Destination Earth needs Data Spaces

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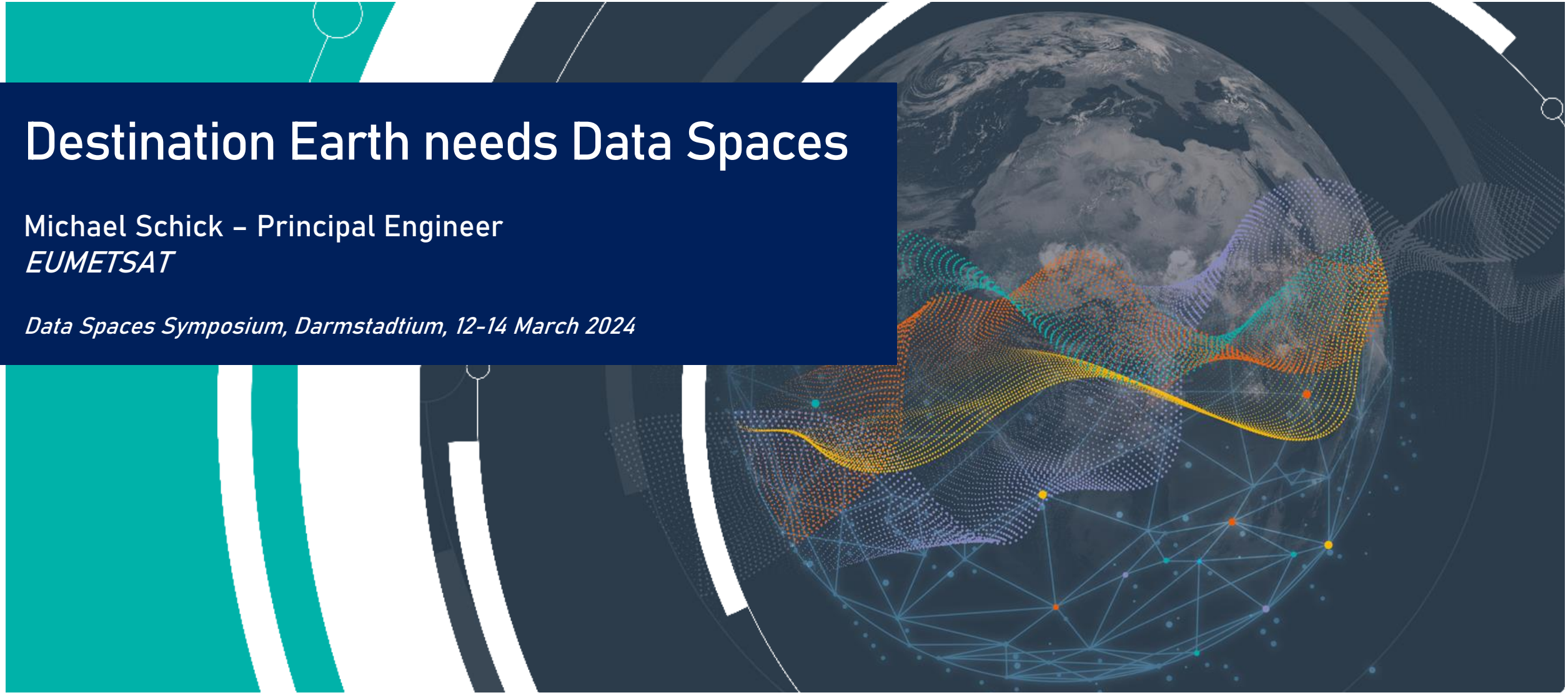
EUMETSAT

