RAISEARTH
Research Infrastructure Services Advancing Frontier Knowledge in Sun-Earth Interactions

Introduction to RAISEARTH: From distributed assets to one integrated, service-ready Sun–Earth research infrastructure

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The ambition

RAISEARTH integrates Europe's distributed Sun–Earth observing facilities, databases, models and AI/ML data processing and modeling facilities into a single service-ready ecosystem for frontier research and innovation.



RAISEARTH innovations:
full-chain integration + AI/semantic capabilities for trustworthy, EOSC-compatible services

RAISEARTH nodes

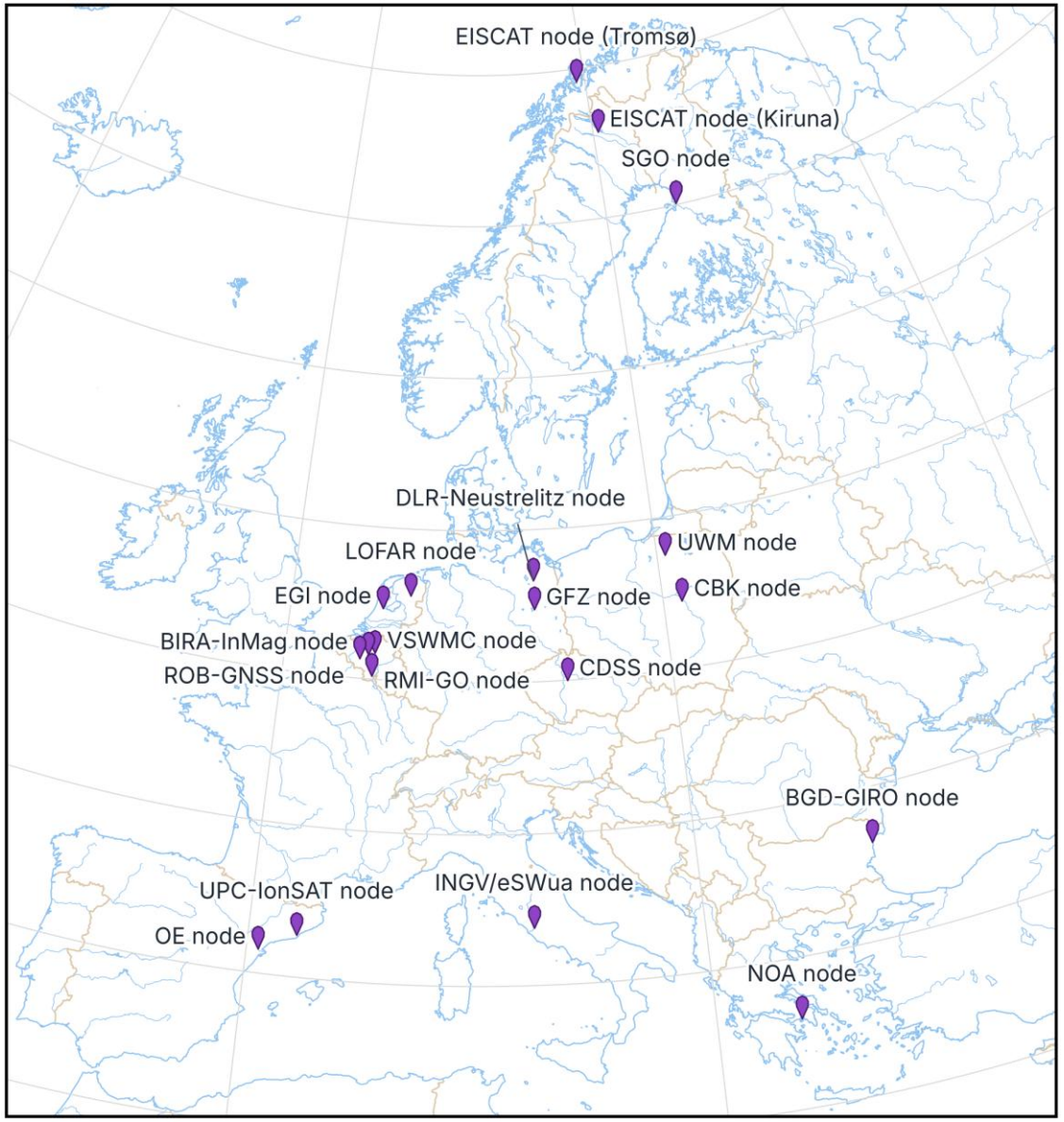
18 nodes offering Trans-National Access (TNA) and/or Virtual Access (VA)

