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The OpenAIRE Scholarly Communication Infrastructure

On Interlinking Datasets, Literature, Fundings, and Research Initiatives

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OpenAIREplus project

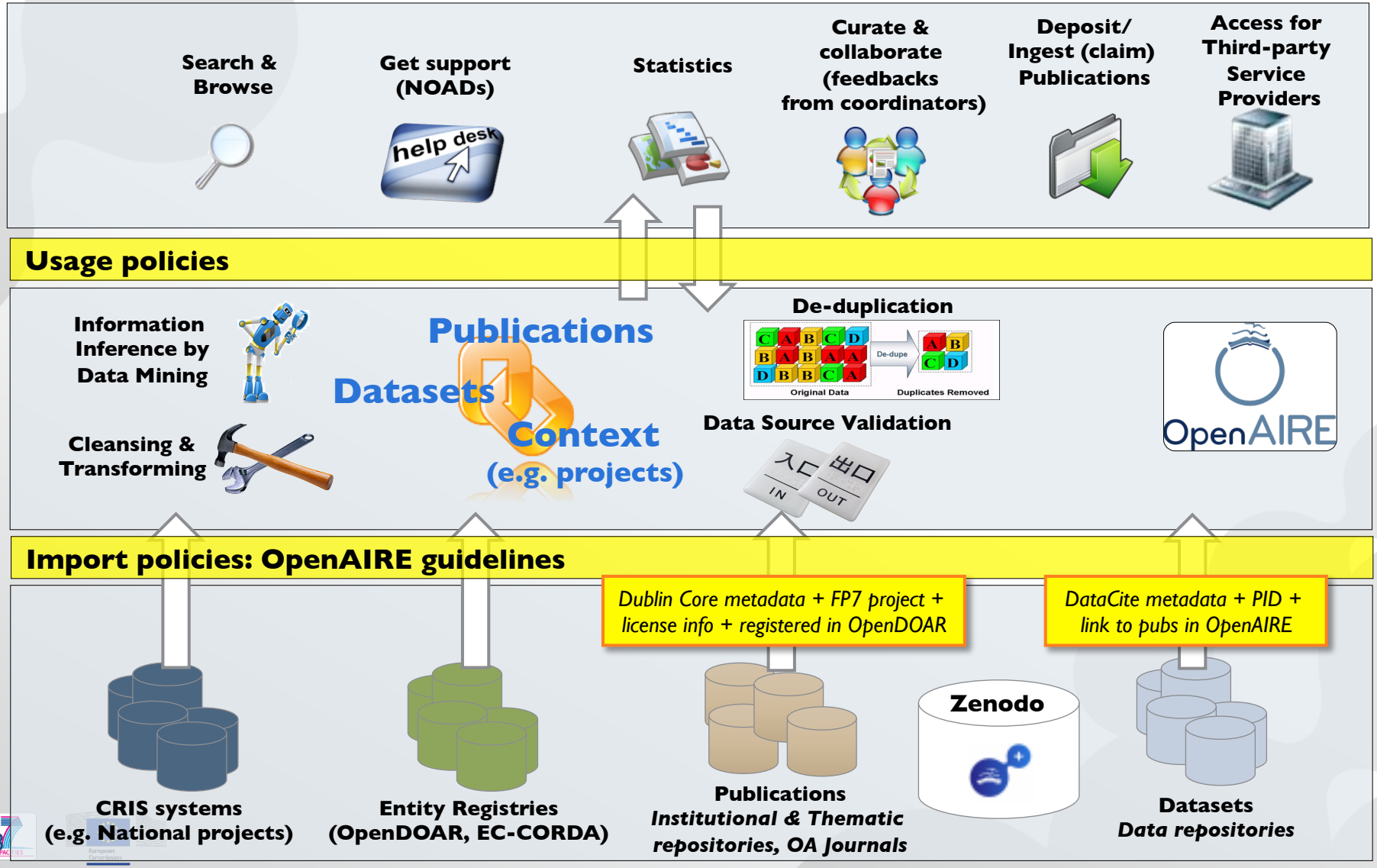
The objectives (in a nutshell)

