigator of project $P$ changes: $X$ is replaced by $Y$ effective date $D$.

Before:

<table>
<thead>
<tr>
<th>Role</th>
<th>Validity range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Investigator : cfClassification</td>
<td>$-\infty .. +\infty$</td>
</tr>
</tbody>
</table>

After:

<table>
<thead>
<tr>
<th>Role</th>
<th>Validity range</th>
</tr>
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<tr>
<td>Principal Investigator : cfClassification</td>
<td>$-\infty .. D$</td>
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<tbody>
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<td>$D .. +\infty$</td>
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</table>

After:

<table>
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<tr>
<th>Role</th>
<th>Validity range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Investigator : cfClassification</td>
<td>$D .. +\infty$</td>
</tr>
</tbody>
</table>

$X$ effective date $D$. $Y$
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 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, ...

Contextual metadata
CERIF

Detailed metadata
Domain-specific standards

Generate
Reference
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](https://github.com/EuroCRIS/CERIF-DataModel)
→ [https://github.com/EuroCRIS/CERIF-Vocabularies](https://github.com/EuroCRIS/CERIF-Vocabularies)
→ CC BY license

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

<table>
<thead>
<tr>
<th>Project</th>
<th>CERIF: the Common European Research Information Format</th>
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<tbody>
<tr>
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<td>Version</td>
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<td>Company</td>
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<td>CERIF Task Group</td>
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## Statistic Information

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<tr>
<td>Notes</td>
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</tbody>
</table>
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 exchange formats [based on XML Schema]

Original
1:1 with the ER structure
Only uses embedding for multilingual texts
→ Many foreign key relationships
→ Takes several API requests to get a presentable form of an object

2nd Generation
Template XML Schema → adaptation
Profiles: Useful subsets of CERIF for specific research information exchange scenarios
1. Specify a subset of CERIF entities & attributes
2. Fix semantic vocabularies to use
3. Add integrity constraints

Ex.: OpenAIRE Guidelines for CRIS Managers 1.0.
DOI 10.5281/zenodo.17065

Ex.: OpenAIRE Guidelines for CRIS Managers 1.1.
DOI 10.5281/zenodo.1298649
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

- Ongoing: https://github.com/openaire/guidelines-cris-managers for version 1.2 with Andreas Czerniak and Dragan Ivanović
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
OpenAIRE CERIF Subset

Note: The Service entity is used to represent the source CRIS itself. It is placed in the response to the OAI-PMH Identify request. No separate set for harvesting Services is specified.

since OpenAIRE CERIF Guidelines 1.0
added in OpenAIRE CERIF Guidelines 1.1
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

- Funding Programme
  - Call
  - Project Funding
- The CRIS
  (OAI-PMH Identify)

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

- 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 illusory claims that are there for the sake of the example.
Strong selection against hybrids maintains a narrow contact zone between morphologically cryptic lineages in a rainforest lizard.

Evolution

1558-5646

66

5

1474

1489

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  <!-- [ ... ] -->
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      <Person>
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          <FamilyNames>Singhal</FamilyNames>
          <FirstNames>Sonal</FirstNames>
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        <!-- [ ... ] -->
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Phenotypically cryptic lineages comprise an important yet understudied part of biodiversity;
CERIF Profiles in general

Useful subsets of CERIF for specific research information interchange scenarios

- Entities & attributes:
  - Profile $\subseteq$ CERIF
- Semantic vocabularies:
  - Profile – specific choices
  - Sources: CERIF & beyond
- Integrity constraints:
  - Profile $\supseteq$ CERIF

Profile data is CERIF
CERIF Profiles in general

Producers know what to include

Consumers know what to expect
CERIF Refactoring

• Address shortcomings of current CERIF
• Modernize CERIF
  – Take away the perceived complexity of CERIF
  – Involve the community in further development of CERIF
  – New modelling approach (and tool), modularity, modern serialization formats
• Ongoing project started 2021

☞ more to be presented on Thursday at 13:55 ☜