Integration

- ✓ Observations, experiments, data, and models across the entire Sun-Earth system, from solar activity to the ionosphere and thermosphere

Access

- ✓ TNA & VA to European instruments, FAIR datasets, event catalogues, and model outputs
- ✓ AI-enabled services for event detection, forecasting, semantic discovery, data quality control, and machine-learning workflows



From 18 contributing nodes to one infrastructure

01 · SUN

LOFAR and CALLISTO radio telescopes
Solar radio observations and burst monitoring

02 · HELIOSPHERE

Solar wind observations and EUHFORIA modelling
Interplanetary propagation and space weather context

03 · MAGNETOSPHERE

Magnetometer & riometer networks
Geomagnetic disturbances and their impacts

04 · IONOSPHERE

EISCAT radars, Ionosondes & GNSS networks
Plasma dynamics, TEC and scintillation

05 · THERMOSPHERE

Upper atmosphere models & optical observations
Coupled ionosphere-thermosphere processes

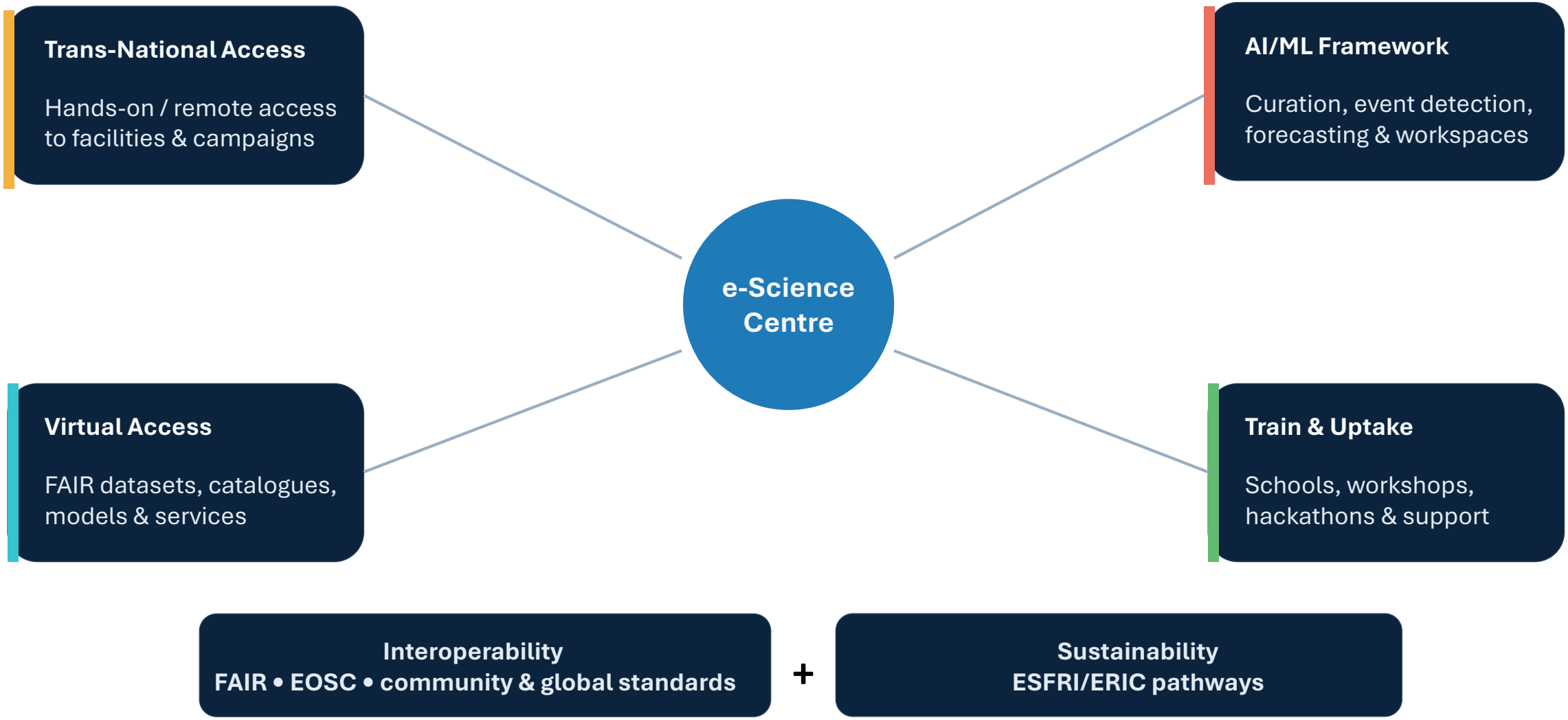
COMMON RAISEARTH LAYER

- Access rules & support
- Service catalogue & ontology
- FAIR metadata + APIs
- Dashboards & workflows
- AI/ML workspaces
- Standards + documentation

USER

The user should experience RAISEARTH as one ecosystem — whether using a dataset, running a model, or visiting a facility.

