



## Open Science Plan-Track-Assess Pathways

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## Abbreviations list

<b>API</b>	Application Programming Interface
<b>DCAT</b>	Data Catalog vocabulary
<b>DMP</b>	Data Management Plan
<b>DQV</b>	Data Quality Vocabulary
<b>FAIR</b>	Findable, Accessible, Interoperable, Reusable
<b>FTR</b>	FAIR Test Results Vocabulary
<b>GORC</b>	Global Open Research Commons
<b>IF</b>	Interoperability Framework
<b>maDMP</b>	Machine Actionable Data Management Plan
<b>PROV-O</b>	Provenance Ontology
<b>RA</b>	Reference Architecture
<b>RDA</b>	Research Data Alliance
<b>RDM</b>	Research Data Management
<b>SKG</b>	Scientific Knowledge Graph

## Executive Summary

The **OSTrails Commons** is a curated set of open, reusable resources that enable interoperability across research-supporting platforms. It provides foundational elements aligned with the OSTrails Interoperability Framework and Reference Architecture, reducing complexity and accelerating adoption by standardizing interactions between tools. Rather than standalone services, the Commons bridges technical, semantic, and procedural gaps, supporting scalable and adaptable workflows.

Developed iteratively with stakeholder feedback, the Commons is versioned and organised around OSTrails' Plan-Track-Assess pathways, flowing through three primary Interoperability Frameworks: the DMP-IF for machine-actionable Data Management Plans, the SKG-IF for Scientific Knowledge Graphs, and the FAIR-IF for FAIR assessment. Each framework provides a layered structure consisting of data models and standards (building on RDA recommendations and W3C standards), application profiles with domain-specific extensions, API specifications for programmatic interoperability, and mappings to existing formats and vocabularies. This layered approach enables gradual adoption while ensuring full interoperability when all components are implemented and allows diverse tools and platforms to integrate seamlessly within the OSTrails ecosystem.

This document serves only as a pointer to the actual deliverable: the living online documentation of Commons artefacts **available at** <https://docs.ostrails.eu/>. That documentation contains full specifications and will continue to evolve as the project progresses. Here, we provide a summary of components developed to date and a link to the complete resource.

## Introduction

The OSTRails project defines a Reference Architecture [2] that guides how research data management components interact across:

- **Planning** via DMP Platforms (machine-actionable DMPs),
- **Tracking** via Scientific Knowledge Graphs (research outputs, and relationships),
- **Assessing** via FAIR Assessment Tools (tests, results, and improvement guidance).

To enable these interactions without vendor lock-in, the project specifies **three Interoperability Frameworks (DMP-IF, SKG-IF, and FAIR-IF)**, each built on RDA recommendations and W3C standards.

The **Commons** [3] provides the concrete, shared resources that implement these frameworks—data models, application profiles, API specifications, and mappings—forming the foundational layer that tools and services adopt to achieve interoperability.

**Tools implementing the Commons** can then be used interchangeably within the architecture: any compliant DMP platform can exchange information with any compliant SKG, and any FAIR assessment tool can evaluate digital objects using standardised test results. This separation of concerns—architecture defining interactions, frameworks specifying standards, Commons providing resources, and tools implementing them—ensures that the ecosystem can evolve while maintaining interoperability.

The architecture is grounded in the **Plan-Track-Assess pathways**, which map how digital objects are managed, evaluated, and improved across their research lifecycle. These pathways flow through the three Interoperability Frameworks, guiding how information moves between DMPs, SKGs, and FAIR assessment tools.



# 1. The OSTrails Commons

**The OSTrails Commons is a collection of open, reusable, and adaptable resources that collectively enable and enhance interoperability within the OSTrails and EOSC ecosystem.** These resources are designed to lower adoption barriers by standardising interactions between tools, ensuring alignment with the Interoperability Frameworks and Reference Architecture [2].

The Commons is not standalone tools or services; rather, it is the **shared foundation** that tools implement to interoperate reliably. It is built through iterative cycles, where specifications evolve to incorporate feedback from tool developers and other stakeholders. This approach ensures that the Commons remains practical and adaptable.

