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OpenAIREplus"

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Summary

In this deliverable we present the plan of design and development of the OpenAIREplus System for the next 28 months. Its intended use is mainly for technical partners to locate their software release duties in the wider context of the project software release, but also for the generic reader to get an overall picture and insight view of the technical activities.

1 Introduction

The aim of this document is to explain in detail how the overall software release plan as detailed in the DoW (Figure 1: WP5) will be accomplished by the technical partners. For this, it will illustrate the plan of design, development, testing, and integration into production of the infrastructure services to be delivered in the Joint Reseach Activities (Figure 2: WP6, WP7, WP8). The plan's technical activities will be supervised and led by CNR and carried out across the five technical partners CNR, CERN, NKUA, ICM, and UNIBI, in synergy with the scientific partners EBI, BADC, and KNAW.

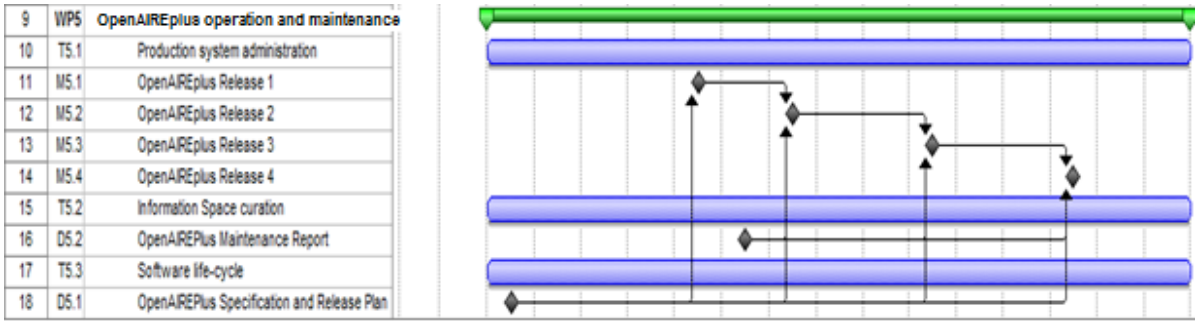

Figure 1 – Service activities: WP5

The OpenAIREplus infrastructure service software will be delivered in four releases (Table 1), each incrementally containing new services developed in WP6, WP7 and WP8. The plan will describe the steps to achieve these objectives by organizing the work in three main actions and each action in a number of "work threads". In order to interpret this structure and roadmap, in the next section we shall introduce an overview of the functional requirements of the OpenAIREplus system, given in terms of the new end-user interaction scenarios and data management issues.

Table 1 - OpenAIREplus: Deliverables and Milestones

Date	Phase	Milestone/ Deliverable	Services/functionalities
M1	Setup development infrastructure		While OpenAIRE is operated in production mode, a separate development infrastructure will be set up to be used for the development and integration of the new services.
M5	OpenAIREplus data model definition	**D6.1**	Technical teams work with DataCite, euroCRIS liaisons and the subject specific communities (EMBL, DANS, STFC/BADC) to produce a data model to be used in the generic OpenAIRE infrastructure
M10	Release 1	**MS9**	Orphan repository for data, data deposition and ingestion - advanced ingestion and content management services. *Includes Data migration from OpenAIRE to OpenAIREplus.*
M14	Release 2	**MS10**	Authority files, end-user services to adapt to OpenAIREplus model - adaptation of OpenAIRE portal to new data model and integration with Orphan Repository. *Feedback from subject specific studies (demonstrators) on Enhanced Publications.*

M20	Release 3	**MS11**	Enhanced publications visualization and interaction - inferred content interlinking services (citation, similarity, content classification) - advanced search/browsing
M26	Final Release	**MS12**	End user data curation (feedbacks), content interlinking with usage patterns, APIs for third party providers