European data infrastructure for scholarly communication

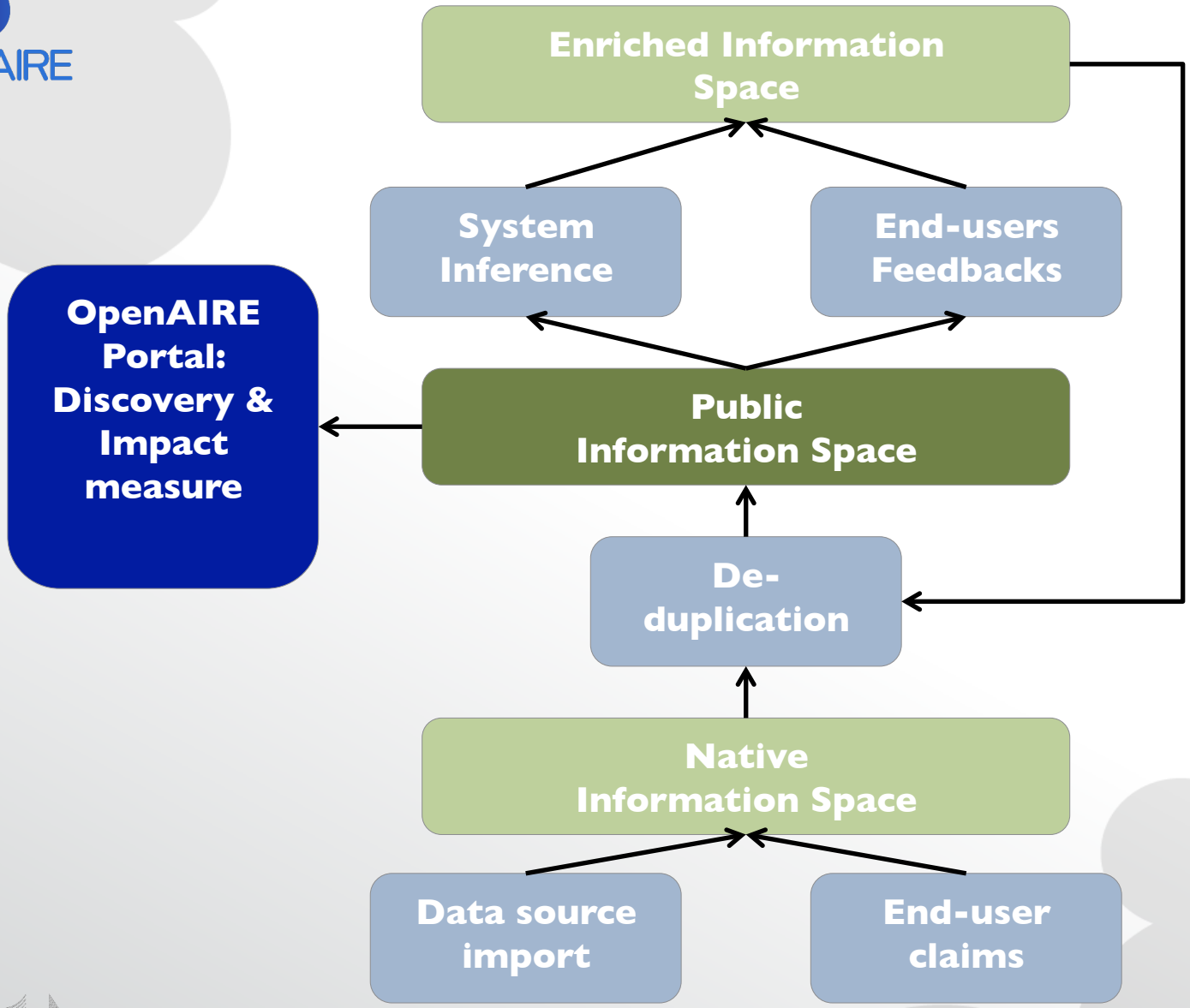
- **Facilitating discovery of research outcome across disciplines and Europe (and beyond) publications and datasets repositories**
  - **Promoting Open Access:** publishing and citation best practices, business models for publications and datasets
  - **Interlinking and contextualizing** publications and datasets
- **Measuring impact of research initiatives**
  - **Open Access vs non-Open Access**
  - **Funding schemes: return of investment**
  - **Research initiatives: research impact**
- **Providing both human and technical infrastructure to make this possible!**

