

interTwin

EOSC and Digital Twins

EOSC Symposium

Tuesday 22.10. 17:00-18:00



Funded by the
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Introduction. Opening of the session

“Setting the scene on what Digital Twins are, and what is happening in the EOSC sphere”

- Digital Twins have proven their potential to revolutionise approaches to challenging tasks in the industrial sector. They are increasingly being leveraged as a research method bringing similar innovative approaches to the way science is performed.
- This session aims to bring relevant Digital Twins initiatives in Europe (DestinE, BioDT, DT-GEO, interTwin and ILIAD/aquaInfra) highlighting new dimensions of interoperability at data and service levels.
- A unique opportunity for the EOSC Community to discover the wide range of possibilities that Digital Twins can offer, in all research domains, and the role Digital Twin Platforms can play in future EOSC Nodes.

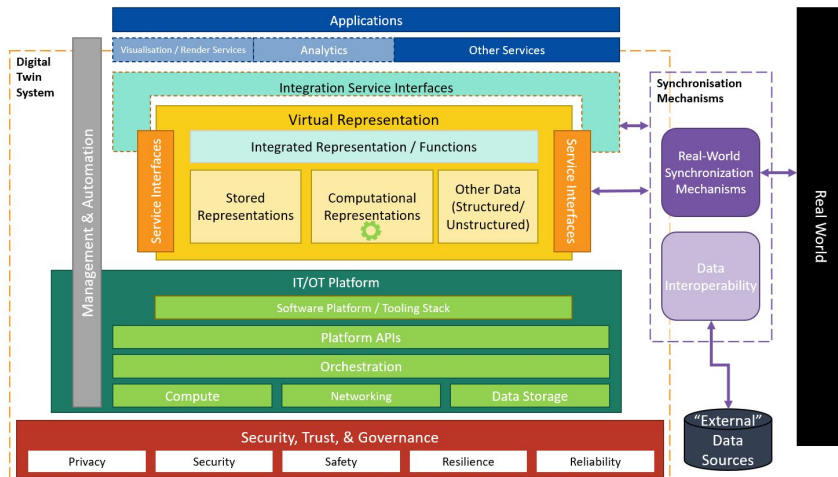


Introduction. Digital Twins definition(s)

A **Digital Twin (DT)** is a **virtual** representation of a **physical object, process, or system**. It is created and sustained with information derived from one or many sources of data such as sensors or models considering historical as well as real-time data.

<https://www.digitaltwinconsortium.org/glossary/glossary>

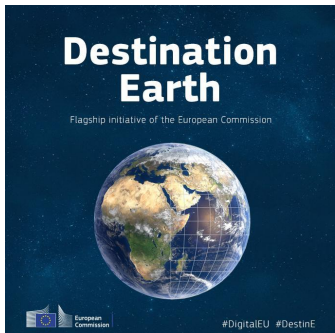
<https://www.deltares.nl/en/expertise/projects/digital-twins>



Type	Industry	Cities & (air)ports	Environment
Goal	Life cycle management	“Smart” cities & (air)ports	Decision support, risk management & dissemination
Interventions	Adaptive design	Spatial planning and policymaking	System operation (e.g. sluices & locks) & policymaking
Cost reduction	R&D, construction & maintenance costs	Design, construction & maintenance costs	Disaster risk reduction, climate adaptation & biodiversity protection
System representation	Single object with many components	Many objects	Many systems
Timespan	Seconds - 5 years	Days - 10 years	Days or decades



Scientific DT Initiatives in Europe



interTwin



Standardization as a Critical Activity for Digital Twins of the Earth

Sigmund Kluckner - sigmund@kluckner.eu - Digital Innovation for Sustainability

Why Standards in Digital Twins of the Earth?

Standards can support effective development, integration and utilization of Earth's Digital Twins.

Standards for Earth's Digital Twins can enable Digital Twin actors to collaborate more effectively, reduce redundancy and minimize integration cost. As such, they play an important role in enhancing the ability of Digital Twins of the Earth (DTEs) for wider range of users, resulting in more informed decision making.

Using and developing standards in DTEs can bring a variety of benefits, for example:

- Interoperability
- Seamless connectors
- Common, exchangeable data formats
- Model adaptability to new (HPQ) technologies
- Transparency
- Reproducibility
- Harmonization (e.g. between teams developing DTEs)
- Increased scalability (more variables, higher resolutions, etc.)

Standards used by all actors in the DTE chain, from development to operation to users, to create an ecosystem with higher consistency, accuracy, reliability and trust from stakeholders.

Potential Areas for DTE Standards

Key areas identified include: Quality Assurance, Assessment and Impact; Feedback Loops; Data RU/OUT Interoperability; Earth Subsystem-related; Engineering Processes; Modelling Conventions; Legal; Ethics; Visualization and UX&M; Architecture; Interoperability; and others.

Activities in Digital Twins of the Earth Standardization at IEEE

Recommended Practice for the Development of Digital Twins of the Earth (P3091), hosted by IEEE Oceanic Engineering Society Standards Committee

The purpose of this recommended practice is to aid in the creation of a digital twin and covers the development processes for Digital Twins of the Earth (DTEs) and their subsystems.

Good engineering practices are needed to support the development of interoperable digital twins - both on a technological level, but also to facilitate an exchange between the project and engineers themselves, by fostering common vocabulary and understanding of basic DT components.

The project aims to establish consensus alignment on such development practices that help guide and validate the various layers of interoperability, including architectures, syntactics, schematics, semantics, and legal interoperability concerns. It is convening a multi-party group of (digital) engineers to propose engineering solutions that can set twins plug to one another, and as such have a life beyond a single project.

The working group draws from a wide variety of contributors from organizations, companies and research projects worldwide.

'Digital Twin of the Earth - Tools and Resources for Interoperable Development and Operations' - IEEE SA Industry Connections Group

Allowing a low-barrier entry to standards, this group convenes regularly to discuss possible future activities. The group aims to understand the landscape of DTE activities worldwide, also within other standards organizations. The group is currently working on developing a white paper on IEEE standardization efforts and gaps.

The efforts on Standards for Digital Twins of the Earth are contributed by many actors, projects and organizations in the field.

The mentioned working groups originate from conversations and projects, most notably:

- EU projects: Iliad (Digital Twins of the Ocean), InterTwin, DT-GEO
- I4M (implemented by NOC)
- NASA/OSTM/AST (Standards for Interoperable Digital Twins' workshop)
- DITTO: Digital Twin of the Ocean (DITTO summit satellite event on Standards and Best Practices for Digital Twins)

Logos for Destination Earth, Iliad, interTwin, DT-GEO, and other partners are shown at the bottom.



BioDT, DT-GEO and interTwin (the 'Cross-DT Working Group') address important societal challenges, such as climate change, through piloting the use of digital twin technologies, developing and delivering novel data and services to research communities, policy makers and industry.

Standardization Efforts - IEEE WG on DTE with DT Iliad, interTwin and DT-GEO

- Introduction & Opening of the session (Xavier Salazar, EGI, interTwin)
“Setting the scene on what Digital Twins are, and what is happening in the EOSC sphere”
 - Project Presentations
 - interTwin (Xavier Salazar, EGI)
 - BioDT (Gabriela Zuquim, CSC)
 - DT-GEO (Ignacio Blanquer, UPV)
 - ILIAD / aqualnra / DTO-Bioflow / EDITO-infra (Arne Berre, SINTEF Digital)
 - DestinE [video] (Thomas Geenen, ECMWF)
- Panel Discussion
“Group discussion with representatives of DestinE, interTwin, BioDT, DT-GEO and DT of the Ocean (ILIAD / aqualnra / DTO-Bioflow / EDITO-infra)”
 - Arne Berre, SINTEF Digital
 - Ignacio Blanquer, UPV
 - Gabriela Zuquim, CSC