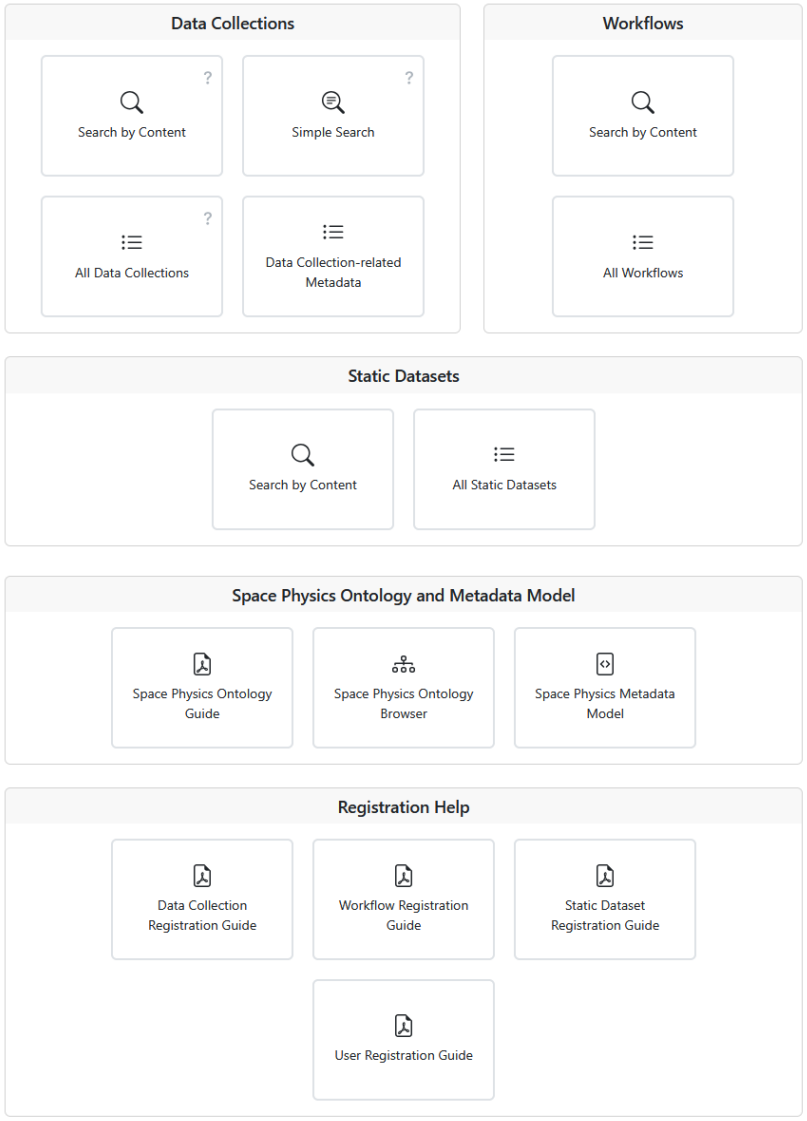
RAISEARTH activities & vision



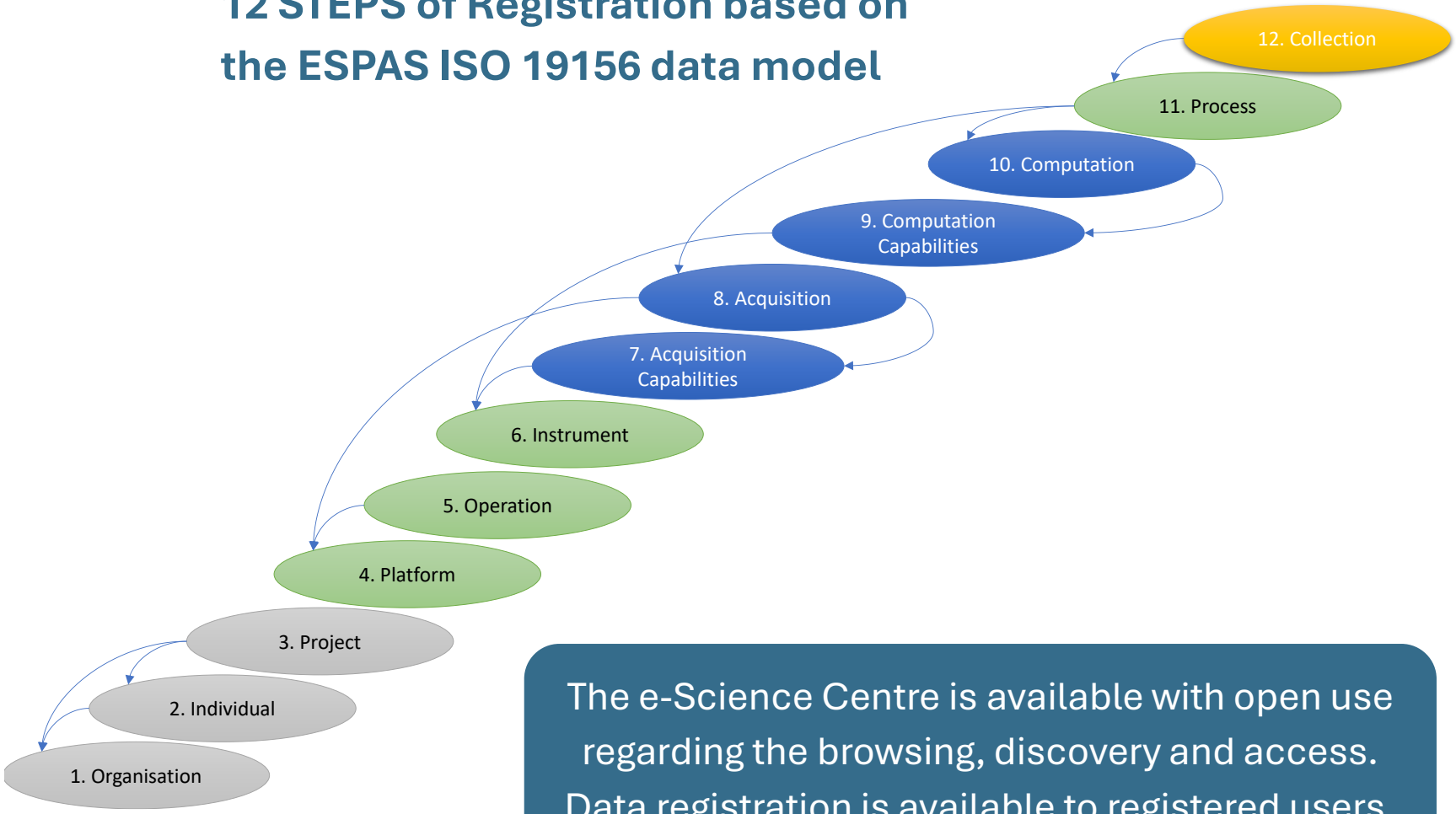
RAISEARTH e-Science Centre

developed in the PITHIA-NRF RI project, already functionable

PITHIA e-Science Centre



