Use case: To track and predict hazard to agricultural crops in Europe induced by climate change using crop growth models and DestinE data (agroclim)

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BIO DIVERSITY DIGITALTWIN.EU

SENCKENBERG world of biodiversity

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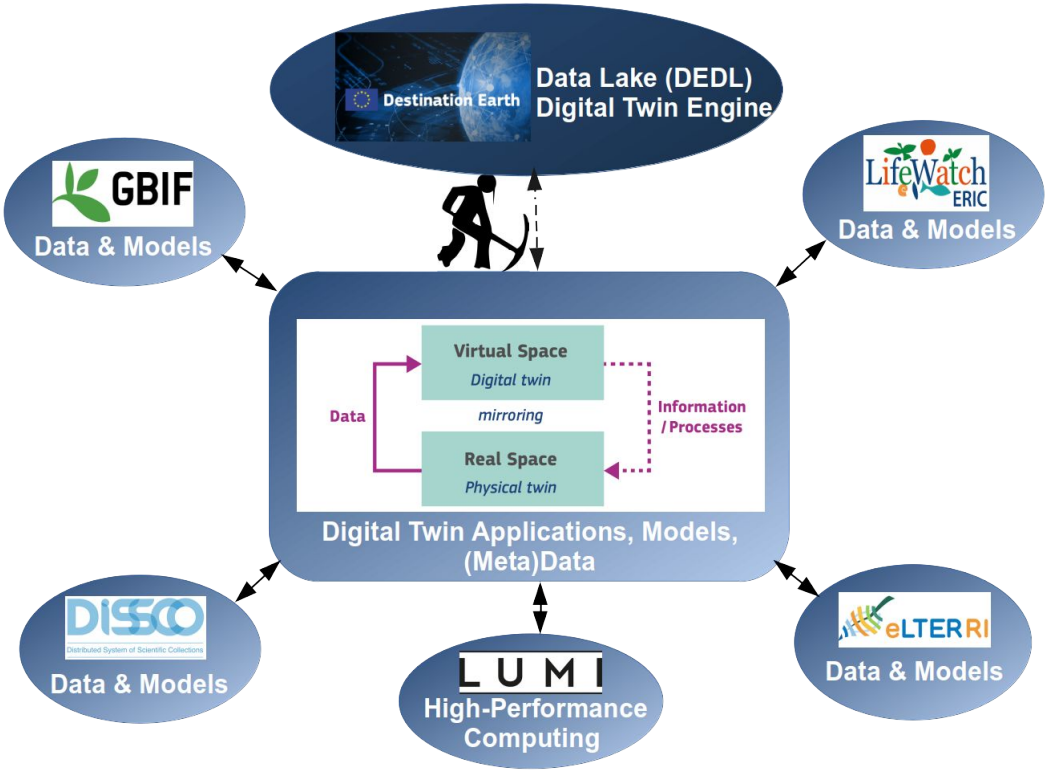
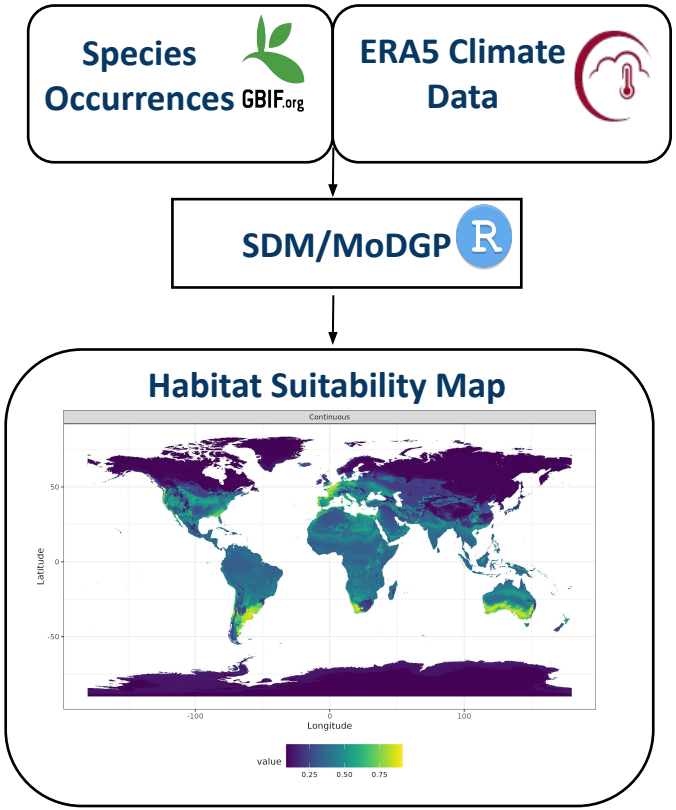
DiSSCo Distributed System of Scientific Collections

Recap: Biodiversity Digital Twin (BioDT)



- BioDT Project: **Biodiversity Digital Twin for Advanced Modelling, Simulation and Prediction Capabilities** (HE)
- Mobilize traceable data & models from environmental-related RIs like **DiSSCo, eLTER, LifeWatch ERIC and GBIF for state-of-the-art modeling on HPC platforms (CSC's LUMI)**
- **Address biodiversity grand challenges such as biodiversity loss in the anthropocene** due to climate change, land use, alien invasive species and zoonotic diseases by a set of DTs (cp. Martinovič et al. 2024)

A Biodiversity Digital Twin for Crop Wild Relatives (UiO's MoDGP)

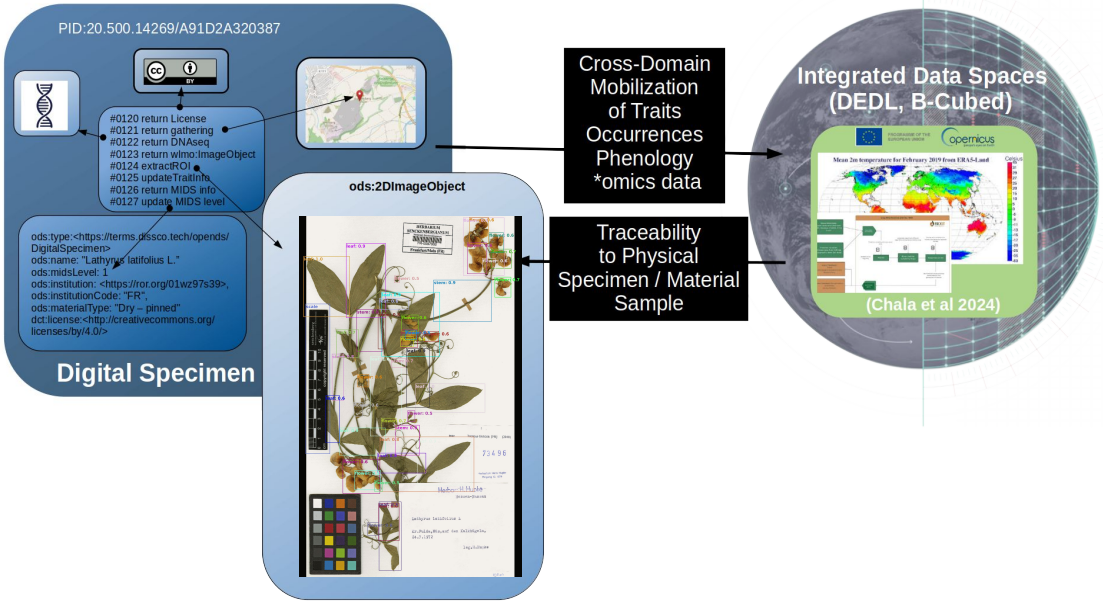


- MoDGP aims to identify novel genetic resources within crop wild relatives (CWR) that can **enhance the resilience of domesticated crops against current environmental changes and contribute to global food security in alignment with SDG 2** ("Zero Hunger Goal")
- Builds on **species distribution modelling (SDM, data source GBIF) involving climatic, topographic, and soil variables (ERA-5) to compute habitat suitability maps**
- **agroclim:** Blueprint study for the **integration of DT CWR into DEDL** (UiO, SGN, EUMETSAT)

3rd Destination Earth User eXchange - Claus Weiland et al.