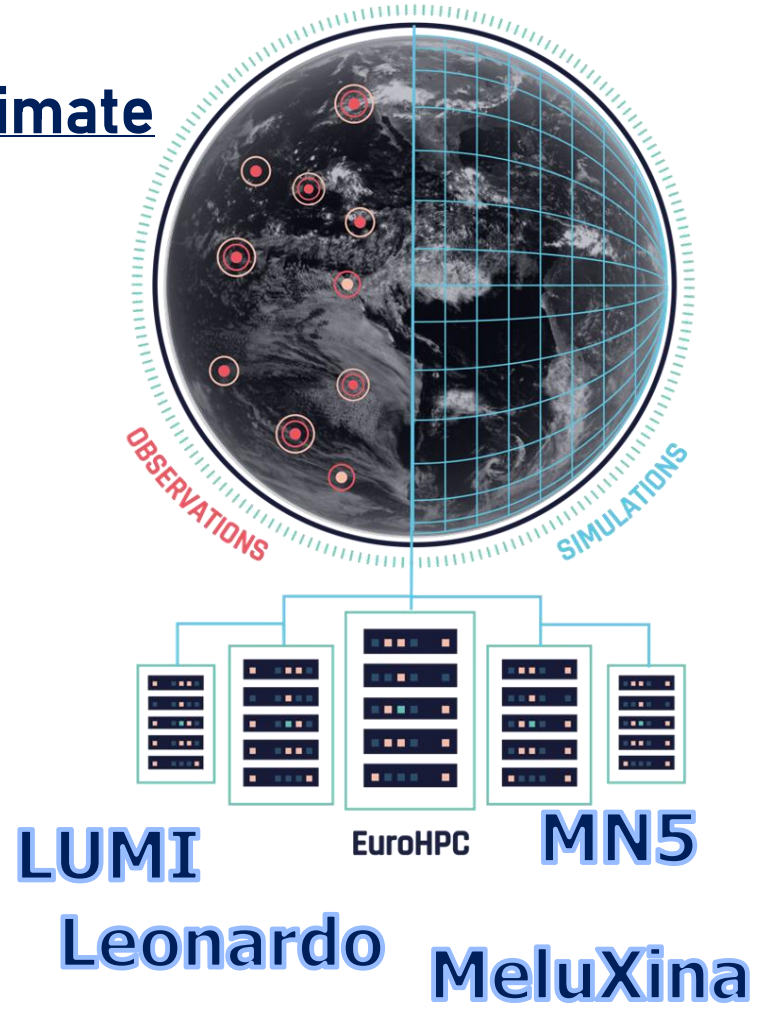
Data Spaces Symposium, Darmstadtium, 12-14 March 2024



Destination Earth

Flagship initiative of the European Commission to develop

a digital replica of our planet to respond and adapt to climate change and extreme events



DestinE is a joint undertaking in strategic partnership with **EuroHPC**

- Establishes bespoke cutting-edge simulation capabilities
- Provides Earth-system information at scales where the impacts of **extreme** events and **climate change** are felt
- Fosters an innovative and thriving AI-enabled digital ecosystem
- DestinE Data Space is part of European Green Deal Data Spaces

GREAT
Green Deal Data Space

Destination Earth: Roadmap

- CAs for Phase II signed by the 3 implementing entities
- 2nd Destination Earth User Exchange
- Round of reach-out activities to potential DestinE users

End 2023

- Finalising the delivery of Phase I
- Preparation for transition to Phase II
- Launch event

Q1/Q2 2024

End of Phase I

Beginning of Phase II

- Phase II activities
- Structure user engagement and feedback
- AI developments
- Calibration of infrastructure, provided services and tools

