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Large-scale Standardized Image Integration for Secondary Use Research Projects

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IMPETUS

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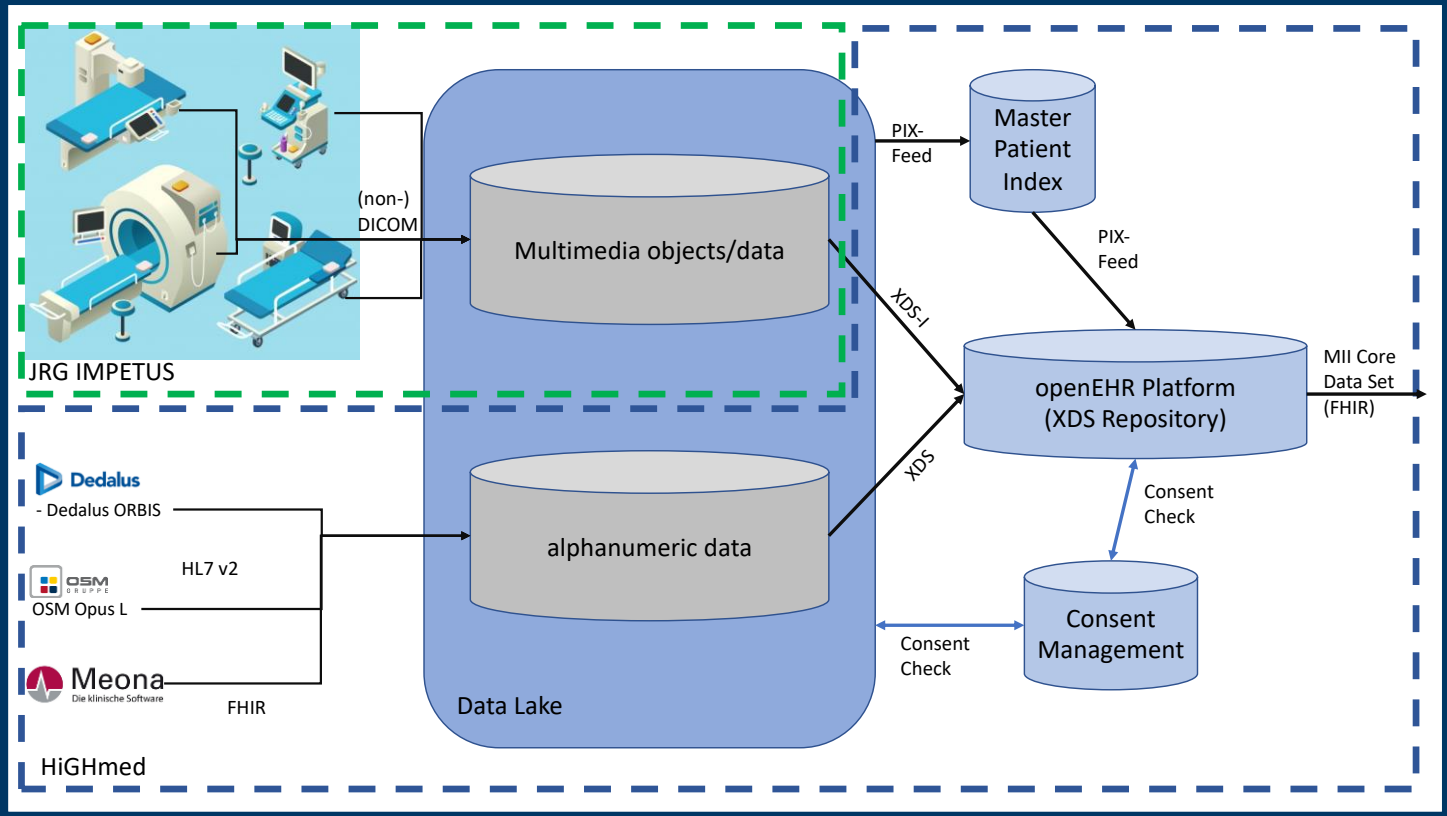
We aim to

Integrate multimedia objects

- DICOM images, freetext-reports, …

Extend the MeDIC

- Current design is suitable for multi-
media integration?