Entities in the Commons are carefully versioned, and releases are generated as required to ensure that tools work together.

Each of the three Commons (DMP, SKG, FAIR) follows a consistent layered structure:

- **Data models and standards** defining core concepts and structures
- **Application profiles** adding domain-specific extensions and constraints
- **API specifications** enabling programmatic interoperability
- **Mappings** aligning with existing formats and external vocabularies

This layered approach enables gradual adoption while ensuring full interoperability when all components are implemented.

## 1.1. Commons Components

To support implementation and uptake, the following overview summarises the Commons domains, core artefacts, and representative implementations.

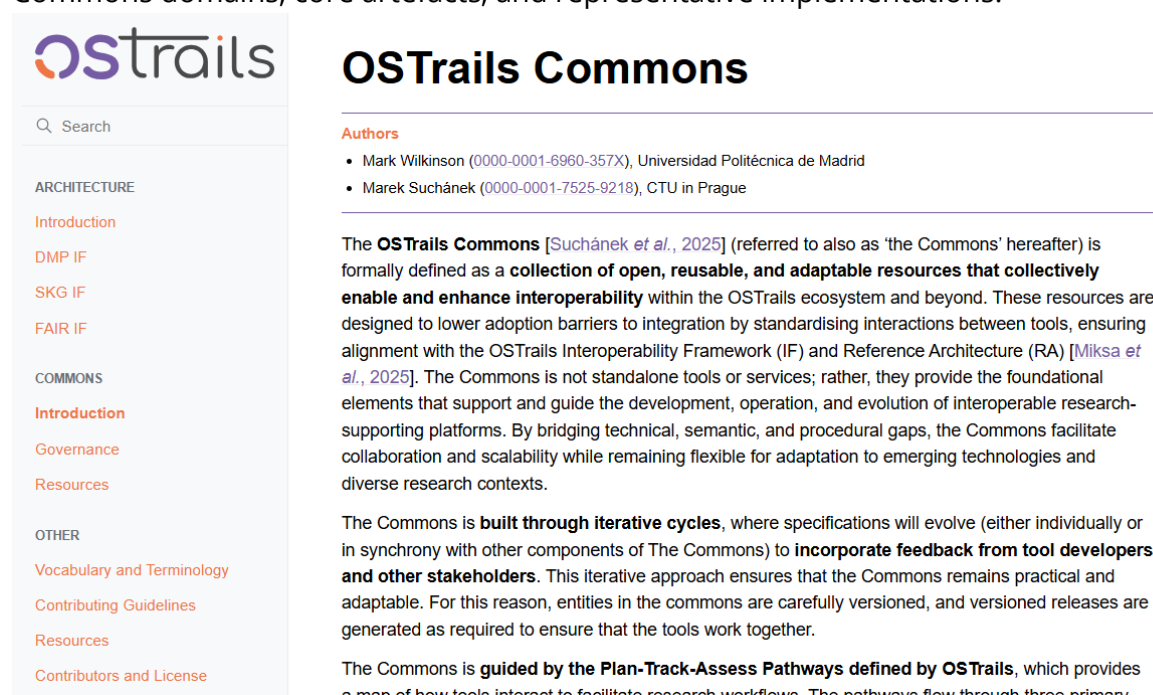


Figure 1. Screenshot of the OSTrails documentation

**Table 1** provides an overview of the three Commons domains, the PTA phase they support, the main artefact types delivered through the Commons, and examples of tools implementing them.

Table 1. Overview of Commons domains, supported PTA phases, artefact types, and example tools

COMMONS	PTA	CORE RESOURCES	EXAMPLE IMPLEMENTING TOOLS	PRIMARY OUTPUT EXCHANGED
SKG	Track	RDA SKG core model; OSTrails extensions; API; mappings	OpenAIRE Graph SKG-IF API; RO-HUB; CESSDA SKG-IF API	research objects, entities, relations
DMP	Plan	RDA DMP Common Standard; OSTrails AP; API; mappings	ARGOS; DAMAP; Data Stewardship Wizard	maDMP records
FAIR	Assess	Guidance spec; vocabularies; API; catalogues; shared tests	FAIR Champion; FOOPSI; FAIROS; FAIRsharing; FAIR Validator	tests, assessment results

**NOTE: Full specifications and artefacts are maintained in the online documentation: <https://docs.ostrails.eu/en/latest/>.**

## 1.1.1. SKG Commons

The SKG Commons provide a common, reusable, extensible, and interoperable foundation for handling data exchange between Scholarly Knowledge Graph (SKG) interfaces across tools and services. They specify how SKG information is modelled, constrained, and exchanged, while remaining neutral regarding the internal design or implementation of individual systems. The SKG-IF data model, developed in the context of RDA, is designed to enhance interoperability among different knowledge graph systems used in research.



**SKG Commons**

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The SKG Commons provide a common, reusable, extensible, and interoperable foundation for handling data exchange between Scholarly Knowledge Graph (SKG) interfaces across tools and services that implement the Scholarly Knowledge Graph Interoperability Framework (SKG-IF). They specify how SKG information is modelled, constrained, and exchanged, while remaining neutral regarding the internal design or implementation of individual systems. The main audience for the SKG Commons consists of software developers who build services to create, manage, or consume SKGs. This includes SKG providers (e.g., OpenAIRE Graph, OpenCitations), other services that manage scholarly metadata and wish to expose interoperable interfaces (e.g., FAIRSharing, RO-Hub), and services that want to integrate with such platforms, as described in the OSTrails Architecture and Pathways.

Figure 2. Screenshot of the SKG Commons documentation

The SKG Commons consist of four key resources:

- (1) the RDA SKG-IF Core Data Model, which captures key SKG entities, relationships, and constraints;
- (2) SKG-IF Extensions for community- or domain-specific specialisations;
- (3) SKG-IF API Specifications using OpenAPI and JSON-LD for programmatic access;
- (4) SKG mappings to [DDI](#), [RO-Crate](#), and [OpenAIRE Graph](#).

## 1.1.2. DMP Commons

The DMP Commons provide a shared, reusable, and interoperable foundation for working with machine-actionable Data Management Plans (maDMPs) across tools and services. They are built as a layered framework designed to enable interoperability and interchangeability of DMP platforms, reduce reliance on static text documents such as PDFs, promote reuse of information from DMPs, and enhance the quality and timeliness of DMPs through direct data sourcing.