Technical infrastructure

Functional architecture

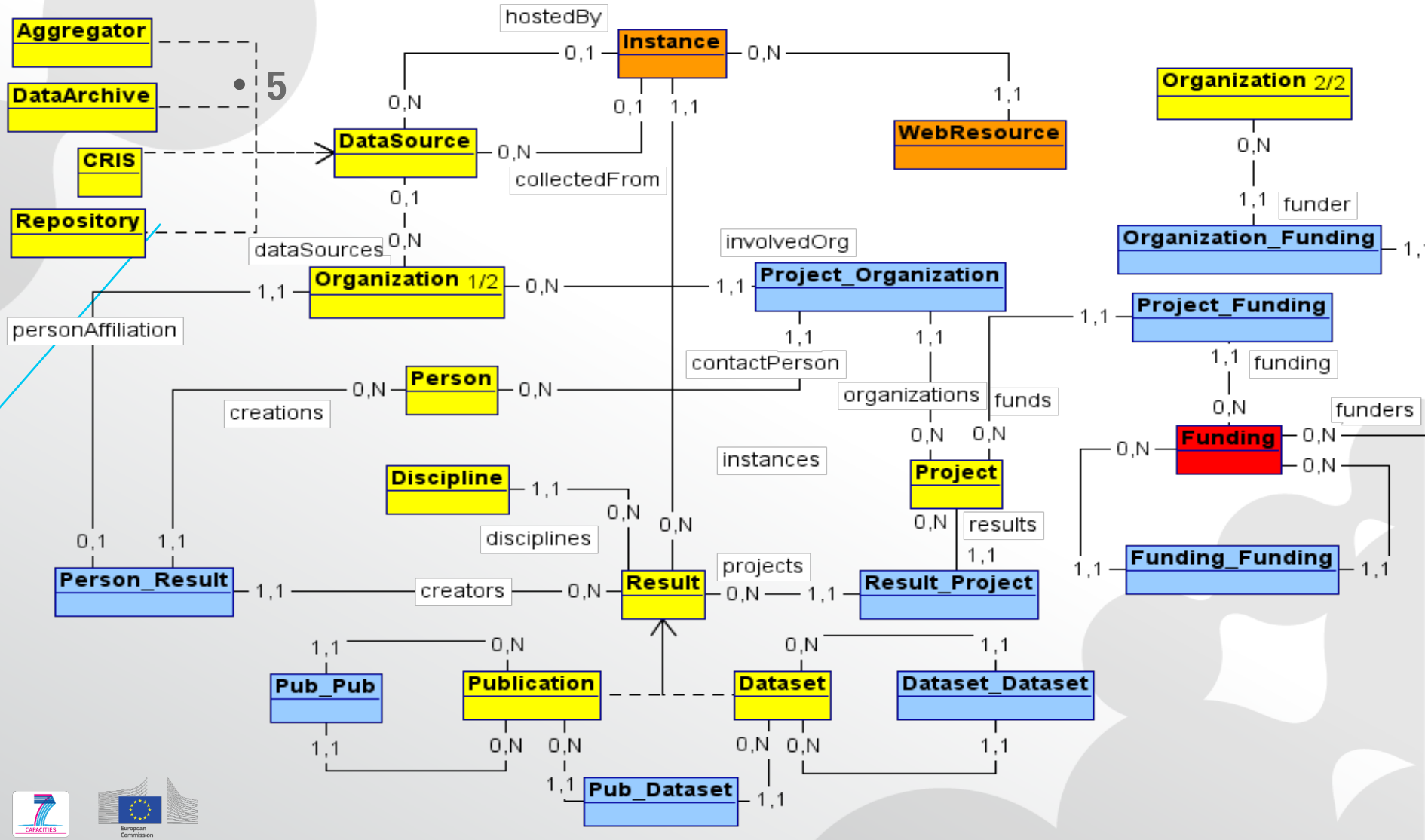


OpenAIRE Data flow



OpenAIRE data model

CERIF & DataCite inspiration



Importing from data sources

Repositories and CRIS systems

- Publication repositories (Dublin Core, OpenAIRE profile)
  - Publications with relationships to authors, projects, licenses, access rights, and repository
- Repositories aggregators (Dublin Core, OpenAIRE profile)
  - Publications with relationships to authors, projects, licenses, access rights, repository, and aggregator
- Dataset repositories (DataCite, OpenAIRE profile)
  - Datasets with relationships to authors, projects, and publications
- CRIS systems (CERIFXML, OpenAIRE profile)
  - Publications with relationships to authors, organizations, projects, etc.
  - Datasets with relationships to authors, organizations, projects, etc.
  - Projects with relationships to persons, organizations, fundings, etc.

