

Deliverables for DTs

Yousuke Ikehata, JAXA
Agenda Item 7.5
WGISS-61
16-20 March, 2026
Dehradun, India

- WGISS-55

- Professional Open-Source Framework for Earth System Digital Twins and Applications/ Thomas Huang (JPL for NASA)

- WGISS-56

- Integrated Digital Earth Analysis System (IDEAS) – an Open-Source Framework for Earth System Digital Twins/Thomas Huang (JPL/NASA)*

- WGISS-57

- CropSmart: An EO-based digital twin for making wiser cropping decisions/Liping Di(GMU)



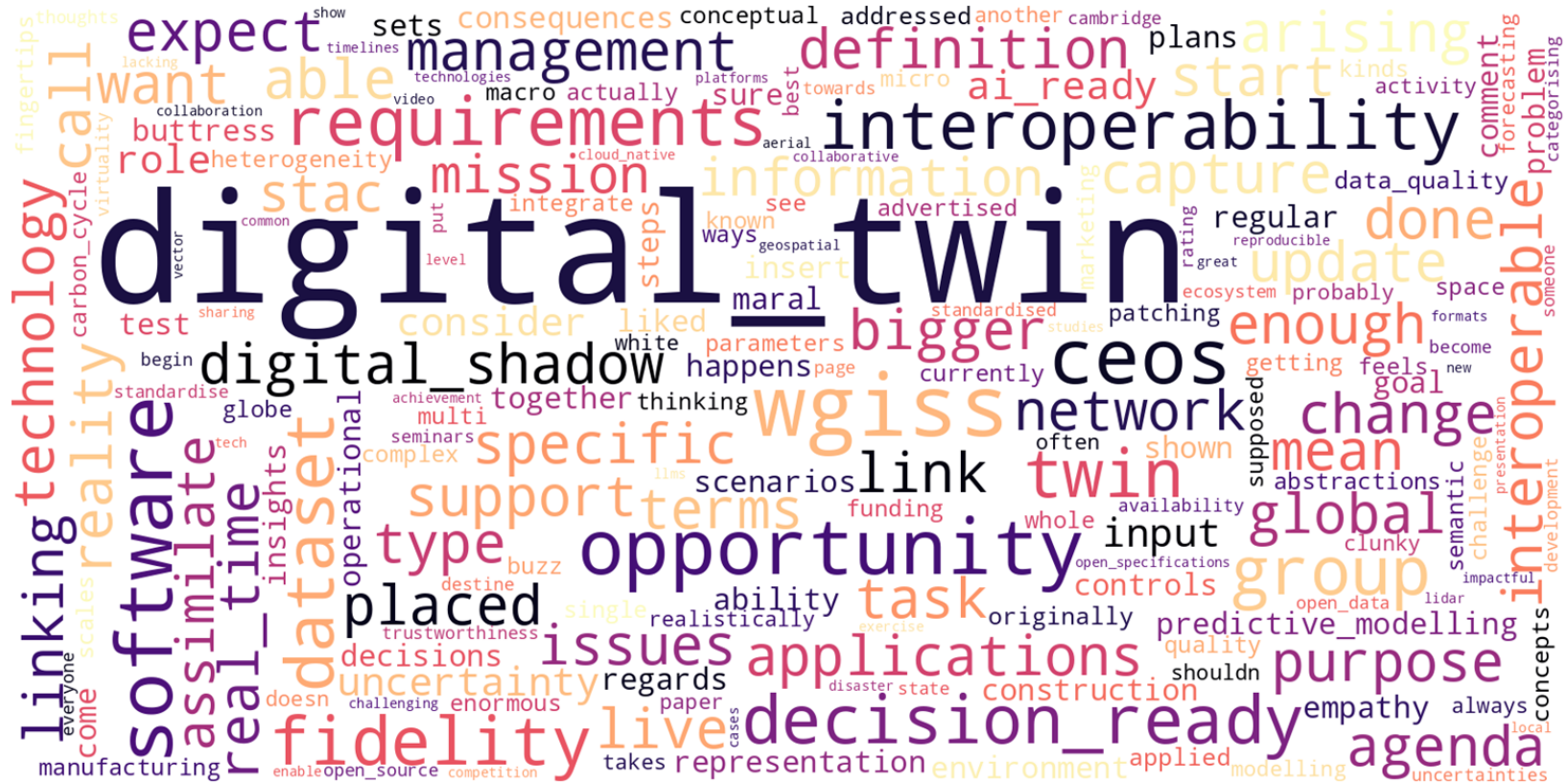
- WGISS-59

- Digital Twins White Paper/Yousuke Ikehata(JAXA)

- WGISS-60

- Harmonization of Mutli-Resolution Geospatial Data in GeoSpatial Digital Twin Framework/J. Narendran(ISRO)
 - Irish National Framework for Digital Twins/Alastair McKinstry(ICHEC)
 - Interactive Session on EO for Digital Twins/Maral Bayaraa(UKSA)

The logo for the Committee on Earth Observing Satellites (CEOS). It features the letters 'CEOS' in a bold, blue, sans-serif font. The letter 'O' is replaced by a realistic image of the Earth, showing continents and clouds. A yellow satellite orbit with a small satellite icon is depicted around the Earth.



- ❖ WGISS should focus on standards, interoperability, decision-ready data, technology evaluation, and community collaboration to make EO a trusted and integral part of Digital Twin ecosystems.

