



EUROPEAN CENTRAL BANK

EUROSYSTEM

Metadata integration as a key enabling technique for AI and ML

IFC Workshop 2025

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Metadata supports and enables AI applications

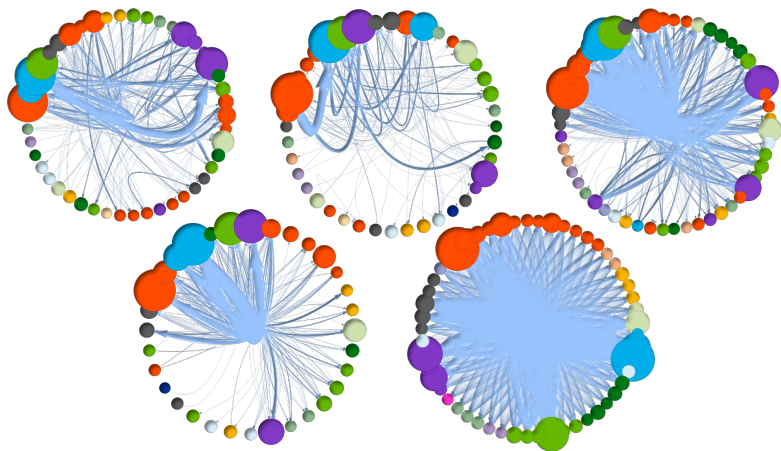


Metadata plays a crucial role for AI and ML:

- **Business metadata:** provision of context and methodological information
- **Semantic metadata:** integration, harmonisation and alignment of definitions
- **Structural metadata:** data models, classifications, mappings, transformations
- **Technical metadata:** insights on encodings, provenance, freshness, etc.

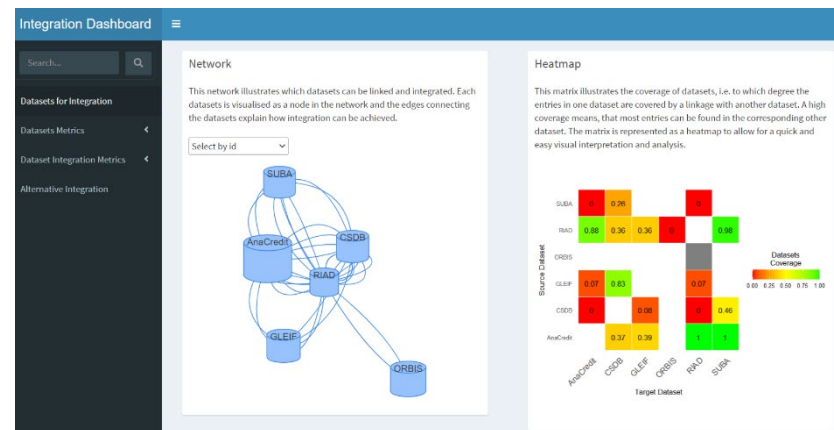
Metadata driven AI use cases in central banking

Analysis of bank exposures and systemic risks



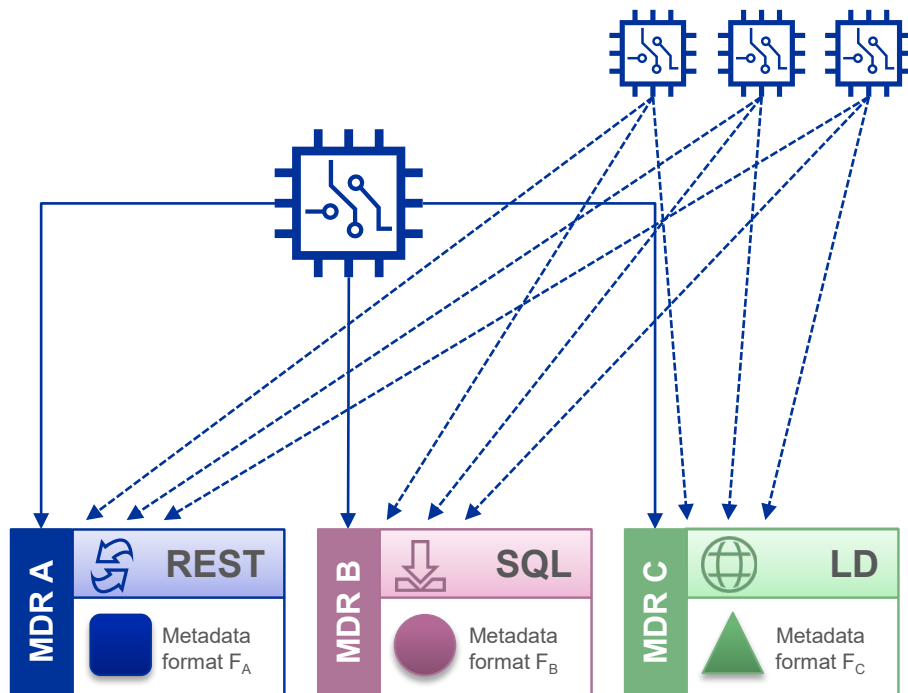
Aarab, I., & Gottron, T. (2024). Network Topology of the Euro Area Interbank Market. High-quality and Timely Statistics (pp. 3-19). Cham: Springer Nature Switzerland

Quality assurance for integrated datasets



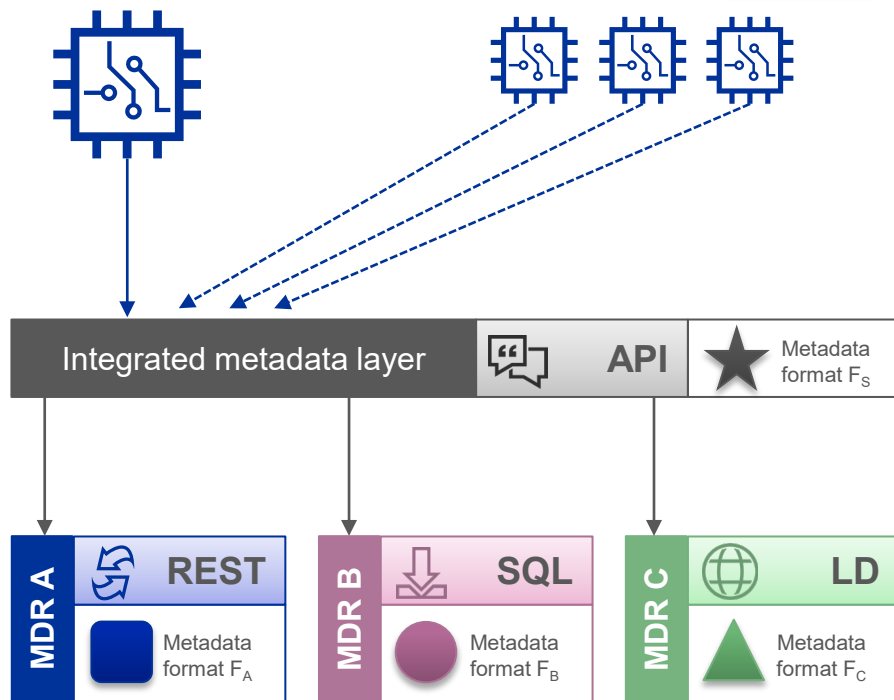
Gottron, T., Novello, A., Aarab, I., & Lauro, B. (2024). Assessing Fitness for Integration – a Metadata-driven Approach. 11th European Conference on Quality in Official Statistics (Q2024).

Challenges in metadata integration

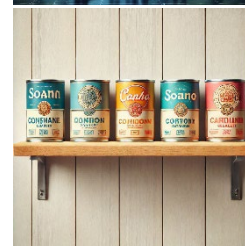


- Metadata silos even within organisations
- Lack of semantic integration and metadata governance
- Fragmented landscape of metadata standards
- Lack of standardised access to metadata repositories

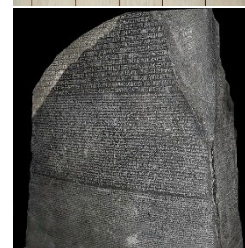
Idea and benefits of an integrated metadata layer



Single metadata access point
for all AI and ML applications



Standardised interface
(API & format)



„Rosetta stone“ for
translating between and
connecting to heterogeneous
metadata sources

Key requirements for an integrated metadata layer

Discovery, access & retrieval

- Standardised information model
- Modern standardised API for searching and retrieving metadata

Support for different types of metadata

- Business metadata
- Semantic metadata
- Quality metadata
- Structural metadata, incl. master metadata

Data integration and transformation

- Capability to describe granular, aggregated and master data
- Mappings between metadata definitions
- Support for data transformation

Based on open standards

- Integrate with a wide ecosystem of solutions
- Extensibility and open to integration with external sources

SDMX as backbone for an integrated metadata layer

“It is felt that a clear, standard formatting of data and metadata for the purposes of exchange and dissemination can also facilitate internal processing by organizations and users, but this is not the focus of the specification”

[SDMX Standards: Section 1](#)

Framework for SDMX technical standards, Version 3.0

Assessment of SDMX and its features

Discovery, access & retrieval



- + SDMX registry
- + Core standard information model
- Fully fledged data catalogue will be more suitable for discovery

Support for different types of metadata



- + Support for reference data, structural information, description of data flows
- + SDMX Metadata Structure Definition and Metadata Set

Data integration and transformation



- + Cross domain concepts and code lists
- + Structure maps, representation maps, item scheme maps
- + Integration of VTL

Based on open standards



- + SDMX as open and extensible ISO standard
- + Wide range of existing third-party and open-source solutions and tools

Summary and Conclusions

Harmonised and integrated metadata is a key enabler for AI and ML application



An integrated metadata layer helps to overcome drawbacks in current metadata landscapes



SDMX is a suitable solution to serve as backbone technology for an integrated metadata layer