12 STEPS of Registration based on the ESPAS ISO 19156 data model



The e-Science Centre is available with open use regarding the browsing, discovery and access. Data registration is available to registered users.

e-Science Centre resource management

Registered users can create, delete or modify resources under their institution

- ✓ A resource can be a Data Collection, a Static Dataset, or a Workflow
- ✓ Registering a Data Collection requires up to 12 steps

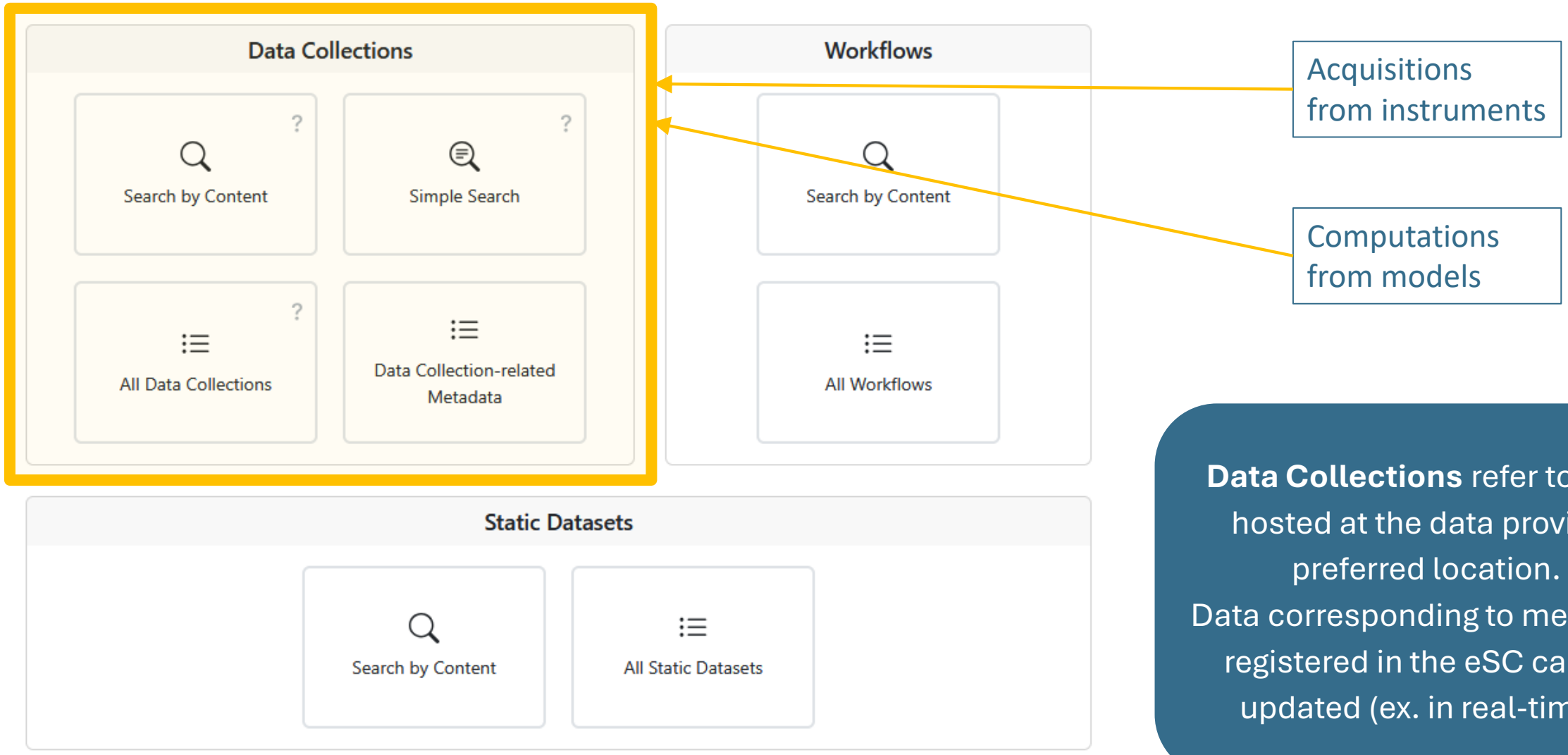
Resource registrations are in XML format