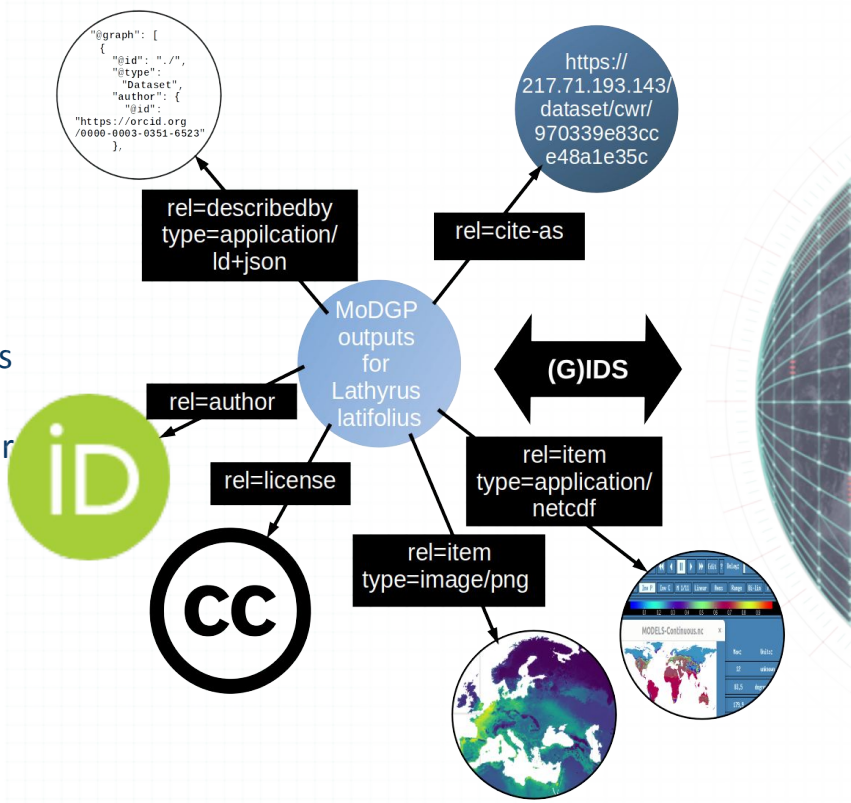
Data model for DataSpace Integration: FAIR Digital Objects

- Aim: Mobilize (agro)biodiversity data **for autonomous processing by machines** (machine-actionability a core objective of FAIR) **and cross-domain usage in integrated data spaces** (B-Cubed/BMD, FC4EOSC, DEDL)
- Use a **unified data model for machine-actionable knowledge units** → FAIR Digital Objects (FDOs)
- Consider ***FAIR as a contract*** (Carole Goble, CoRDI 2023), **FDOs as a implementation path for fulfilling this contract**



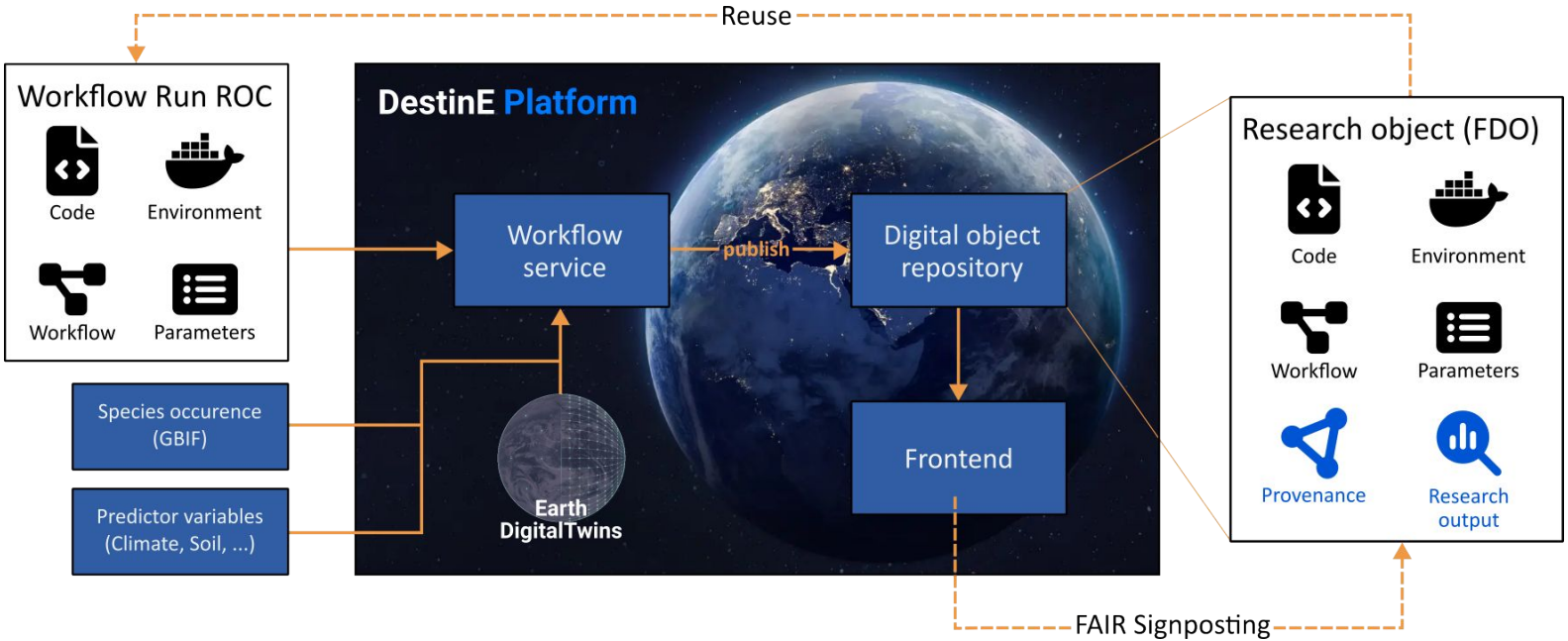
“Webby” FDOs with FAIR Signposting

- We use **RO-Crate + FAIR Signposting** to set up an implementation path leveraging on common web technologies → **webby FDO**
- RO-Crate: Provides a lightweight container for the FAIR-compliant representation of research data with metadata, workflow descriptions (CWL) and schema mappings to make the data cross-domain re-usable (e.g. mapping the SpatioTemporal Asset Catalogues (STAC) format to the broader concepts in Bioschemas).
- FAIR Signposting: Add **machine-interpretable links to human-readable digital objects** using link relation types (RFC8288) such as `item`, `cite-as`, `describedBy` to present the web topology of a resource



Implementation Concept for DEDL integration (Daniel Bauer)

- Build prototype service with lightweight frontend for workflow deployment in DEDL
  - Backend: Leveraging on CNRI's Cordra middleware for managing digital objects at scale.
  - Frontend: Support FAIR Signposting plus interoperable workflow provenance (Khan et al. 2019)



agroclim workflow demo

https://bit.ly/agroclimmov

Many Thanks!

agroclim
https://217.71.193.143

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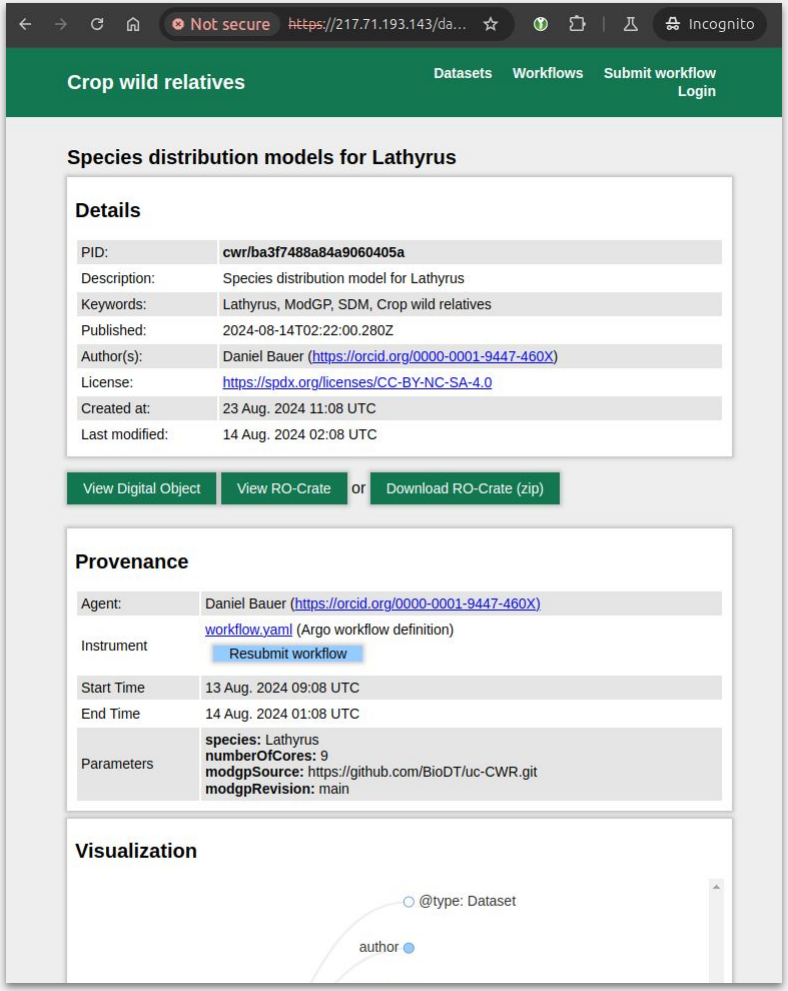
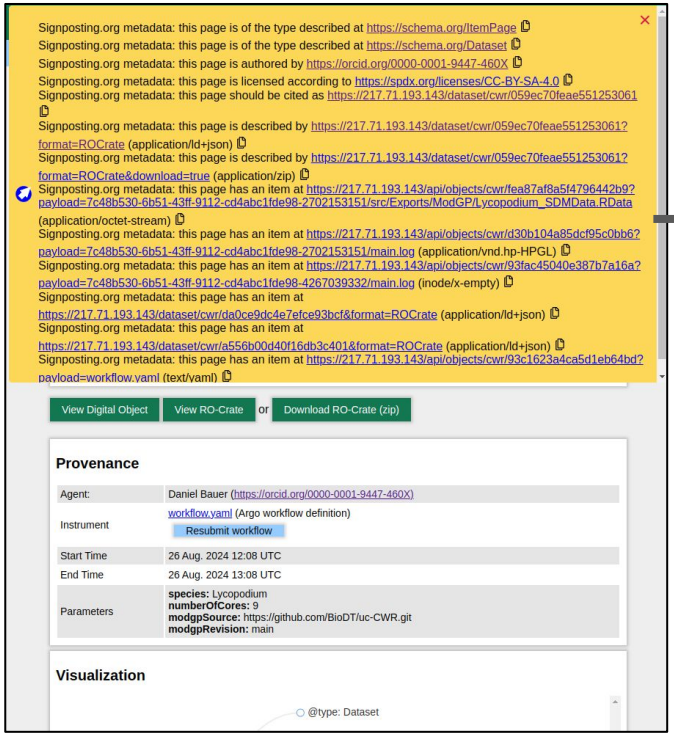
Backup