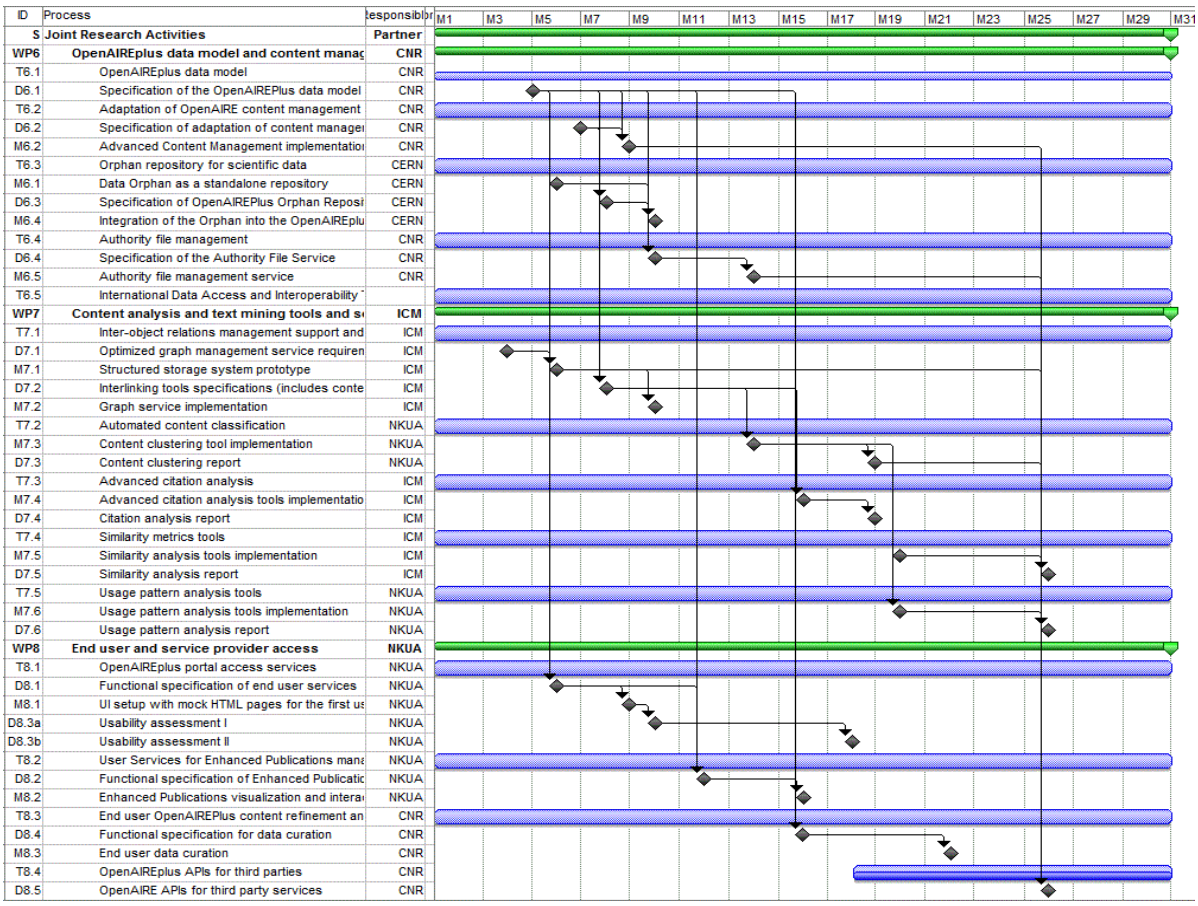

Figure 2 – Research Joint Activities: WP6, WP7, and WP8

2 Functional Requirements

In this section we shall present the main functionalities to be realized in OpenAIREplus. To this aim, we shall first introduce the status of the OpenAIRE infrastructure, of which OpenAIREplus will be an extension.

2.1 OpenAIRE data infrastructure

The OpenAIRE system implements an advanced data infrastructure, whose purpose is (*i*) enabling the collection of heterogeneous data, (*ii*) aggregation and processing of such data to generate a uniform information space, and (*iii*) offering access to the information space.