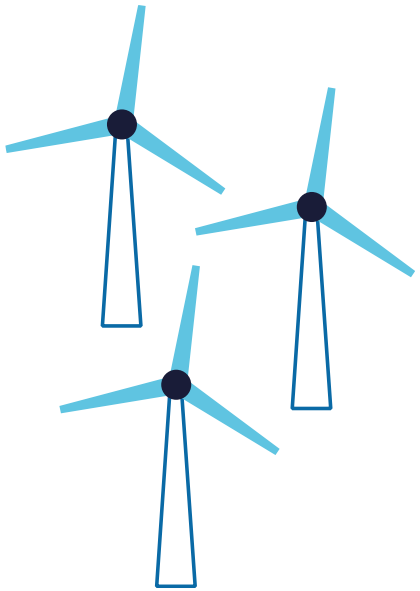
Q3-Q4 2024

What-If Scenarios

Simulate scenarios and tailor INFORMATION

To optimise the use of renewable energies

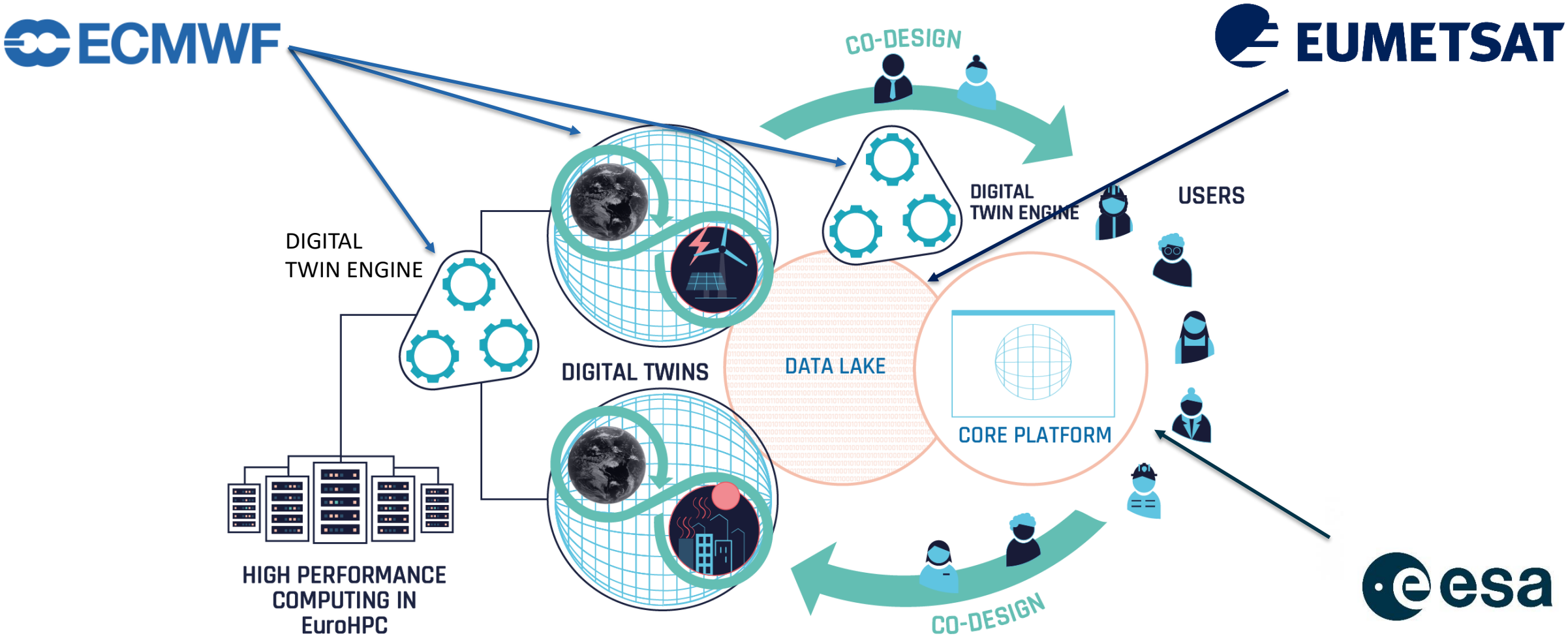
How will an approaching storm affect the renewable energy production in my wind park, and how does it effect others ?



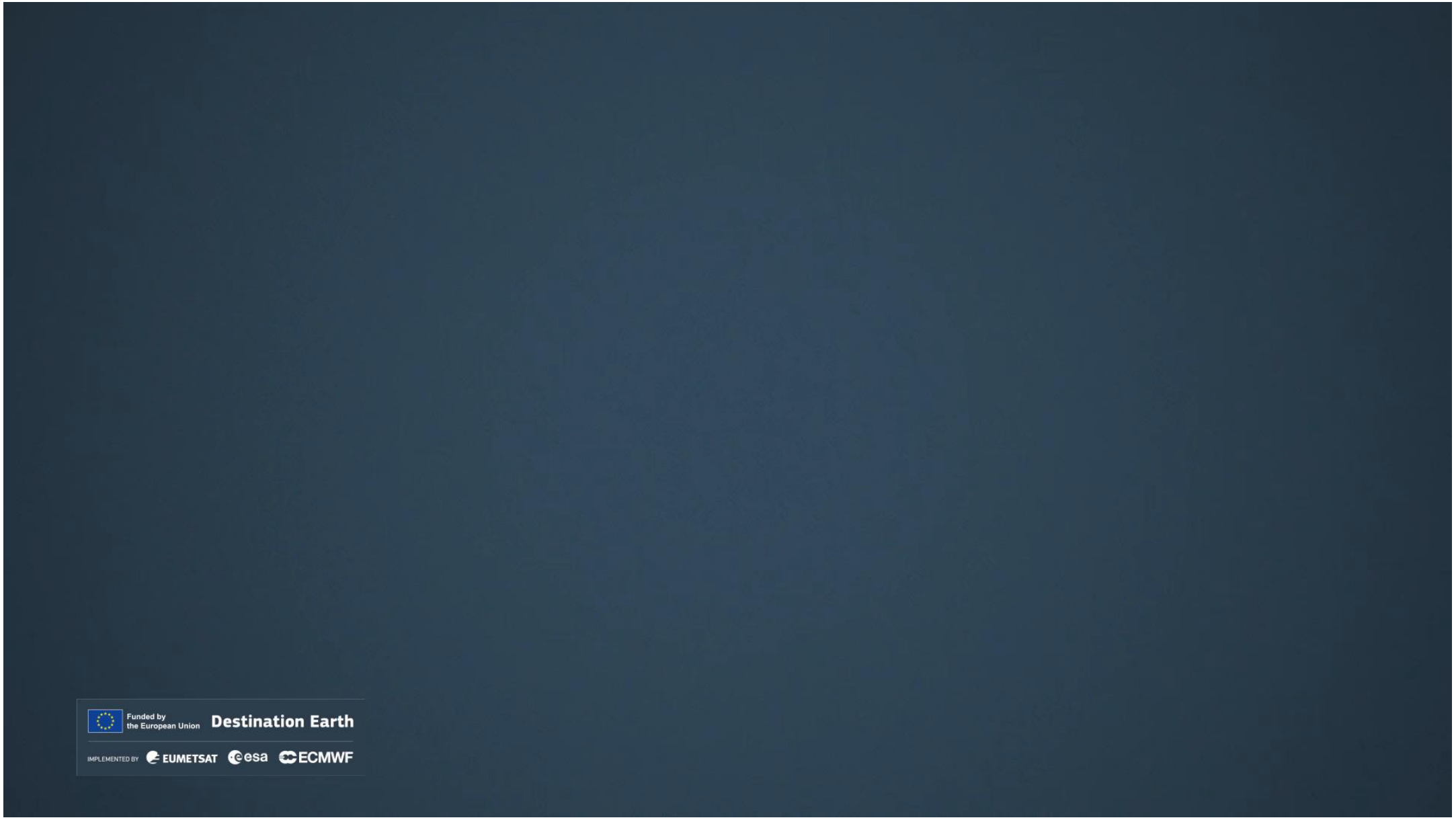
To explore possible future scenarios

How do heatwaves look like in a +2° or +3° warmer world and how should I adapt my city?

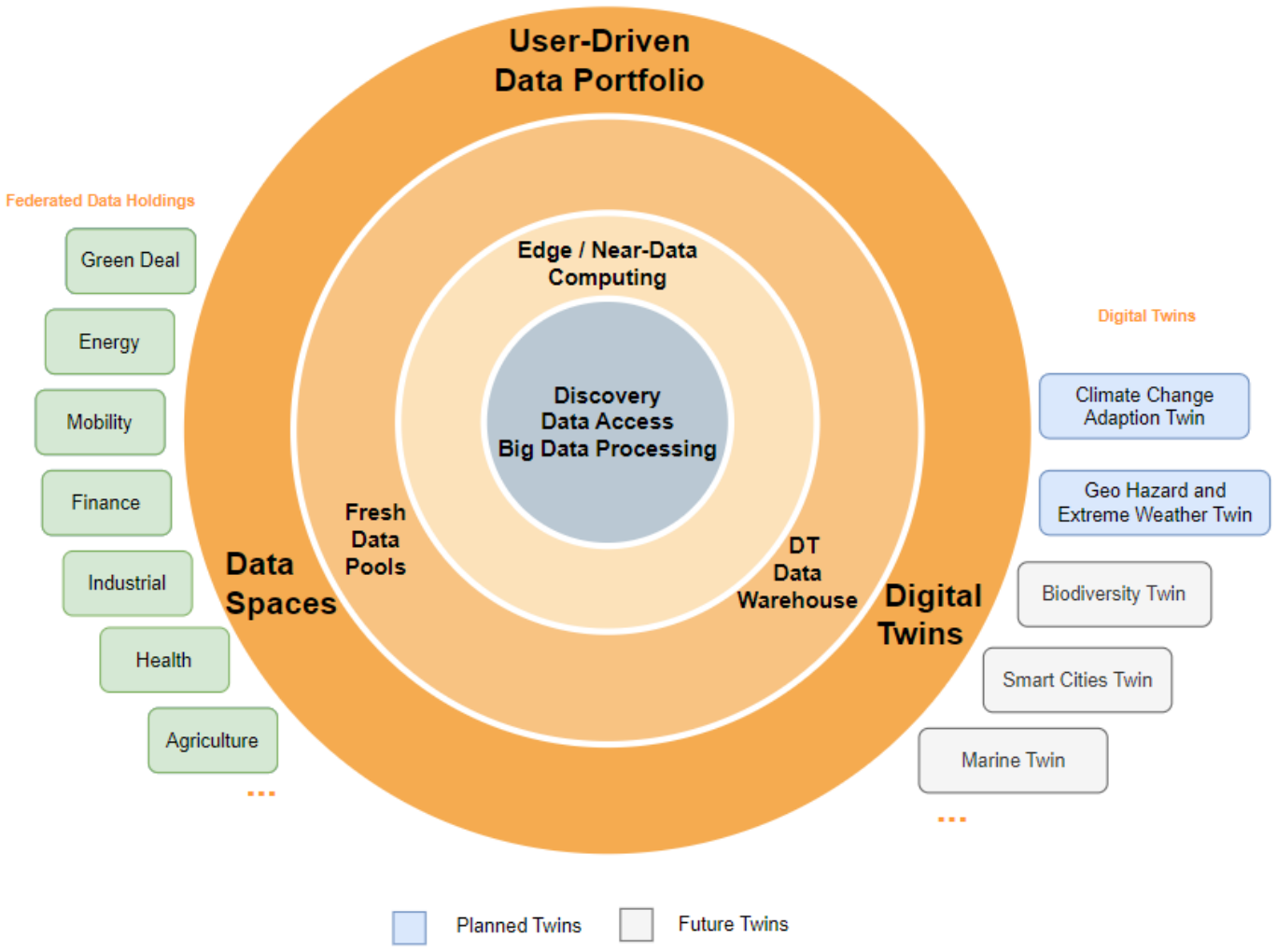
A novel information system – implemented by the 3EEs