Integration Requirements

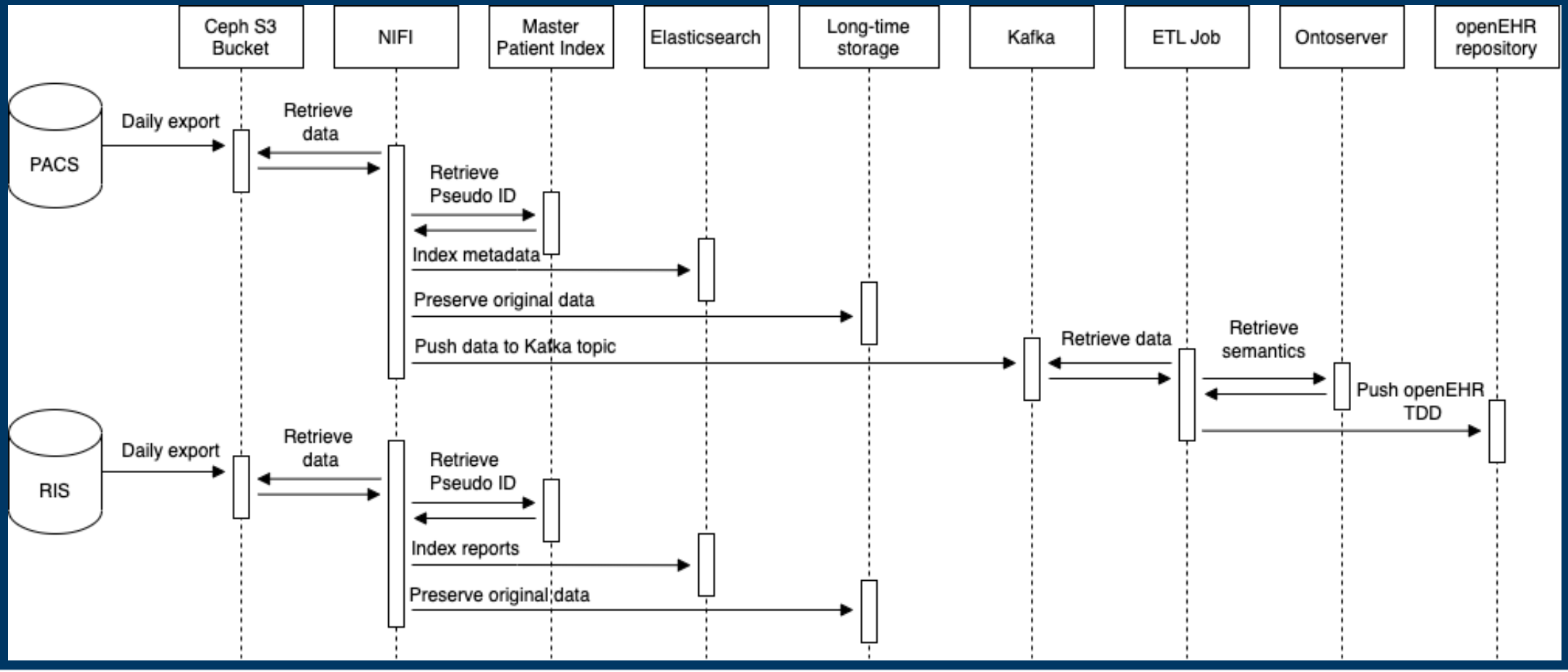
The existing MeDIC infrastructure should be reused as extensively as possible.

Based on prior work [1], we identify key requirements for the integration

1. The integration must be based on healthcare interoperability standards.
2. The integration must use international terminologies to support interoperability.
3. The integration must handle unstructured data by using natural language processing (NLP).
4. The data must be linked from the clinical routine IT systems.
5. The integration must preserve the raw data.
6. The integration must create, transfer and process logs.
7. The integration must provide metadata processing.
8. The integration must follow European, national and local data privacy and legal regulations.
9. The integration must provide pseudonymization.

[1] Kinast B, et al. Functional Requirements for Medical Data Integration into Knowledge Management Environments: Requirements Elicitation Approach Based on Systematic Literature Analysis. J Med Internet Res. 2023 Feb 9;25:e41344. doi: 10.2196/41344.

Integration of a live system from the hospital



Enabling Semantic Interoperability

openEHR SNOMED CT

Enhancement source data using openEHR and SNOMED CT

- Derivation of a openEHR template based on FHIR ImagingStudy
- Mapping source values of laterality and bodyside to SNOMED CT

Resulting in enabling **29 million** radiological series, e.g.

- 7.1 million Computed Tomography
- 6.9 million magnetic resonance series

Lessons Learned

Initial concept based on HL7 ORU message

- Dismissed due missing messages
- PACS is a submodule of the HIS – only *internal* communication

→ CSV fallback allows only nightly update – no live update

Reports could not yet be integrated in the Clinical Data Repository due to data privacy concerns

Aligning healthcare standards can also be surprisingly simple at some times.

Outlook: Integration is only the 1st step

Enabling the imaging data is opener to more possibilities and challenges

1. Deidentifying the German reports
   - Suitable methods mostly available for English text only
2. Improving completeness of series information
   - Using classifier to detect region of interest
   - Using CNN to pre-segment image for further AI trainings

Conclusion

Data integration centers are a vivid and crucial component for research

- Integration of the imaging information in our CDR enables cross-querying with other data like diagnosis, procedures, lab, …
- More imaging source to conquer (e.g. special systems for cardiology)

FAIR leap forward in terms of findability and discovery of imaging data and enabling years of images for further research

Thank you!

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