Achievements

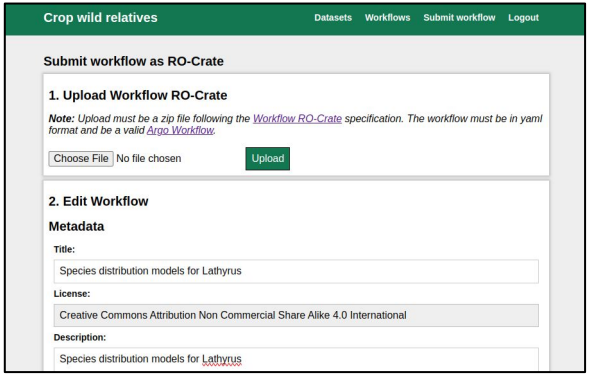
A workflow platform for crop wild relatives



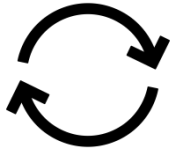
Machine-Actionability through RO-Crates and FAIR Signposting

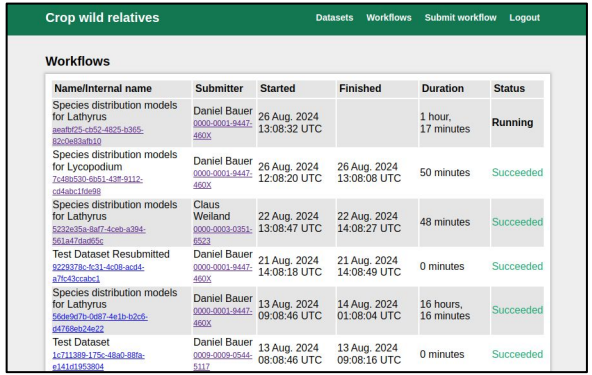


https://www.researchobject.org/ community
WRROC: https://doi.org/10.48550/arXiv.2312.07852

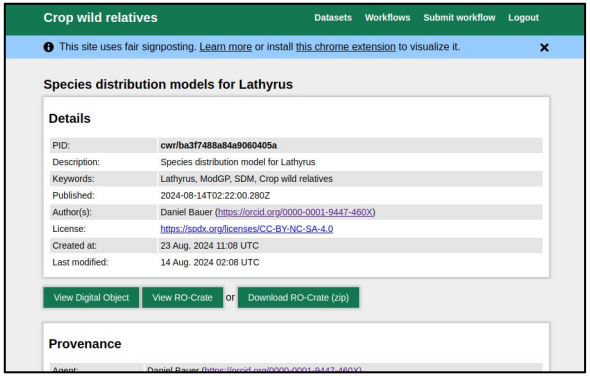


Submit workflows

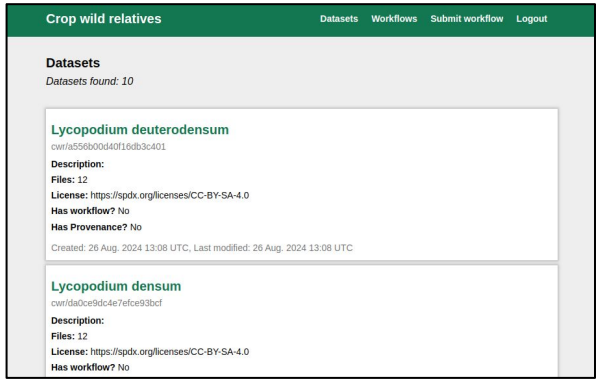




Monitor progress



Reuse workflows



View results