Collection of heterogeneous data OpenAIRE collects and integrates the following data source typologies:

- Bibliographic metadata records from institutional repositories which comply with the OpenAIRE guidelines; these ensure records contain references to the EC FP7 projects funding the publication.
- EC FP7 project information from the EC CORDA database, which includes information about projects and participants.
- Publication PDFs (where copyright makes it possible).
- European repositories information from the OpenDOAR directory.
- Bibliographic metadata records, together with references to the EC projects funding the publications, from end-users "claiming" such publications by pointing to the repository where they were deposited in the first place. End-users submit "claims" to the infrastructure either by providing DOIs or by searching through the DRIVER information space, and then completing the bibliographic metadata they get with EC funding information.

The OpenAIRE project also includes an Orphan repository whose purpose is to offer repository management functionalities for those authors who do not have an institutional repository of reference and are willing to respect the OA mandates of the EC. The Orphan repository is integrated into the infrastructure as a registered OpenAIRE compliant repository.

Aggregation and processing of such data To be regularly harvested by OpenAIRE data curators, the repositories must export metadata according to the indications provided by the guidelines. The infrastructure offers validation services capable of evaluating the degree of conformance of a repository and return useful feedbacks. Once the repository is validated, its managers can register it to the OpenAIRE infrastructure and make it available for data collection.

The infrastructure processes such data in order to convert it to the OpenAIRE data model structure and normalize its semantics accordingly (e.g., vocabulary conversion, format conversion). Moreover it offers tools to mine the text in the PDFs in order to identify relationships between the publications and the FP7 projects which funded them. Finally, it includes services for calculating statistics out of the data, e.g., number of publications per project.

Access to the information space As to data access, the data infrastructure currently offers a portal which implements advanced search and browsing mechanisms as well as

access to statistics. From the same portal, end-users can manage their claims and repository managers can register their repository to the infrastructure or validate their content with respect to the guidelines.

2.2 OpenAIREplus data infrastructure

OpenAIREplus extends the OpenAIRE infrastructure with a number of functionalities to operate over an extended information space, which includes dataset entities as well as funding schemes beyond those of the EC. In particular, its functionalities can be grouped and organized into the following realization actions:

Action 1: *Upgrading the OpenAIRE infrastructure to manage datasets, European funding schemes, DRIVER Open Access publications*. This action includes:

- The definition of the OpenAIREplus data model to include entities such as projects, projects results (e.g., datasets and publications), licenses, funding schemes, data sources (e.g., archives, repositories, CRIS systems) and relationships between them.
- The adaptation of the OpenAIRE infrastructure services to:
  - collect and process data from data archives, CRIS systems, and DRIVER compliant repositories;
  - store and index data conforming to the new model;
  - export through several protocols and formats the new data;
- The adaptation of the Orphan Repository to handle datasets;
- The migration of the current OpenAIRE data and the DRIVER information space onto the OpenAIREplus information space.

Action 2: *Realization of data curation and data enrichment services*. This action includes the realization of services for:

- Data curation: de-duplicating content (information space disambiguation) and validating, applying, undo, data adjustment feedbacks from end-users;
- Data enrichment: realization of services for inferring semantic relationships between information space entities (e.g., citations, similarity) and classifying them by content.

Action 3: *Access to Information Space: end-user interface services and APIs for third-party systems*. This action includes the realization of services offering user-interfaces for:

- Searching and browsing the new information space
- Managing (creation, editing, deletion) "enhanced publication" objects
- "Claiming" project results (datasets and publications);
- Obtaining statistics over the information space;
- Enhanced publication management;
- Submitting feedbacks on how to improve the information space;
- Supporting APIs to access the information space through several protocols and formats.

3 Release Plan

The release plan is organized into a number of "work threads" whose aim is to accomplish the main actions illustrated in the previous section. Such actions have been identified based on the lines of action to be followed by subgroup of partners in the development of infrastructural services and are conceived to minimize dependencies and maximize parallelism. Hence, the main project milestones (see Table 1) will be delivered as a combined effort of multiple actions.

