

interTwin: An interdisciplinary Digital Twin Engine for science

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interTwin co-designs and implements the prototype of an interdisciplinary Digital Twin Engine (DTE), an open source platform that provides generic and tailored software components for modelling and simulation to integrate application-specific Digital Twins (DTs). Its specifications and implementation are based on a co-designed conceptual model - the DTE blueprint architecture - guided by the principles of open standards and interoperability. The ambition is to develop a common approach to the implementation of DTs that is applicable across the whole spectrum of scientific disciplines and beyond to facilitate developments and collaboration.

Co-design involves DT use cases for High energy physics, Radio astronomy, Astroparticle physics, Climate research, and

Environmental monitoring, whose complex requirements are expected to significantly advance the state of the art of modelling and simulation using heterogeneous distributed digital infrastructures, advanced workflow composition, real-time data management and processing, quality and uncertainty tracing of models, data fusion and analytics. As a result, a consolidation of software technologies supporting research will emerge.

The validation of the technology with multiple infrastructure facilities, will boost the accessibility of users to technological capacity and the support of AI uptake in research. interTwin builds on the capacities of experts from pan-European research infrastructures and the long tail of science, an open source community of technology providers that will deliver TRL 6/7 capabilities to implement the interdisciplinary DTE, experts of the European Centre of Excellence in Exascale Computing, and infrastructure providers from the EGI Federation, PRACE and EuroHPC supporting data and compute intensive science. interTwin key exploitable results will be continually co-developed and aligned with the contribution of external initiatives such as Destination Earth, EOSC, EuroGEO and EU data spaces.

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