1. Define Purpose and Scope

- (1) Clarify what DTs are. Need common definitions.
- (2) What is the key value of DTs relative to other models? What do users expect from it?
- (3) Role of Earth Observation (EO) for DTs. Emphasise use-case-driven DTs (e.g., methane emission monitoring, disaster response, carbon cycle monitoring).

2. Interoperability and Standards

- (1) Lead efforts to standardise data formats, APIs and software ecosystem for DTs: Promote STAC for discoverability, develop an Interoperability Matrix for EO datasets and DT tools.
- (2) Ensure open specifications and cloud-native geospatial technologies are adopted for reproducibility.

3. Decision-Ready and AI-Ready Data

- (1) Establish guidelines for decision-ready EO data: quality controls, uncertainty quantification, and metadata standards.
- (2) Support AI-ready data pipelines for DTs to enable predictive modeling and simulation.

4. Technology Evaluation and Ecosystem Mapping

- (1) Rate currently available DT software/tools for performance, interoperability and usability.
- (2) Maintain a catalog of open-source DT tools and frameworks for EO integration.
- (3) 'Common practice' document

5. Requirements Gathering for Future Missions

- (1) Collect DT-related requirements from academia, industry, and agencies:
- (2) How uncertainty, fidelity, and real-time updates should be handled.
- (3) Feed these into future EO mission planning.

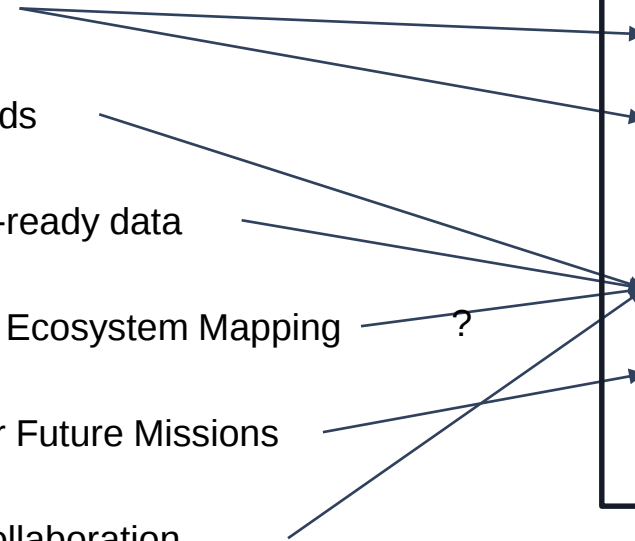
6. Promote Open Data and Collaboration

- (1) Advocate for open data policies and interoperable platforms to prevent siloed DT development.
- (2) Encourage collaborative networks rather than competitive approaches for emerging tech like DTs and LLMs.

Activity scope

1. Define purpose and scope
2. Interoperability and standards
3. Decision ready data and AI-ready data
4. Technology Evaluation and Ecosystem Mapping
5. Requirements Gathering for Future Missions
6. Promote Open Data and Collaboration

Activity output



Background

General Digital Twins

Digital Twins for EO

Roles of DTs

What's is needed

Future missions

- ❖ TEIG commits that it will develop a document about Digital Twins.

Number	Title	Completion Date	Description	Responsible User(s) - including email address	Responsible CEOS Entity(ies)	Contributing Agency(ies)
DATA-26-05	Summaries of Digital Twins	2026 Q4	This document figure out the difference between "general Digital Twins" and "Digital Twins in EO". Through the discussion and survey, use cases and roles of DTs will be collected and we will categorize and list them in this document.	ikehata.yousuke@jaxa.jp	WGISS	JAXA, UKSA, GISTDA, CSIRO, ICHEC, ISRO

- ❖ I don't know if it will be a white paper or not.
- ❖ But I think that we should summarize some document as our discussions.

Team members



- ❖ JAXA/ Yousuke Ikehata
- ❖ UNEP/ Maral Bayaraa
- ❖ GISTDA/
- ❖ CSIRO/ Matt Paget
- ❖ ICHEC/ Alastair McKinstry
- ❖ ISRO/ Sai Kalpana, Jai Singla, Narendran
- ❖ ESA / Claudia Vitolo
- ❖ Eumetsat /
- ❖ NASA / David Borges, others
- ❖ UKSA / Rob Fletcher,

❖ Background

- Purpose of document

❖ PoC&Contributor

- Writer: Yousuke Ikehata
- Editor: Jai Singla/ISRO

❖ General Digital Twins

- History
- Features
- Definition by “industry 5.0”

❖ PoC&Contributor

- Writer: Yousuke Ikehata
- Editor: Jai Singla/ISRO

❖ Digital Twins for EO

- History:
 - Simulation/assimilation
- Clarify DTs
- Variation
 - Scales
 - Users

❖ PoC&Contributor

- Writer: Ikehata Yousuke
- Editor: Jai Singla/ISRO

❖ Roles of DTs

- Show cases
 - NASA
 - GISTDA
 - ICHEC
 - ISRO
 - ESA

❖ PoC&Contributor

- Writer:
- Editor:

We need more information and discussion for this section!

❖ What is needed

- Interoperability
- Standards
- Data
- Architecture

❖ PoC&Contributor

- Writer:
- Editor:

❖ Future missions

- Pipelines for DTs

❖ PoC&Contributor

- Writer:
- Editor: