Architecture for the implementation of the Fusion FAIR Data Framework

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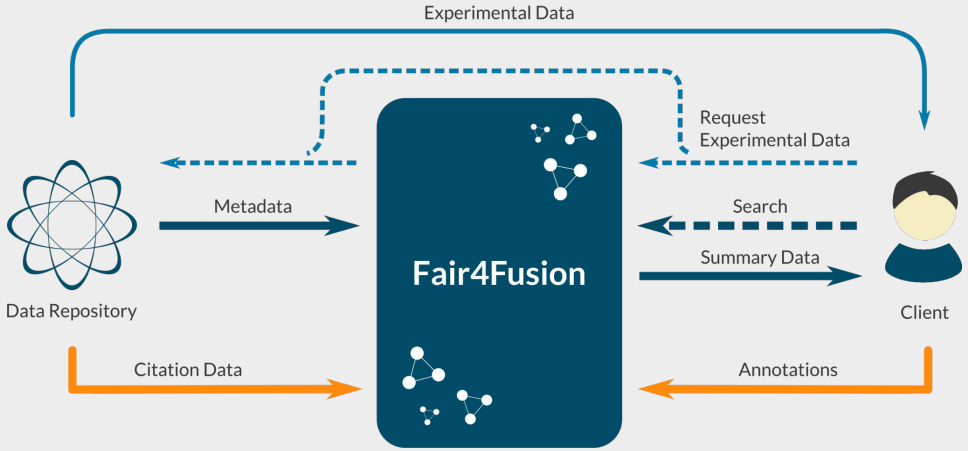
Fair4Fusion - open access for fusion data in Europe

This project has received funding from the Euratom research and training programme 2014-2018 under grant agreement No 847612

Architectural Blueprint for Fusion Open Data Framework

- One of the main outcome of the Fair4Fusion project
- Long term Blueprint architecture for Fusion Open Data Framework
- Blueprint content (current status):
  - **Current state of the art – policies and data access, fairness status**
  - **User stories , requirements, list of functionalities**
  - **Architecture**
    - Baseline architecture
    - Components
    - Relationship, standards, protocols
    - Initial technological options
  - **Costs, roadmap for implementation**
- Available for comments:
  - https://cutt.ly/2mcDHSX



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Data Identification and Policy Landscape

- Existing experiments have some internal degree of FAIRness
  - But not across the EU fusion community
- Need a way to make scientific analysis and discoverability interoperable across multiple fusion experiments.
- Benefits not only for manual database queries
  - but would also enable the use of new methods of research with Data Mining and Machine Learning techniques at an unprecedented scale
- The IMAS Data Dictionary is recommended for achieving interoperability within the community.

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Use case definition/requirements specification

- Developed with fusion researchers and members of FAIR groups
- 76 user stories identified so far
- Covers
  - Security
  - Data Access
  - GDPR
  - Searching & Querying
  - Experimental Impact
  - Visualisation
  - Who
    - Fusion scientists / data scientists / members of the public
  - What
    - scalar data / 1-d data / 2-d data / structured data
  - Limitations
    - usually from the data providers (GDPR, no impact on operations, cost)
- Requirements have come from the community and external researchers
-

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Investigation of similar platforms

An investigation of other FAIR platforms and their architectures to look for reuse opportunities.

- CLARIN
- EUROPEANA
- ICOS
- FOODIE
- ROHUB
- EVER-EST

Investigation of Existing Tools in Alternative Domains

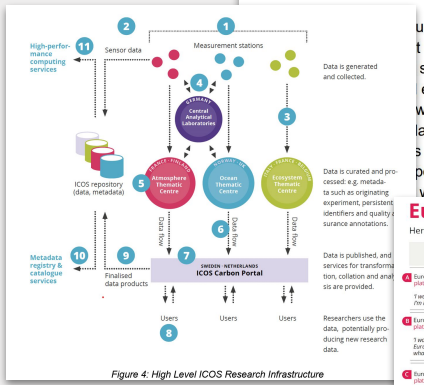


Figure 4: High Level ICOS Research Infrastructure

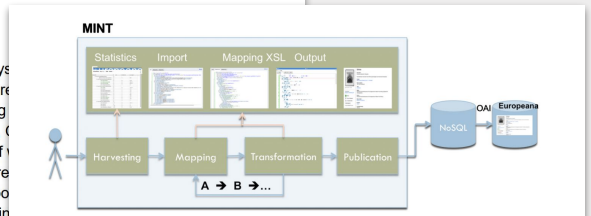
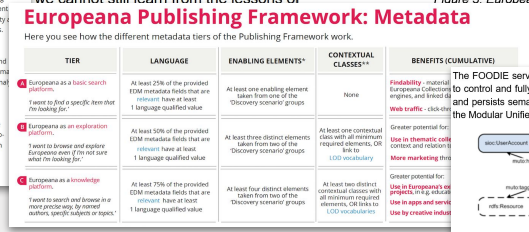


Figure 3: Europeana Ingestion Mechanism (MINT)[4]



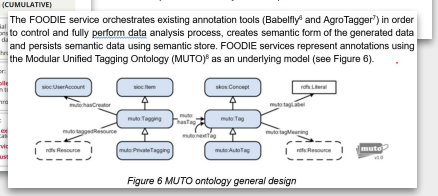


Figure 6 MUTO ontology general design

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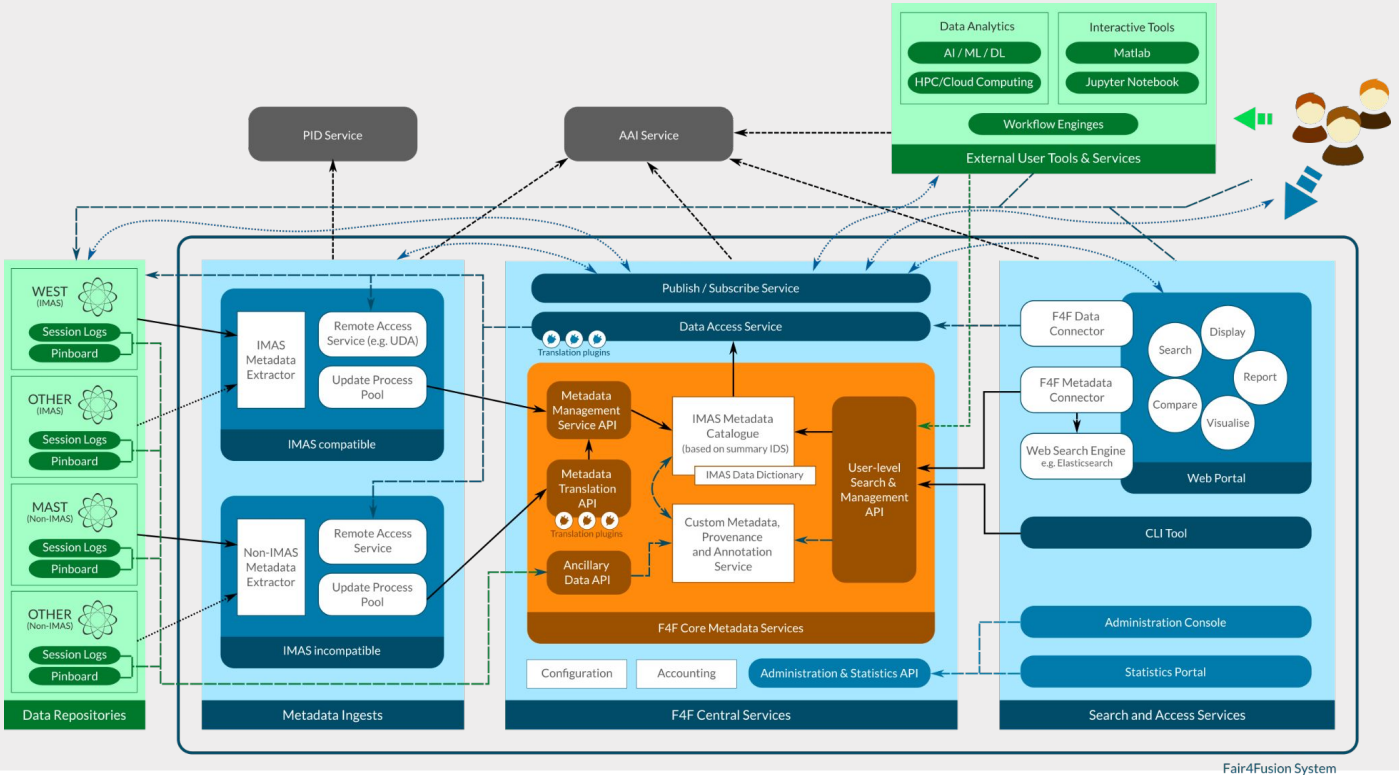
Proposed architecture overview



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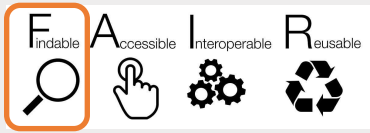
Metadata Standards and Ontology Mapping

- Agreed to use Summary IDS as basis for physics metadata schema
  - IDS structures already based on extensive discussions with the community
  - Augmented with elements from Dublin Core to support FAIR
- Gathered list of existing fusion glossaries
  - Which sort of highlights the issue with developing a Ontology
- Investigating use of OAI-PMH for harvesting
  - …but looks like a ‘push’ model from experimental sites is more suitable



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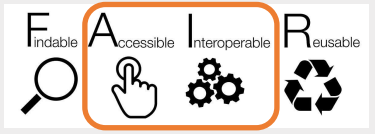
Data Interoperability 4 FAIR and Open Data

- Investigated different PID solutions and obtained relevant costings
  - Demonstrated interoperability of DataCite and Handle systems
- Proposed recommendations on granularity at which they could and should be applied
  - Shot/Pass level strongly recommended for interoperability
  - Other levels at site discretion
  - Investigating long term funding sources



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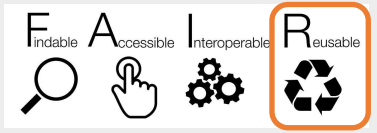
Standardised Models of Provenance

- Proposed provenance model based on W3C PROV
  - Prototype implementation in place
  - Tested on MAST and JET
  - Issues around ownership - recommendation to use roles rather than personal identification
- Proposal to extend IDS structures to incorporate minimal provenance on data access
  - e.g. if, for instance, bolometric data is accessed - include the shot/pass (and/or PID) in the bolometer IDS



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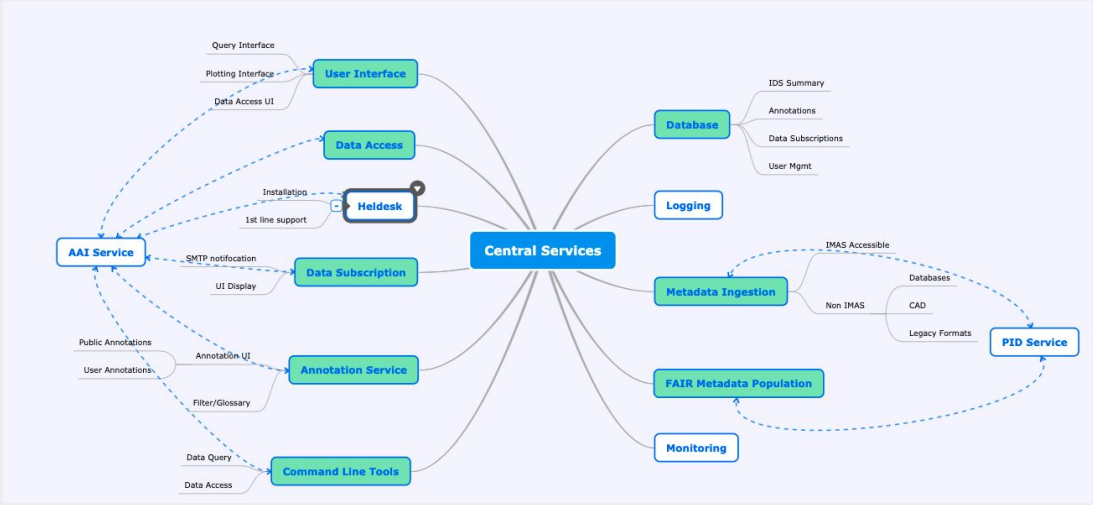
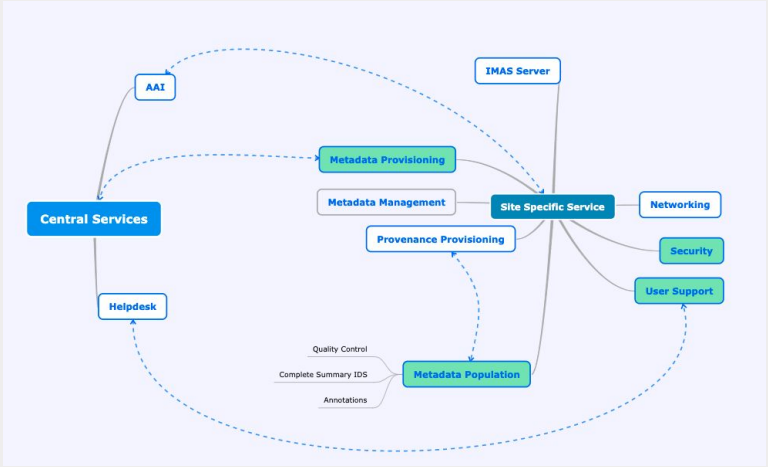
Initial evaluation of implementation costs





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Initial components of roadmap

- Get blueprint/implementation of proposed architecture embedded into EUROfusion system
- Acceptance from data providers that the proposed system will be adopted

For EUROfusion:

- Decide on policy for data publication, licenses (and make its DMP consistent with the policy)
- Define an implementation project : scope, organisation, resources, timeline
- Organise dissemination of the services and user feedback, evolutions of the project

Central Services:

- Host the Services - (the recommendation is to start with the prototypes developed by F4F)
- Provide AAI, PIDs
- Set up a helpdesk system with first line support
- Set up a monitoring service
- Guarantee data preservation and archiving

Experimental sites:

- Provide Summary physics metadata
- Implement mechanisms to submit the data to Central Services (including remote data access)
- Progressively map more physics data to IMAS
- Progressively add provenance information in the output of experiments-related workflows
- Maintain FAIR information related to the submitted data (dataset validity, publications, …)
- Extend the data submission to simulations related to experiments

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Summary

- Big step forward for the community towards FAIR and Open Data
  - Detailed identification of current state of art
  - Recommendation on the architecture and roadmap implementation
  - Cost analysis
- Looking forward to feedback from Fusion community on the Blueprint Architecture to validate correctness of approaches
- Still to do…
  - Actually get a PID service up and running for the community
  - Propose data access methods
  - Complete blueprint architecture (gaps analysis, evaluation of demonstrators, roadmap, benefit vs costs analysis)

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Questions?

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