IFC-Bank of Italy Workshop on "Data science in central banking: enhancing the access to and sharing of data"

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Collaborating on SDMX APIs and open-source software[1]

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[1] This contribution was prepared for the workshop. The views expressed are those of the authors and do not necessarily reflect the views of the Bank of Italy, the BIS, the IFC or the other central banks and institutions represented at the event.

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Collaborating on SDMX APIs and Open Source Software

SDMX – the ISO Standard

- **Effective governance**
  - Eight international organizations (sponsors)
- **Continuously evolving**
  - SDMX 3.0 (latest release) – Improved support for micro/big/geo data
- **Collaborative evolution**
  - working groups & task forces, involving national and international organisations (and independent consultants)
  - SDMX 2025 roadmap
- **Comprised of a robust Information model + technical standard for modelling any data & implementing tools.**
- **SDMX in G20 DGI work (Data Gaps Initiative)**
  - International Data Cooperation / Data Sharing & Access
  - Data Structure Definitions (DSDs) established for several domains

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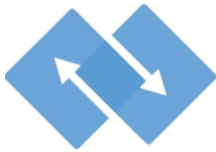
EUROPEAN CENTRAL BANK
EUROSYSTEM
eurostat
ILO
INTERNATIONAL MONETARY FUND
OECD
United Nations Statistics Division
THE WORLD BANK

SDMX – The Vision

- **Improve Quality**
  - **Standardize and harmonize Data and Metadata exchange** through agreed formats**,** ensuring consistency and comparability
  - **Robust information model** supporting the entire data lifecycle
  - Foster Collaboration
- **Promote Efficiency**
  - Enhance Data Sharing, ie **support production, exchange and dissemination of statistics** for public good
  - Enable automated (machine to machine) data sharing and process automation
- **Drive Innovation**
- **Facilitate Data Use**
  - Web services
  - Connectors (Python, R, MS Power BI, …)



Web Services – the SDMX v2 API

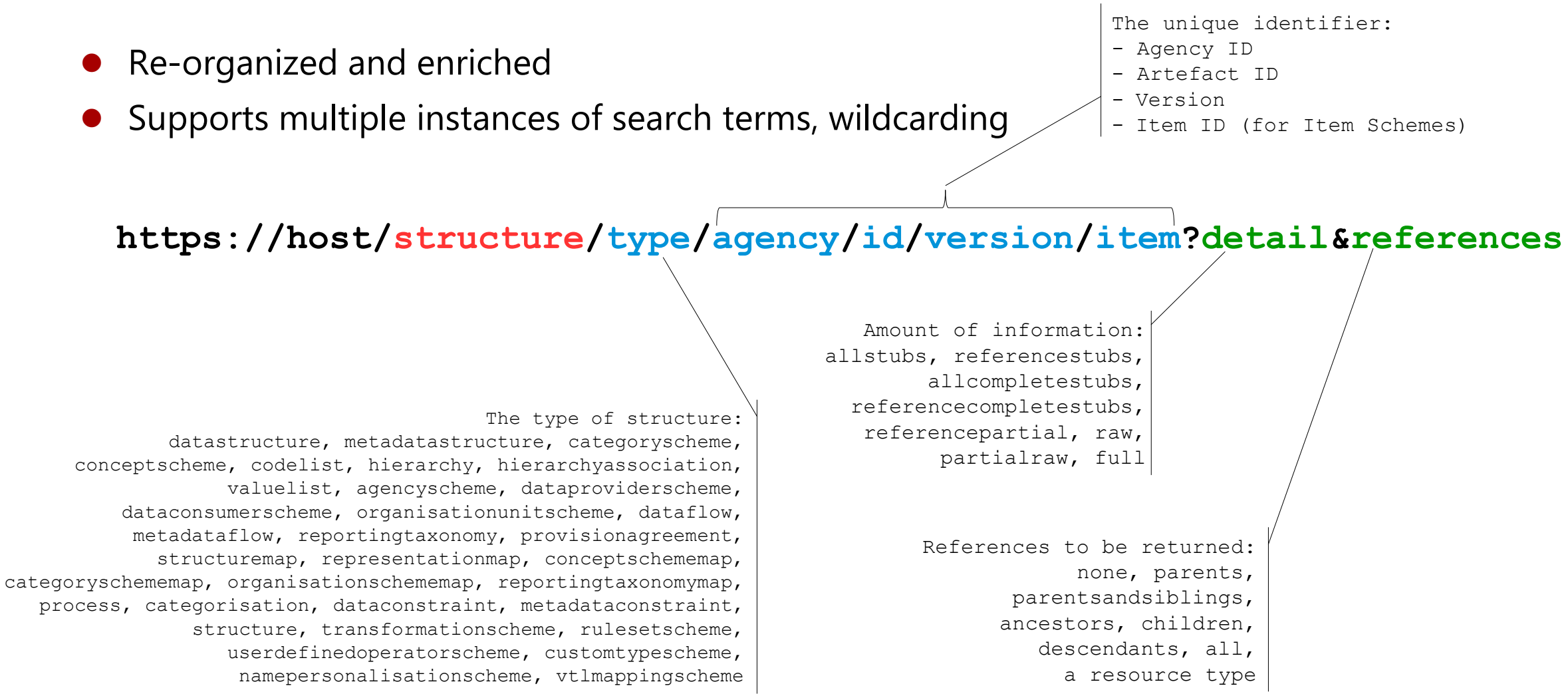
- A RESTful API maintained by SDMX-TWG Task Force 4
  - 9 releases since 2011 (first released with SDMX 2.1)

- The 9th release (with SDMX 3.0 – Sep 2021) features:
  - Enhanced data queries and reference metadata support
  - Restructured resources (breaks backwards compatibility to v1.*)
  - Metadata maintenance (additional HTTP verbs – POST, PUT, DELETE)
  - Schema query "allowed content" in more formats

- Improved clarity and documentation of the API
- Deprecated SOAP API

The structure queries

- Re-organized and enriched
- Supports multiple instances of search terms, wildcarding



The data queries

The unique identifier of the context:
- Agency ID
- Artefact ID
- Version

https://host/data/context/agency/id/version/key?c
&updatedAfter
&firstNObservations
&lastNObservations
&attributes
&measures
&dimensionAtObservation
&includeHistory

The context of data retrieval:
datastructure, dataflow,
provisionagreement

Key(s) of the series to be returned:
eg M.GR.EUR.SP00

with wildcarding:
eg M.*.EUR.SP00

With support for multiple keys:
eg M.GR.EUR.SP00, M.CY.EUR.SP00

Component-based filters (for any Dimension, Attribute or Measure):
eg **c**[REF_AREA]=CH&**c**[CONF_STATUS]=F

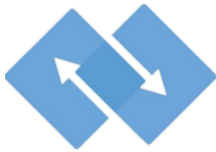
Support for operators:
eg **c**[ICP_ITEM]=**sw**:01&**c**[TIME_PERIOD]=**ge**:2015

eq	Equal
ne	Not equal
lt	Less than
le	Less than or equal to
gt	Greater than
ge	Greater than or equal to
co	Contains
nc	Does not contain
sw	Starts with
ew	Ends with
nd	And
or	Or

The data queries

https://host/data/context/agency/id/version/key?c

- **&updatedAfter** — Retrieves what changed since supplied timestamp. Must be percent-encoded (e.g.: 2009-05-15T14%3A15%3A00%2B01%3A00)
- **&firstNObservations** — Maximum number of observations starting from the first observation
- **&lastNObservations** — Maximum number of observations counting back from the most recent observation
- **&attributes** — Id of the dimension at the observation level
- **&measures** — The attributes to be returned: dsd, msd, dataset, series, obs, all, none, {attribute_id}
- **&dimensionAtObservation** — The measures to be returned: all, none, {measure_id}
- **&includeHistory** — Whether to return vintages