A possible Journey with focus on the Data Lake



DestinE Data Lake – connecting to Data Spaces



Self-standing component

- Built from geographically distributed physical elements (central & edges)
- Distributed services – seamless access
- **Implemented via European Industry**

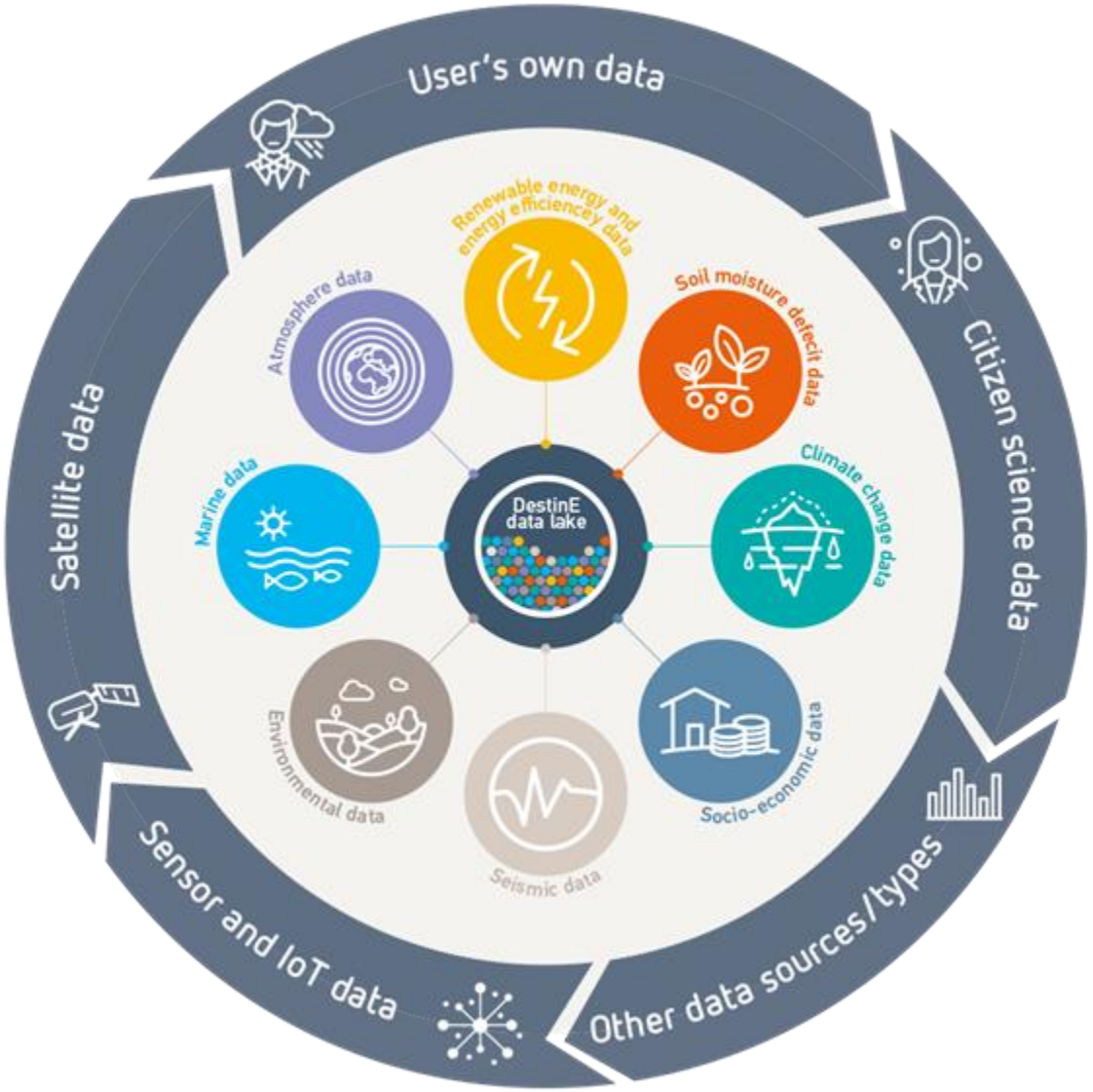
Discovery & Data Access

- Harmonisation of data access (HDA) to simplify data discovery & access
- External federated data spaces
- Digital Twin data (ECMWF):
  - Extreme Weather and Climate Change Adaptation
- DestinE User generated data

Big Data Processing

- Processing near data including distributed computing & workflows
- **Supports & enables AI/ML applications**

DestinE Data Portfolio

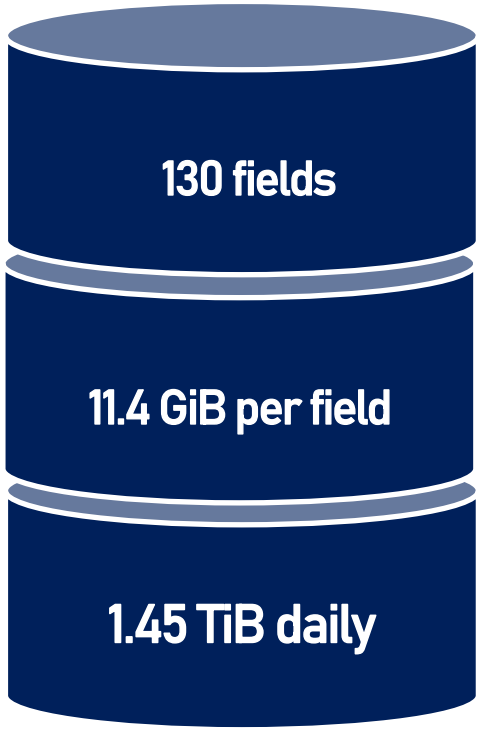


- **Evolving Data Portfolio**
  - User **influenced and agreed with EC**
  - Managed and Controlled by a DestinE Joint Board
- Digital Twins Data
  - Climate Change Adaptation
  - Extreme Weather and Geo hazards
- Federated datasets
  - Contributing missions (EUMETSAT, ESA, ECMWF)
  - Copernicus Satellites & Services data
  - Eurostat
  - ISIMIP
  - IAGOS
- Harmonized APIs: some STAC compliant

DestinE Data Portfolio

DT on Weather-induced Extremes

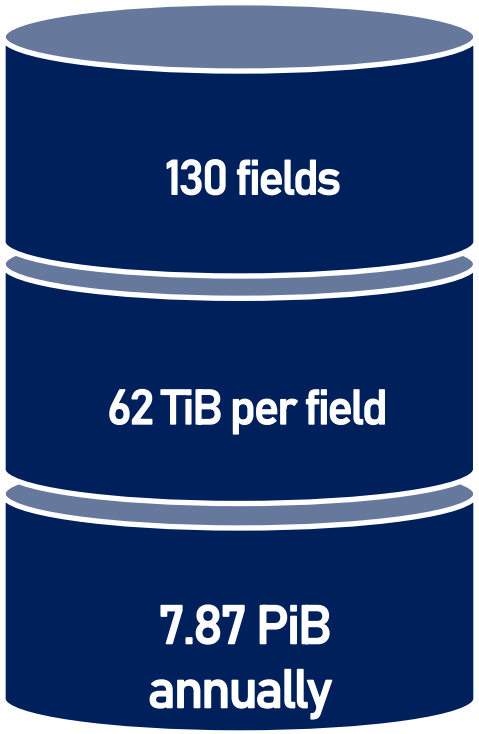
Temporal resolution: 15 minutes to 1 hour
Time horizon: 4-7 days forecast
Horizontal resolution: 4.4/2.8/1.4 km
Number of instances: 1



- capabilities and services for the assessment and prediction of **environmental extremes**

DT on Climate Adaptation

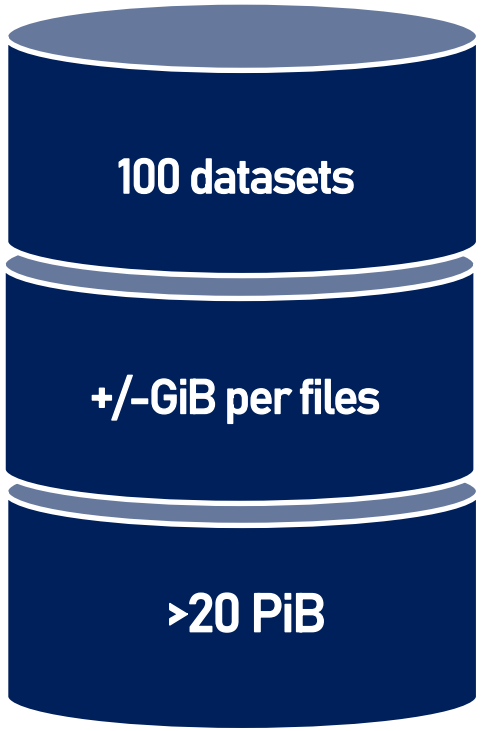
Temporal resolution: 1 hour to monthly
Time horizon: Multi-decadal
Horizontal resolution: 9/4.4/2.8 km
Number of instances: 2-3 models x 70 years (control, historical, future years)



- capabilities and services in support of climate change **adaptation policies and mitigation scenario** testing

Fresh Data Pool

Earth Observation Data
Directly accessible



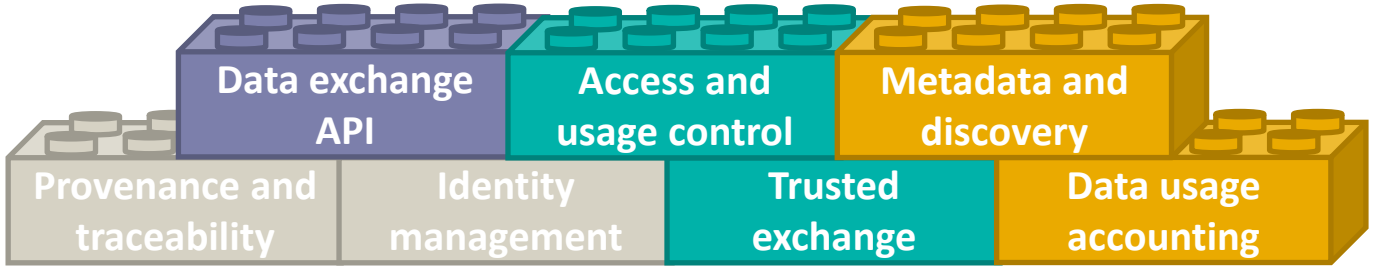
Federated Data

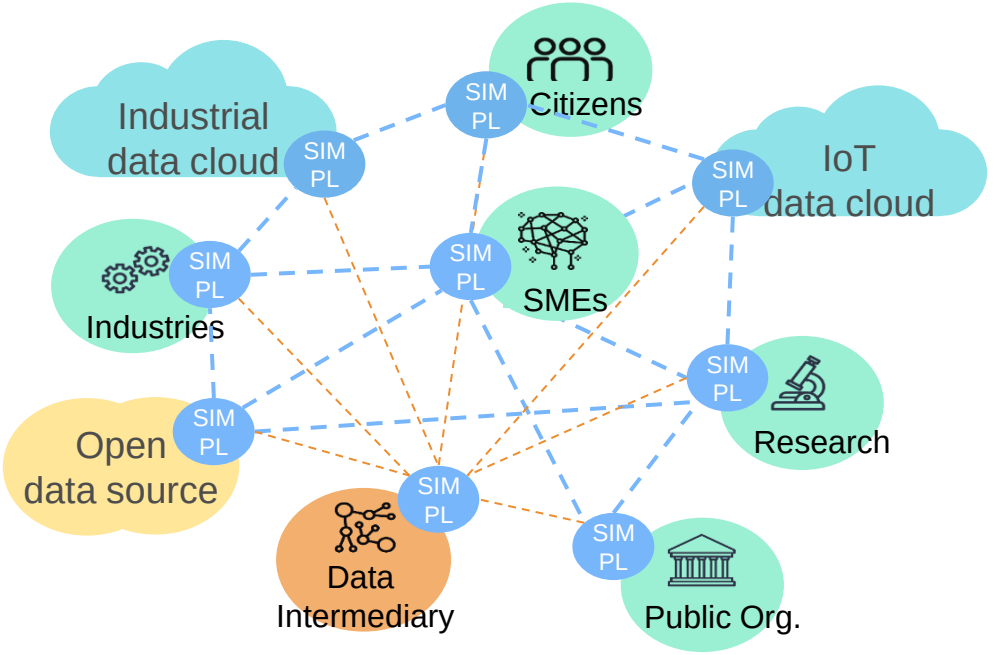
Loosely coupled Data Spaces

DestinE + common European DS + SIMPL

SIMPL is the smart middleware that will enable cloud-to-edge federations and **support all major data initiatives** funded by the European Commission, such as the **common European data spaces and DestinE**.

- Providing an open-source framework that makes it easier and more efficient to build, customize, and deploy data spaces
- Covering a broad range of cases **from sectoral data spaces** (e.g. Agriculture, Genomics, Energy, Mobility) to **Destination Earth**, and from **AI-on-demand** to the **European Open Science Cloud (EOSC)**.
- **SIMPL** will ensure that data sources and their infrastructures can be seamlessly interconnected and made interoperable.