Two options for managing/creating XML files

- ✓ Edit XML files off-line and upload them
- ✓ Use registration wizard to generate XML automatically

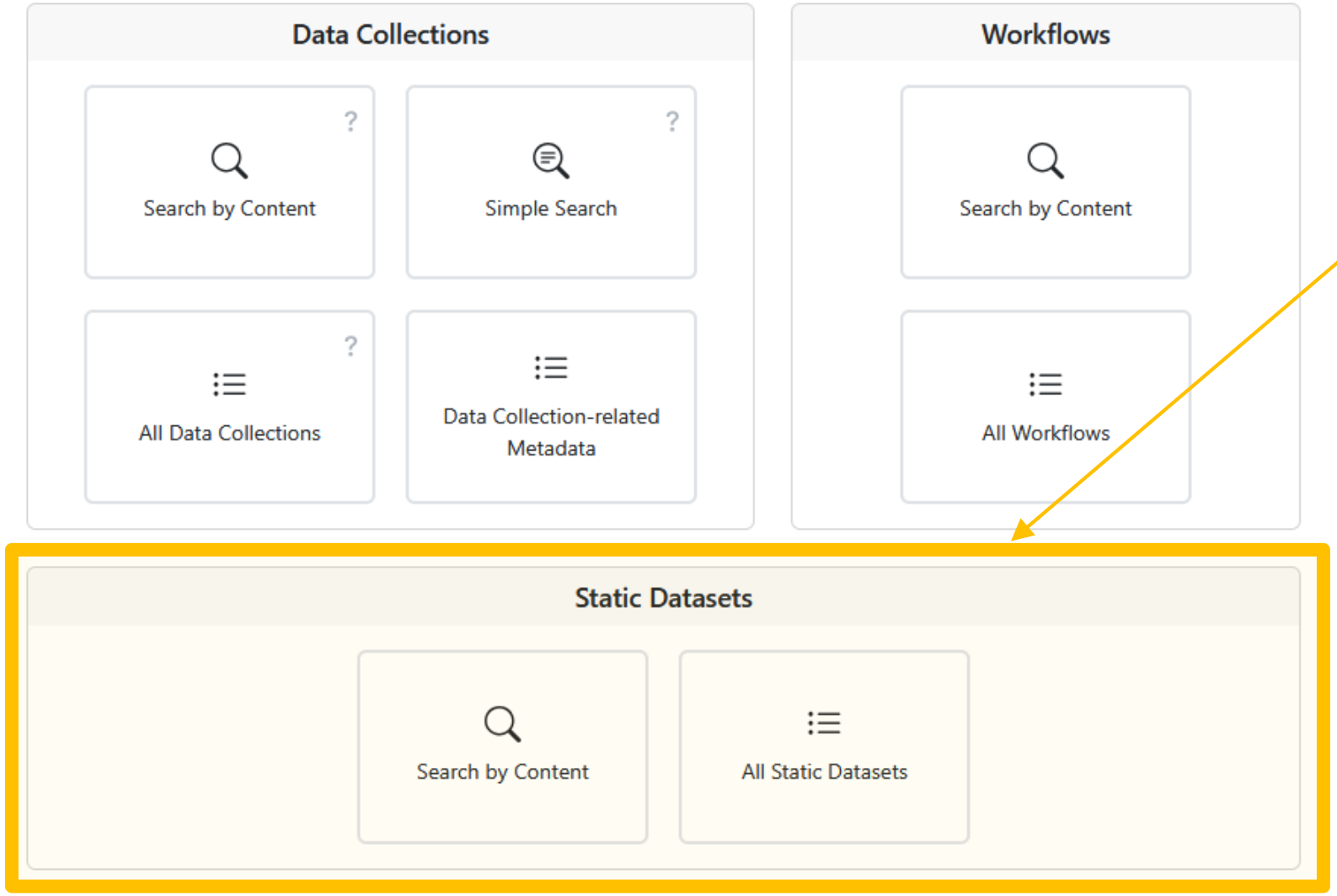
User management is based on EGI Check-in for authentication and Perun for authorisation

Data Collections



Data Collections refer to data hosted at the data provider preferred location.
Data corresponding to metadata registered in the eSC can be updated (ex. in real-time).

Static Datasets

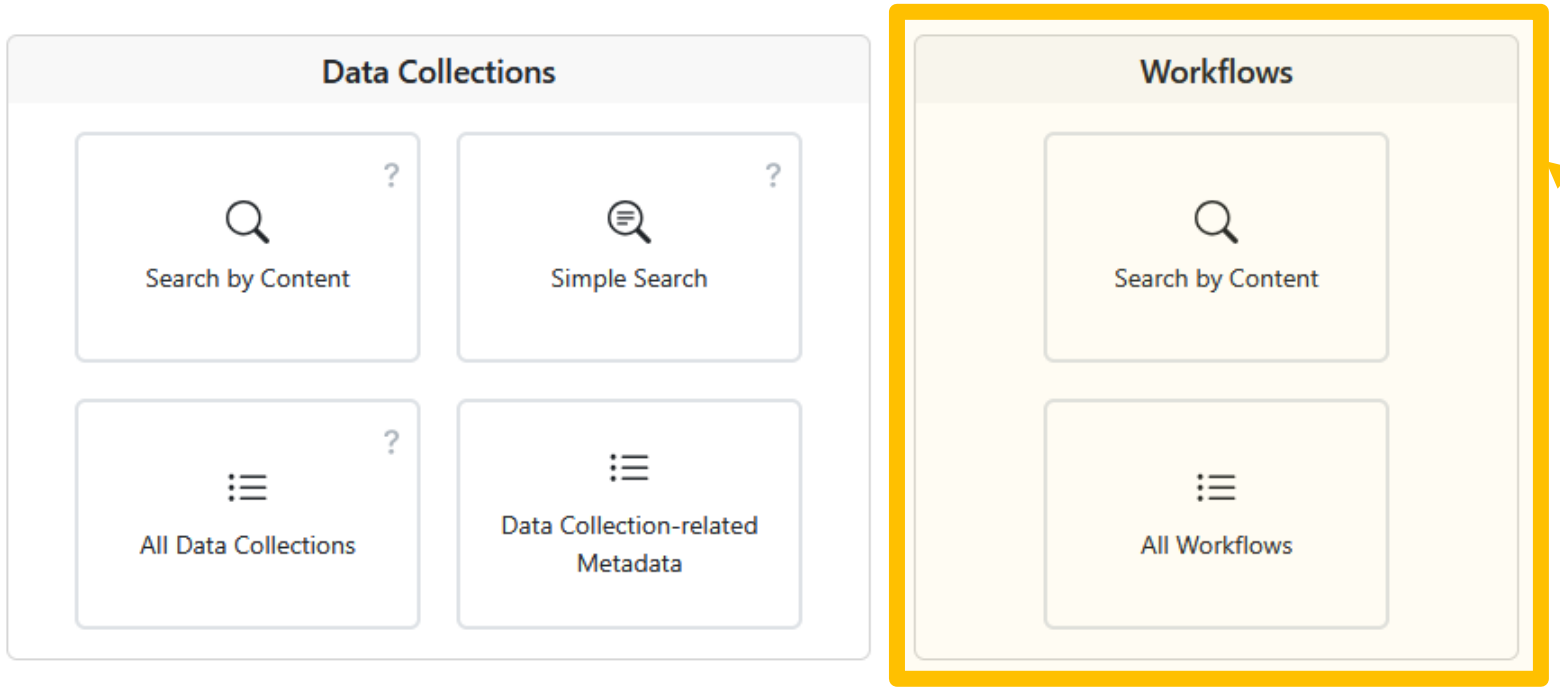


Data that refer to:

- ✓ Datasets Used in an Academic Publication
- ✓ Training Datasets for a Machine Learning Model
- ✓ Data Pertaining to an Event
- ✓ Data from an Experiment Campaign

Static Datasets refer to a locked dataset; a DOI can be attributed; this dataset can be hosted in EOSC.

Workflows



Workflows allow the real-time execution of a chain of processes that combine different data collections and software codes.

Workflows refer to a combination of different interconnected Data Collections executed repeatedly in an orchestrated pattern to produce its output result.

Interaction with datasets, models & workflows

Download a software application to interact with the data

A download and installation page for a software application that can read (usually over the Internet to an online repository) the data products for interactive visualisation and additional processing.

Download documents describing the data/access specifics

Documentation holding information about specific aspects of data and access/interaction techniques, such as user guides, data format specifications, API definitions, rules of the road.

Access online textual / visual training materials

An online resource with textual or visual material produced for educational purpose (e.g., training webinar recordings or downloadable PowerPoint presentations from capacity-building workshops or training schools).

Browse and download graphical data products (images)

Access to a data repository holding graphical/imagery data, usually via a landing webpage with GUI

Download numerical data products

Access to a data repository holding numerical data, usually via a landing webpage with GUI

Online service responding to a parametrised data request using OpenAPI standard

An online service operated by the data repository that accepts standard OpenAPI data requests with formally defined parameters and returns the requested resource as defined by the interface.

- ✓ **Interaction methods depend on the datasets/model provider.**
- ✓ **Workflows are accessed and executed via an API (*online service responding to a parametrised data request using OpenAPI standard*).**

RAISEARTH data quality and data management

Data quality

Scientific Quality: Data Quality Flag, Scientific Relevance

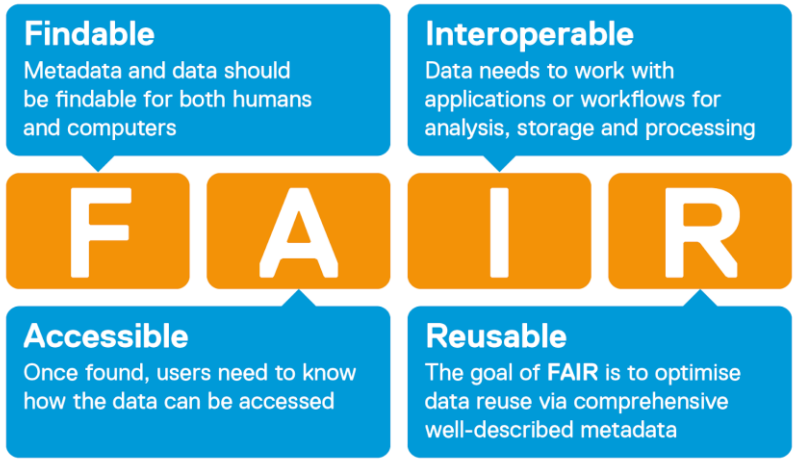
Quality of Metadata: Usage, Scope, Provenance, Persistence, Aggregation, Standardisation, Interoperability, Quality, Earliness, Availability

Quality of Data Resources: Quality of data generation, Quality of data repository, Quality of data usage

Compliance to FAIR

Data management

The focus is on FAIRness.



The basic data collections are assessed against a full list of FAIR data maturity model indicators.

Our ambition is to bring RAISEARTH nodes to achieve FAIRness, through the e-Science Centre.

RAISEARTH

Four years.
One integrated ecosystem.

ALIGN • ACTIVATE & COMMIT • INTEGRATE • DELIVER
https://raisearth.eu

Thank you for your attention!

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