Other queries

- Data validity

  https://host/schema/context/agency/id/version?dimensionAtObservation
  &explicitMeasure

- Data availability

  https://host/availability/context/agency/id/version/key/componentId?c
  &updatedAfter
  &references
  &mode

- Metadata

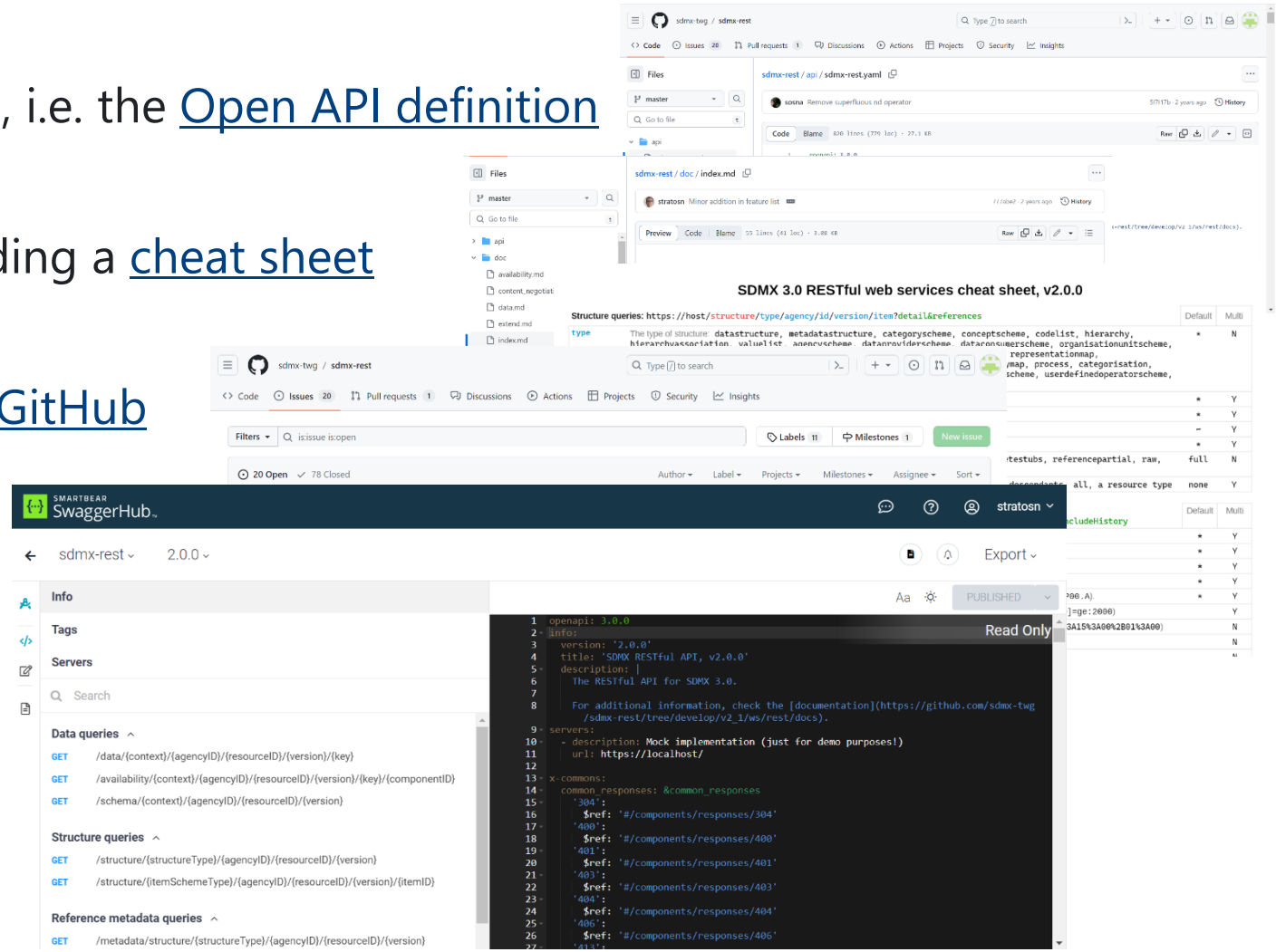
  https://host/metadata/metadataset/provider/id/version?detail

  https://host/metadata/metadataflow/agency/id/version/provider?detail

  https://host/metadata/structure/type/agency/id/version/provider?detail

SDMX 3.0 RESTful API v2.0.0

- The normative part of the specification, i.e. the Open API definition
- The Developers' documentation, including a cheat sheet
- Request features and report issues on GitHub
- See the API spec on SwaggerHub
- The SDMX v2 API in action



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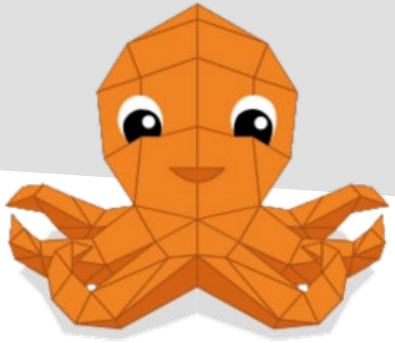


What is sdmx.io?

sdmx.io is not a single project but an **ecosystem of open source tools, patterns, guidance, learning materials and other resources** like pre-configured containerised environments that make the software quick and simple to deploy.

- An **open-source SDMX software and resource portal**
  - Software releases (FMR, FusionXL, etc.)
  - E-learning courses and webinars
  - Knowledge and use-case articles
- **Governance in place, incl. Prioritisation and User Advisory Groups**
- **Officially public**, after the SDMX Sponsors approval

- Share software tools and components based on SDMX
- Complement existing tools in order to achieve statistical use-cases
- Interface SDMX with other standards or tools
- Promote reusability of SDMX software

Collaboration partners and activities

- **IMF**: IMF SDMX Central is powered by FMR11 (since Sep 2023)
- **SIS-CC/Eurostat/BIS**: working closely on achieving SDMX 3.0 compliance
- **OECD/SIS-CC**: .Stat/FMR integration for the National Bank of Belgium (**NBB**) use case
  - `FMR Workbench`
  - `.Stat Suite` on sdmx.io
- **NBB:** Launch of FMR Workbench user group (targeting CBs and SIS-CC members)
- **Eurostat**: SDMX Reference Implementation for SDMX 3.0
  - `sdmx-core` evolution (Java/.Net)
- **Banca d'Italia**: `VTL Engine` & `FMR` → exploring the use cases
  - UNSD working with BdI on the first use case
- **Meaningful Data**: `SDMXthon` & `FMR` → exploring the use cases

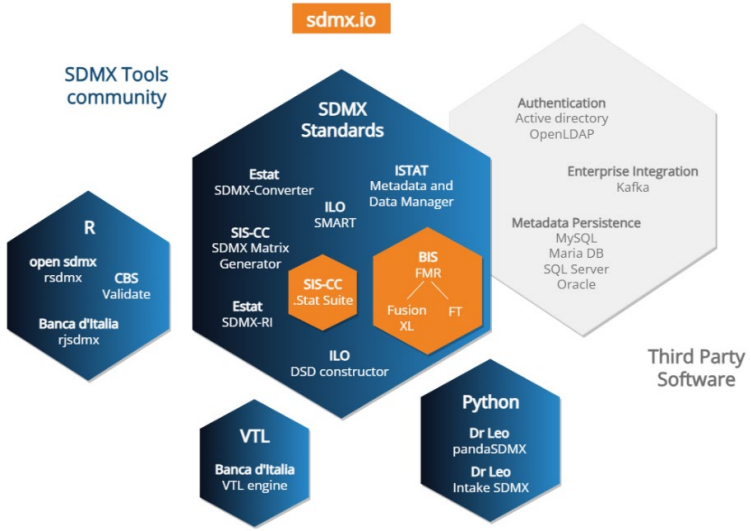
The use-cases

Statistics production

Statistics dissemination

Data domain modeling

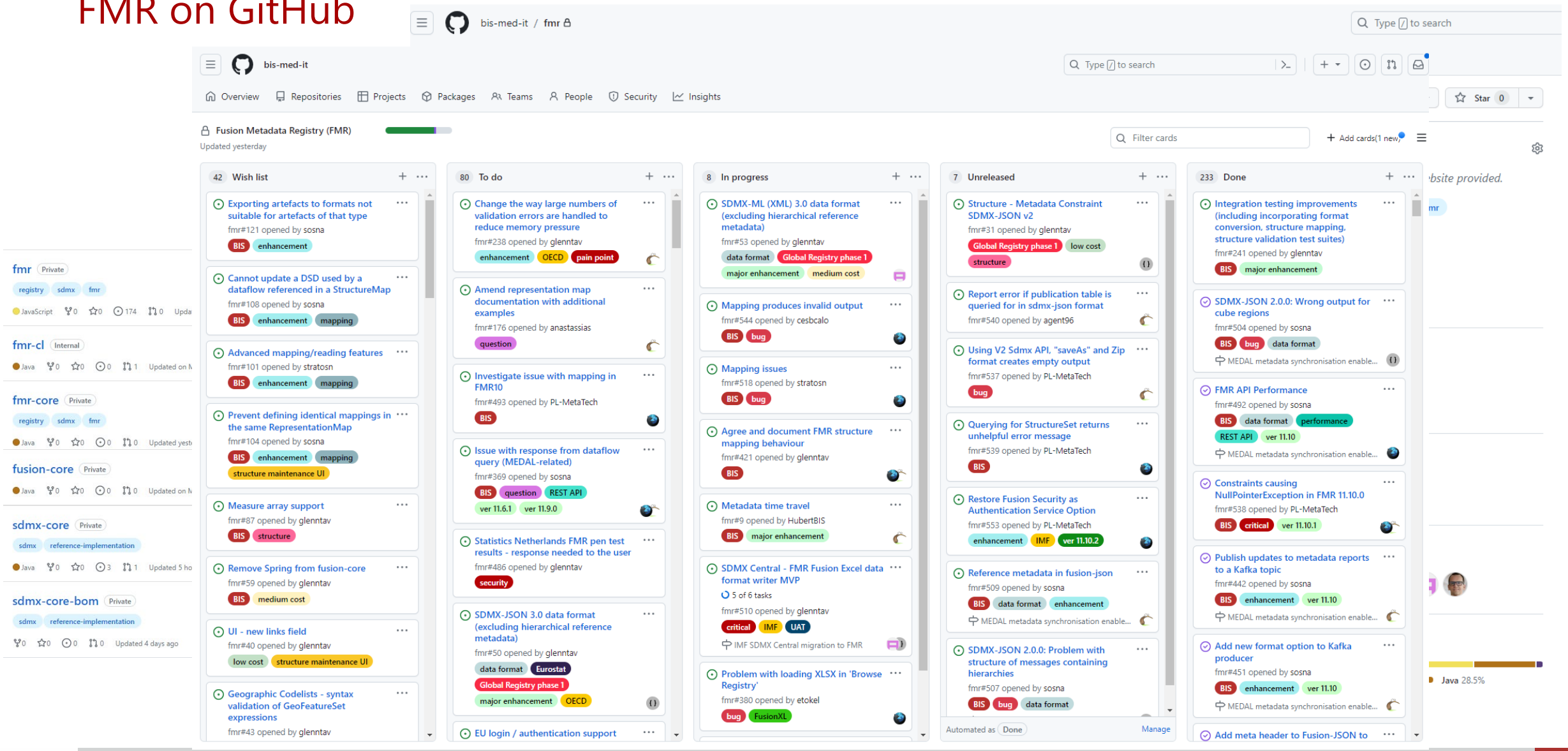
Data collection



eLearning Catalogue

sdmx.io's library of learning resources covers a diverse range of topics including how to use software tools, SDMX theory and data modelling best practice.

FMR on GitHub



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Thank you!

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