More info and preparatory work available at: Simpl: cloud-to-edge federations and data spaces made simple

Data Spaces Considerations

Several initiatives on connecting Data Spaces

- DestinE, EOSC, CDSE, WEkEO, EOSC…..
- GREAT => Green Deal Data Spaces
- SIMPL => Smart Middleware Platform

from “FAIR/O”

- Finable, Accessible, Interoperable, and Reusable /open license

towards “FIRST”

- Findable, Interoperable, Reusable, **Streamable**, **Transformable**

Loosely coupled Data Spaces (federated vs monolithic)

Process near data and Transform & Stream
only what is needed !

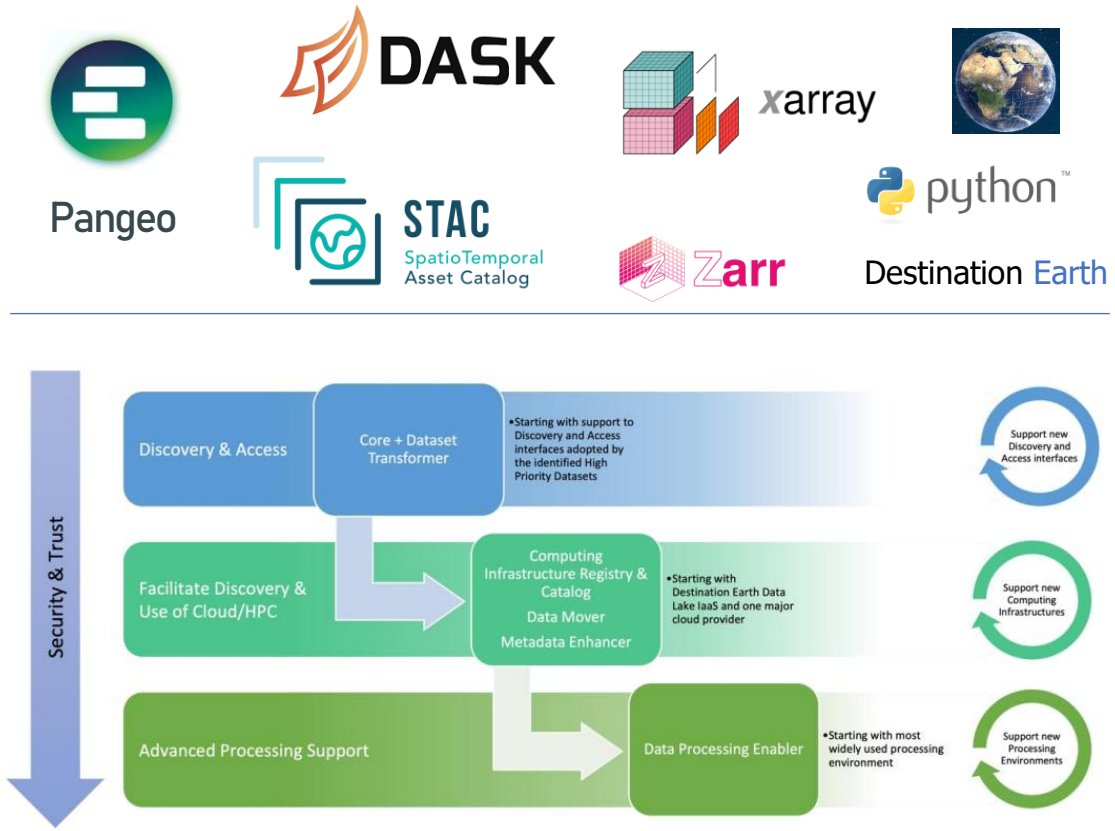


Figure 15 - Possible Development Roadmap of the GDDS DE

SIMPL - Smart Middleware Platform

- Simpl-Open – middleware itself
- Simpl-Labs – Infrastructure & test beds
- Simpl-Live – Deployments of Simpl-Open

AI Act + AI factories and Data Spaces

- EU Commission proposes AI factories (EU AI Act – 12/2023)
  - Simplified access to AI supercomputers (HPCs)
  - Large-scale Model training hand in hand with supercomputers
  - GPUs need to be fed efficiently with AI ready data to optimize usage
  - Efficient access to Data Spaces required !!

- **AI ready data:** facilitate preparation of data to be usable for AI (fuse, tailor & harmonise)
  - Geo-referencing and sub-setting, Resampling, Rearranging and reshaping, Normalisation, Dimensionality reduction, Data labelling

EuroHPC Joint Undertaking

Thank you!

www.destination-earth.com