Dependencies The main dependency is that arising from Thread #1.1, which targets the definition of the data model at different stages. The first version of the OpenAIREplus data model will be delivered at Month 5. It will include all new entities except license descriptions and semantics relationships between datasets and publications to be identified by the relative studies in WP3 at Month 14 (T3.1) and Month 18 (T3.2) respectively. The design and implementation of OpenAIRE services can fully or partially depend on the definition of the data model and its further refinements.

A further dependency arises from Thread #2.1 targeting the realization of a graph storage whose functionalities will be used by data curation and enrichment services to be delivered under Action 2.

Development infrastructures The plan described in the following is made possible by the activities carried out in WP5 which regard the overall software life-cycle: design, development, testing, integration, packaging, and deployment into production. CNR is responsible for the installation and maintenance (on-demand) of development infrastructures, where OpenAIREplus technical partners can independently or in synergy develop, test and integrate their services. ICM is responsible for the maintenance of the OpenAIREplus production infrastructure, ensuring 24/7 operation.

3.1 Action 1: upgrading the OpenAIRE infrastructure to manage datasets, European funding schemes, DRIVER Open Access publications, and enhanced publications

WPs involved: WP3, WP5, WP6

Time-span: from M1 to M18

Thread #1.1: definition of the OpenAIREplus data model (WP3, WP6)
Leader: CNR, Participants: NKUA, UNIBI, ICM, CERN, EKT/EuroCRIS, DANS/KNAW, EBI/EMBL, STFC/BADC, DTU/DataCite
Time-span: from M1 to M18
Deliverables and Milestones:

- D6.1 Specification of the OpenAIREplus Data Model (M5)
- D3.2 Report "Connecting Data and Publications through e-Infrastructures" (M14)
- D3.3 Study on licensing of publications and research data (M18)

Activities:

- Data model to include entities such as projects, projects results (e.g., datasets and publications), funding schemes, data sources (e.g., archives, repositories, CRIS systems) and relationships between them (**M5**).

- Data model **to support data curation activities**: duplication (result versions), history of harvesting activities, provenance of information (**M5**)
- Data model **to include further dataset-publication relationships** as a consequence of studies in WP3-T3.1) (**M14**)
- Data model **to include license schemes** for publications and datasets as a consequence of studies in WP3-T3.2 (**M18**)

Detailed description:

The definition of the data model is crucial for the realization of all services of OpenAIRE. The model will be released in three main chunks: M5, M14, and M18. In correspondence of such deliveries, several services will have to be realized or adapted to manage the new entities included in the model. We expect the data model to be modified beyond the limits imposed by this document, for example to adapt to new data curation modalities or to express new semantic relationships between some of the entities. In such cases, the changes will be agreed with the partners whose services require or are indirectly impacted by the changes, in order to mitigate the overall refinement cost.

Thread #1.2: Consolidation of OpenAIRE infrastructure back-end services (WP6)

Leader: CNR, Participants: UNIBI, ICM, DANS/KNAW, EBI/EMBL, STFC/BADC

Time-span: from M5 to M10

Deliverables and Milestones:

- D6.2 Specification of adaptation of content management Services (M7)
- MS14 Advanced Content Management implementation (M9)

OpenAIRE software release:

- **MS9 Release 1 (M10)**

Activities:

- Builds on data model first release (**M5**) and adapts to further releases (**M14, M18**) **– Thread #1.1**
- Store and index the graph of data conforming to the new information space data model of publication-projects-research data (CNR, **M9**);
- Registration and validation of content providers, and harvesting and transformation of their content (CNR, UNIBI, **M9**);
    - Harvesting: collect data from data archives, CRIS systems, and DRIVER compliant repositories
    - Transform: clean and enrich data whose models go beyond those of publications (e.g., Dublin Core); allow for explicit linking procedures, i.e., linking publication data with research data using explicit identification mechanisms (e.g., DOI reference from one object to the other).

Thread #1.3: Content providers to support export interfaces conforming to the OpenAIREplus guidelines for content providers (WP6)

Leader: CNR, Participants: DANS/KNAW, EBI/EMBL, STFC/BADC, DTU; UNIBI, CERN, UMINHO

Time-span: from M12 to M14

Deliverables and Milestones:

- D4.4 Guidelines for Data Source Administrators (M12) – **DoW inconsistency: guidelines are expected for month 12 while content providers should export metadata according to these (MS15) by month 10. We shall postpone MS15 to month 14 to be part of MS10 release 2 of OpenAIRE. The idea is to work to anticipate this date.**
- MS15 Data Providers publish interfaces, OpenAIREplus metadata ingestion (M10)

OpenAIRE software release:

- **MS10 Release 2 (M14)**

Activities:

- Build on guidelines for data providers (**M12**)
- Data providers to expose metadata datasets to OpenAIREplus as data archive resources to provide first dataset metadata samples to the infrastructure (UNIBI, CNR, DANS/KNAW, EBI/EMBL, STFC/BADC) (**M14**)

Thread #1.4: Adaptation of the Orphan Repository to handle datasets (WP6)

Leader: CERN, Participants: CNR, NKUA

Time-span: from M5 to M10

Deliverables and Milestones:

- MS13 Data Orphan as a standalone repository (M6)
- D6.3 Specification of OpenAIREPlus Orphan Repository configuration and merge interface with OpenAIREPlus (M8)
- MS16 Integration of the Orphan into the OpenAIREplus model and infrastructure (M10)

OpenAIRE software release:

- **MS9 Release 1 (M10)**

Activities:

- Builds on data model first release (**M5**) and adapts to further releases (**M14, M18**) **– Thread #1.1**
- Adaptation of Orphan repository for publications to new data model and to host datasets (**M6**)
- Integration with portal: single-sign on and seamless integration between portal and repository user interfaces (NKUA, CERN) (**M8**)
- Integration with information space storage services, e.g., history of end-user actions (CNR, NKUA) (**M8**)

Thread #1.5: Migration to OpenAIREplus information space (WP5)

Leader: CNR and ICM, Participants: NKUA

Time-span: from M9 to M10

Deliverables and Milestones:

OpenAIRE software release:

- **MS9 Release 1 (M10)**

Activities:

- Build on MS14 "Advanced Content Management implementation" (**M9**)
- Migration of current OpenAIRE data and the DRIVER information space onto the OpenAIREplus information space (**M10**)

3.2 Action 2: realization of data curation and data enrichment services

WPs involved: WP6, WP7, WP8

Time-span: from M5 to M26

Thread# 2.1 Data curation and enrichment: graph storage (WP7)
Leader: ICM, Participants: CNR, NKUA
Time-span: from M1 to M20
Deliverables and Milestones:

- D7.1 Optimized graph management service requirements (M4) **– DoW inconsistency: CNR is expected to draft this deliverable, while it should be ICM.**
- MS18 Structured storage system prototype (M6)
- MS19 Graph service implementation (M10)

OpenAIRE software release:

- **MS11 Release 3 (M20)**

Activities:

- Design and specification of a graph storage service capable of supporting storage and access of a labelled graph of nodes to be used for the data mining purposes of citation inference, similarity inference, content classification and pattern behaviour inference (**ICM, M4**)
- Requirements to be provided by NKUA and ICM, technical support from CNR (integration with OpenAIRE information space storage services)
- Service implementation due for (**M10**)

Thread# 2.2 Data curation services: content deduplication (WP6)
Leader: CNR, Participants: ICM
Time-span: from M5 to M20
Deliverables and Milestones:

- D6.4 Specification of the Authority File Service (M10)
- MS17 Authority File Management Service (M17)

OpenAIRE software release:

- **MS11 Release 3 (M20)**

Activities:

- Builds on data model first release (**M5**) and adapts to further releases (**M14, M18**) **– Thread #1.1**
- Specification of authority file service (CNR) (**M10**)
- Specification of Context Extraction-Inference service (ICM) (**M15**)

- Integration of Authority File Service and Context Extraction-Inference service (CNR, ICM) (**M17**)

Detailed description:

The Context Extraction-Inference service extracts from the information space record contextual information resulting from the services in T7.2 (content classification), T7.3 (citations), and T7.4 (similarity). Context information enriches records with specificities which may help authority file services at disambiguating the information space.

Thread# 2.3 Data curation services: end-user feedbacks (WP8)

Leader: CNR and NKUA, Participants:

Time-span: from M10 to M26

Deliverables and Milestones:

- D8.5 Functional specification of data curation services (M16)
- MS26 End-user data curation (M22)

OpenAIRE software release:

- **MS12 Final Release (M26)**

Activities:

- Builds on MS9 Release 1 (**M10**)
- Definition of end user feedbacks: extensions to the OpenAIREplus model to allow user intervention in the metadata (CNR) (**M16**)
- Back-end services to perform user interventions, including roll-back features (CNR) (**M22**)
- Admin user interfaces for end-user feedback administration (to be used in T5.2 curation activities): validating, applying, undo, data adjustment feedbacks from end-users (NKUA) (**M22**)
- Extending the portal to allow registered end users to place and handle their feedbacks while searching/browsing the information space (NKUA) (**M22**)

Detailed description:

CNR and NKUA will design and develop tools giving support to end-users willing to "refine" the data while depositing into and searching and browsing from the OIS. End-users will be able to give their advice by "tagging" any record and any "field" with an action and some parameters to go with it:

- Remove record or field;
- Update field;
- Add record or field;
- Merge two records;
- Split one record in two records.

Data curators of OpenAIRE will have to revise, hence *validate*, *suspend, reject* or *roll back* all end-users actions. To this aim:

- The DB Service will be extended with tables for supporting the (history of) tagging and validation model;
- The OpenAIRE portal will have to be upgraded to offer user interfaces allowing this interaction;

- D-NET authority file services will be employed to identify possible duplicates across different entities, e.g., authors. CERN will also contribute in this direction, by encapsulting duplication matching algorithms into new D-NET services specially devised for OpenAIRE.

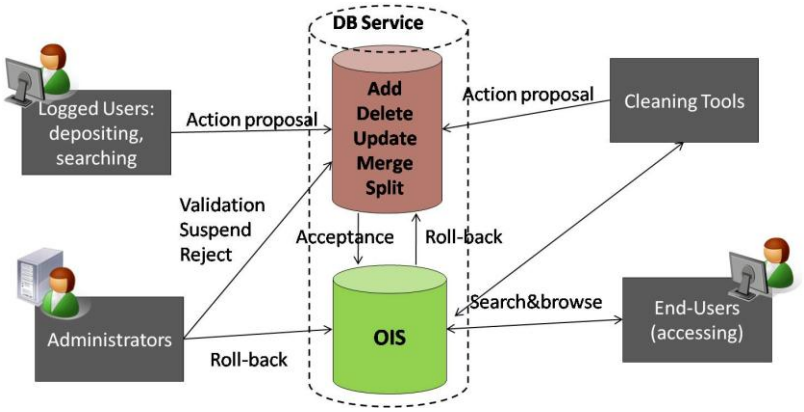

Figure 3 – Architecture of refinement deposition scenario

Thread #2.4 Data enrichment services: similarity, citation (WP7)
Leader: ICM, Participants: NKUA, CNR, CERN
Time-span: from M5 to M26
Deliverables and Milestones:

- D7.2 Interlinking tools specifications (includes content clustering, citation, similarity, usage pattern (M8) – **citation and similarity services (ICM)**
- MS21 Advanced citation analysis tools implementation (M16)
- MS22 Similarity analysis tools implementation (M20)
- D7.4 Citation analysis report (M18)
- D7.5 Similarity analysis report (M26)

OpenAIRE software release:

- **MS11 Release 3 (M20)**

Activities:

- Builds on data model first release (**M5**) and adapts to further releases (**M14, M18**) **– Thread #1.1**
- Design and specification of the services (in synergy with Thread #2.1 ,graph storage), **D7.2** (**ICM, M8**)
- Implementation of the services
- Report of service operation

Thread #2.5 Data enrichment services: user-behaviour, content classification (WP7)
Leader: NKUA, Participants: ICM, CNR
Time-span: from M5 to M26
Deliverables and Milestones:

- D7.2 Interlinking tools specifications (includes content clustering, citation, similarity, usage pattern (M8) – **usage pattern behavior and content classification part (NKUA)**
- MS20 Content clustering tool implementation (14)
- D7.3 Content clustering report (M18)
- MS23 Usage pattern analysis tools implementation (M20)
- D7.6 Usage pattern analysis report (M26)

OpenAIRE software release:

- **MS11 Release 3 (M20)**

Activities:

- Builds on data model first release (**M5**) and adapts to further releases (**M14, M18**) **– Thread #1.1**
- Design and specification of the services (in synergy with Thread #2.1 ,graph storage), **D7.2** (**ICM, M8**)
- Implementation of the services
- Report of service operation (**M26**)

3.3 Action 3: Access to Information Space: end-user interface services and APIs for third-party systems

WPs involved: WP3, WP6, WP8

Time-span: from M5 to M26

Thread #3.1: Consolidation of OpenAIRE infrastructure front-end services (WP6, WP8)

Task leader: NKUA; Participants: CNR, ICM, DANS/KNAW, EBI/EMBL, STCF/BADC
Time-span: from M5 to M18
Deliverables and Milestones:

- D8.1 Functional specification of end user services (M6)
- D6.2 Specification of adaptation of content management Services (M7) **– statistics services (NKUA)**
- MS24 UI setup with mock HTML pages for the first usability assessment (M9)
- D8.3 Usability assessment report I (M10)
- D8.4 Usability assessment report II (M18)

OpenAIRE software release:

- **MS10 Release 2 (M14)**

Activities:

- Builds on data model first release (**M5**) and adapts to further releases (**M14, M18**) **– Thread #1.1**
- Search and browse w.r.t. to publications, projects and datasets and navigate based on relationships between such entities;

- Statistics w.r.t. new project funding schemes (e.g., National fundings) (**NKUA, T6.2, M7**)
- Manage claim actions and visualize provenance information w.r.t. new content provider typologies: repositories, CRIS systems, and data archives
- Integrate new helpdesk support pages for the NOADs
- Upgrade to HTML5
- Incorporate in the portal enhanced publication management functionalities and end-user feedbacks
- Usability assessment reports (**M10, M18**)

Thread #3.2: Enhanced publication management (WP3, WP6, WP8)
Leader: UNIBI, Participants: NKUA, DANS/KNAW, EBI/EMBL, CNR, ICM
Time-span: from M1 to M20
Deliverables and Milestones:

- D3.1 Demonstrators for Enhanced Publications (M10)
- MS14 Advanced Content Management implementation (M9): **DoW inconsistency! The milestone is supposed to include storage for enchanced publications. Too early with respect to the plan, since demonstrators will be released at M10. Enhanced publication management is expected at M16, therefore we shall expect enhanced publication storage for the same month.**
- D8.2 Functional specification of Enhanced Publications visualization and interaction (M12)
- MS25 Enhanced Publications visualization and Interaction (M16)

OpenAIRE software release:

- **MS11 Release 3 (M20)**

Activities:

- OpenAIREplus data model for enhanced publications (**M10**): will come with deliverable "D3.1 Demonstrators of enhanced publications"
- Enhanced publication storage: specification and implementation (NKUA, CNR, ICM): considering re-use of ICM graph storage (**M16**)
- Enhanced publication management (user interfaces): specification and implementation (**M16**)

Thread #3.3 Access to OpenAIRE Information Space through APIs (WP8)
Leader: CNR, Participants: NKUA
Time-span: from M10 to M26
Deliverables and Milestones:

- D8.6 OpenAIRE APIs for third party services: Definition and documentation of OpenAIREplus service APIs to be used by external service providers (M26)

OpenAIRE software release:

- **MS12 Final Release (M26)**

Activities:

- Builds on MS9 Release 1 (**M10**)

- Export information space entitites through several protocols (e.g., OAI-ORE, OpenSearch) and formats (e.g., CERIF, LinkedData) the new data (CNR, NKUA) (**M26**).

4 Summary of actions

Table 2 summarizes the course of actions organized into threads, highlighting the relative (co-)responsible partners.
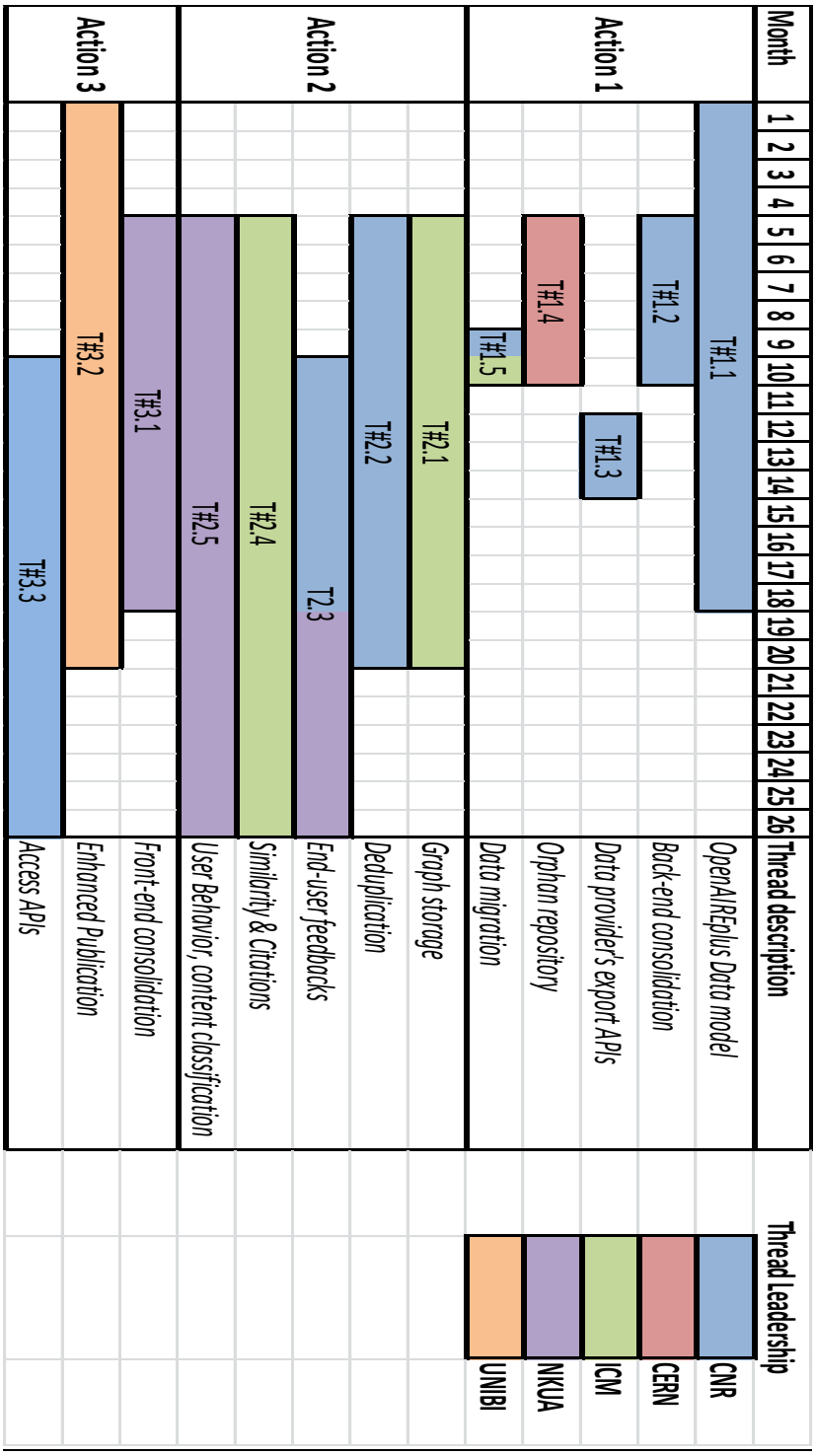
Table 2 – Summary of actions and threads