Importing from data sources
Entity registries

- OpenDOAR (OpenDOAR HTTP)
  - Repositories with relationships to organizations
- EC CORDA (CORDA XML)
  - EC FP7 projects with relationships to persons and organizations
- Wellcome Trust (Wellcome Trust HTTP)
  - WT projects with relationships to organizations
- Re3data.org for data repositories?

- **Exchanging data with data sources! Typically relationships to objects out of their domain**
  - **Publications and datasets**
  - **Context**

Importing from end-users

Depositing, claiming, feedback

- **OpenAIRE Zenodo Deposition**: authors who are orphans of a repository of reference for publication and datasets can deposit file and metadata into the Zenodo repository
- **CrossRef Claiming**: authors who have a repository of reference can “claim” their depositions into OpenAIRE by specifying the relative DOIs
- **Feedback**: registered end-users (and OpenAIRE data curators) can give advice on how to enrich or fix the information space

Information Space

- Publication repositories:
  - ~400 repositories
    - With links to EC projects: ~110 repositories + 20 Open Access Journals + 1 aggregator (NARCIS, NL)
    - With Open Access publications (DRIVER): ~390 repositories
- Dataset repositories
  - DataCite, DRYAD, Pangaea, others

Information Space

- **OpenAIRE Production system** (www.openaire.eu)
  - 40,000 publications linked to EC fundings
- **OpenAIREplus Beta system** (public release end of July 2013)
  - 8 Millions publications, including DRIVER OA publications, OpenAIRE publications, and datasets
  - Datasets
    - DRYAD
    - DataCite
    - Geoscience journal?

Inferring data

- Relationship inference by mining publication PDFs
  - Project-publication: EC and National projects (e.g. WT)
  - Dataset-publication: DOI connections
  - Publication-publication: citations by bibliography
  - Publication-publication: text similarity
- Property inference by mining
  - Title of papers
  - Authors of papers
  - Organizations of authors at time of publication

Inference framework

OpenAIRE implements a framework and infrastructure for data inference services

- Inference service (pluggable and pipeline-able): applies an algorithm to an *input collection* and returns an *output collection* with a given degree of TRUST
  - Scope: publication/dataset files (e.g. PDF, XML), graph of objects, metadata
  - Actions: e.g. discipline-specific inference methods, NLP techniques
- Inference workflows: sequences of *inference steps* each instantiated by an inference service
  - Workflow' intermediate and final collections are cached and can be used for testing new inference configuration or re-executing only part of the workflows

Provenance and TRUST

Each object in the information space is enriched with information relative to:

- **Data source** from which the object was collected
- **Workflow** performing the collection: data source import, end-user claim, end-user feedback, inference, etc.
- **Agent** responsible of the collection of the object: registered users, system driven mechanism
- **Trust**: value from 0 to 1 stating the level of TRUST of the object

De-duplicating data

"Equivalence relationships"

Equivalent objects are "merged" into one "representative object"

- **Publications**, the representative object stores:
  - All properties of the merged records (prioritized by degree of TRUST)
  - All files of the merged records: URLs, data source and license
  - All relationships to other objects of the merged records: projects, authors, publications, datasets, etc.
- **Organizations**, the representative object stores:
  - All properties of the merged records (prioritized by degree of TRUST)
  - All relationships to other objects of the merged records: projects, publications, datasets, etc.
- **Persons** (*ongoing*), the representative object stores:
  - All properties of the merged records (prioritized by degree of TRUST)
  - All relationships to other objects of the merged records: organizations, publications, datasets, etc.

Exploiting relationships

Measuring impact of “research initiatives”

- *Research initiative*: activity funding, favoring or developing science and willing to measure its impact in terms of research outcome
  - Example: European Commission, e-IRG EGI infrastructure, National funding agencies
- OpenAIRE supports research initiatives by providing:
  - **End-user claim services**: manually identifying research output linked to the relative initiative
  - **Relationship inference services**: tools to automatically identify publications linked to the research initiative
- Current research initiatives:
  - OA vs non-OA publications w.r.t. EC projects (facets: organizations, countries, EC funding schemes, EC subjects)
  - Publications w.r.t. EGI infrastructure (facets: EGI virtual organizations, EGI disciplines)

Enabling Technology

- **D-NET Software toolkit**
  - Service-oriented data infrastructure enabling technology
  - Adoption: Projects (DRIVER/II, OpenAIRE/plus, EFG/1914, HOPE, EAGLE) and nations (Spain-Recolecta, Poland, Belgium, Argentina (in progress))
  - By: CNR-ISTI (IT), Uni Athens (GR) , ICM (PL), Uni Bielefeld (GE)
- **INVENIO Repository**
  - Customizable repository platform: workflows and data models
  - Adoption: CERN digital library and 30+ institutions world-wide
  - By: CERN (Switzerland), collaboration from DESY, EPFL, FNAL, SLAC

Data-publication Linking Issues

Data models for scholarly communication

Dataset modeling issues

- Data typology: e.g. raw data, secondary data, software, experiments
- Data granularity: e.g. DB, DB record, DB queries, DB query results
- Data scope: e.g. discipline-specific (BADC format), cross-discipline (INSPIRE), general-purpose (DataCite)

General issues

- Contextual entities: e.g. authors, organizations, patents, funding schemes, tools, devices
- Publication and data IPRs: e.g. access control, propagation of IPRs, ownership
- Provenance: e.g. location, hosting data source, generating agent (human, machine, device, facility)
- Relationships: e.g. semantics, modes (static, dynamic, inferred)

New Trends

- Enhanced publication data models, i.e. packaging existing publications and datasets into one new consumable object (research objects, executable objects)

Data-publication Linking Issues

Information systems for scholarly communication

Information System Typologies

- Data infrastructures: aggregation of existing pubs and datasets for discovery and re-use
- Data Centers, Journals, Repositories: deposition, publishing, preservation of pubs and datasets

Data infrastructure issues

- Top-down approach: e.g. integrating existing repositories
- Bottom-up approach: e.g. guidelines for repositories to facilitate data and publication linking, mandates to include references to fundings, best practices on citation
- Relationship inference: equivalence (de-duplication), reference, citation, etc.

General functionality issues

- Reading/visualization, discovery (search/browse/navigation), automated reuse, enrichment/annotation, cross-discipline investigation, research impact, community views (VREs), export APIs and exchange formats

Data-publication Linking
LCPD2013 Workshop

- First Workshop on **Linking and Contextualizing Publications and Datasets**
- In conjunction with the 3rd international conference on Theory and Practice of Digital Libraries in **Valletta, Malta**, September 22-26, 2013 (http://www.tpdl2013.info)
- CFP to be made officially public in May, important dates:
  - **Research paper submission: June 24th, 2013**
  - **Notification of acceptance: July 29th, 2013**
  - **Camera ready version: August 31st, 2013**
  - **Workshop day: 26th of September 2013**

OpenAIRE project factsheet

- Coordination
  - University of Athens - GR
  - Goettingen University Library - DE
  - CNR-ISTI - IT
- Technical production & operation
  - 5 partners with expertise in technologies for Digital Libraries and Data Infrastructures
- General
  - Starting date: Dec 1, 2011
  - Duration: 30 months
  - Total budget: 5.2 Mi
- Scientific communities
  - EMBL-EBI – biology
  - DANS – social sciences
  - STFC/BADC – climate
- Networking Organization
  - 5 libraries, active in OA movement
- National Open Access Desks
  - All member states
  - Norway, Switzerland, Turkey, Iceland

Questions?

For more:

OpenAIRE infrastructure: http://www.openaire.eu

D-NET software: http://www.d-net.research-infrastructures.eu

INVENIO: http://http://invenio-software.org/