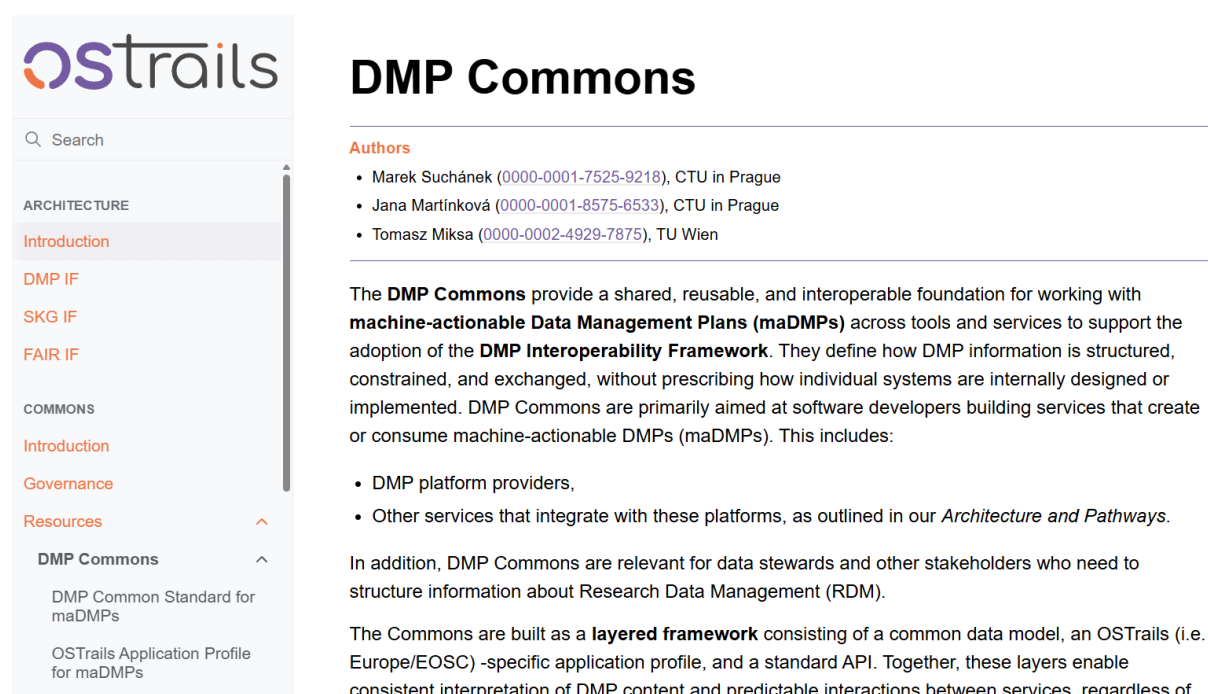


Figure 3. Screenshot of the DMP Commons documentation

The DMP Commons consist of four key resources:

- (1) the RDA DMP Common Standard for maDMPs, which defines core DMP concepts and structures as an RDA recommendation;

(2) the OSTrails Application Profile for maDMPs, a Europe/EOSC-specific extension introducing additional entities, fields, and constraints [1];

(3) the OSTrails maDMP API Specification using OpenAPI for programmatic interaction with maDMPs;

(4) maDMP mappings, e.g. to [Science Europe](#) templates.

### 1.1.3. FAIR Commons

The FAIR Commons provide a shared, reusable, and interoperable foundation for working with FAIR assessment content across tools and services. Built on W3C standards including the Data Quality Vocabulary (DQV), Data Catalog vocabulary (DCAT), and Provenance Ontology (PROV-O), the FAIR Commons define how FAIR-related guidance, tests, and assessment results are represented and exchanged consistently. The FAIR Reference Model organises components at three levels: Conceptual (Dimensions, Metrics, Benchmarks), Software (Tests, Algorithms), and Data (Test Results, Assessment Outcomes).

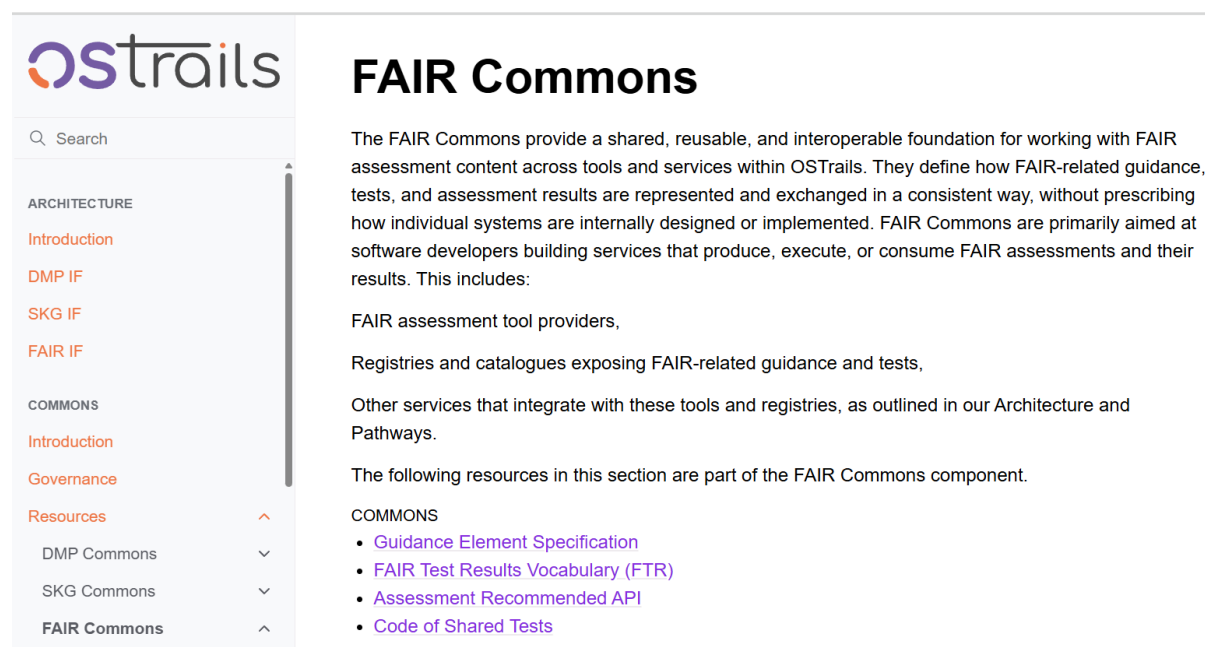


Figure 4. Screenshot of the FAIR Commons documentation

The FAIR Commons consist of seven key resources:

- (1) Guidance Element Specification;
- (2) FAIR Test Results Vocabulary (FTR), an OWL ontology with SHACL shapes for validation;
- (3) Assessment Recommended API;

- (4) Catalogue of Benchmarks and Metrics;
- (5) Catalogue of Tests;
- (6) Catalogue of Benchmark Scoring Algorithms;
- (7) Code of Shared Tests.

## 2. Governance

The OSTrails Commons is managed through a federated governance model ensuring adaptability and inclusivity. The governance structure consists of three key roles:

- **Group of Maintainers**, who are responsible for specific parts of the Commons, ensuring technical consistency, version control, and interoperability standards across DMP, SKG, and FAIR components;
- **Resource Representatives**, who are responsible for specific resources that are part of the Commons, maintaining records up-to-date and aligned with the Commons and OSTrails Interoperability Framework;
- **Community Contributors**, comprising researchers, developers, and stakeholders who provide feedback, propose enhancements, and contribute to resource maintenance.

Maintenance follows key principles including a versioning policy using semantic versioning for compatibility and traceability, compliance monitoring with periodic assessment against EOSC and GORC standards [4], a feedback mechanism via GitHub discussions and issue tracking, and transparent deprecation and archival guidelines for phasing out outdated resources.

Our approach aligns with the Global Open Research Commons (GORC) International Model [4], ensuring sustainability through long-term stewardship of resources and metadata, interoperability through adherence to global data exchange and research infrastructure standards, and transparency through open decision-making processes, public documentation, and structured community involvement.

## 3. Tools Ecosystem

The Commons is implemented by tools and services developed and maintained by the OSTrails consortium. Tools adopting the Commons specifications [3] become

interoperable within the OStrails architecture and can exchange information with other compliant services regardless of internal implementation choices.

Adoption is ongoing, with tools at various stages of implementation maturity:

- **DMP platforms:** [ARGOS](#), [DAMAP](#), [DSWizard](#).
- **SKG providers:** [OpenAIRE Graph](#) SKG-IF API, [RO-HUB](#) SKG-IF API, and [CESSDA](#) SKG-IF API.
- **FAIR assessment tools:** [FAIR Champion](#), [FOOPS!](#), [FAIROS](#), [FAIRsharing](#), the [FAIR Assessment Authoring Tool](#), and [FAIR Validator](#).

The documentation at <https://docs.ostrails.eu> includes a dedicated Tools section with detailed descriptions, implementation status, and guidance for each platform. As more tools adopt the Commons specifications [3], this ecosystem will continue to grow, demonstrating the practical value of the interoperability approach.

## Conclusion

The OSTrails Commons provides a practical, open interoperability foundation for the Plan–Track–Assess pathways by delivering shared artefacts that tools can implement. By standardising models, profiles, APIs, and mappings across DMP, SKG, and FAIR domains, the Commons reduces integration friction and supports scalable adoption in EOSC-aligned environments. The canonical and evolving specifications are maintained in the online documentation, while this deliverable remains a stable overview of scope, structure, governance, and implementation landscape.



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