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interTwin Digital Twin Engine: Enabling Federated Scientific Workflows

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The interTwin project, funded by Horizon Europe, is building an open-source Digital Twin Engine (DTE) to support interdisciplinary scientific Digital Twins (DTs) across domains such as High Energy Physics, Astrophysics, Climate Science, and Environmental Monitoring. The platform is co-designed by infrastructure providers, technology experts, and domain scientists to streamline the creation and deployment of complex DT workflows.

The DTE enables the execution of containerized workflows on heterogeneous computing backends (HPC, HTC, Cloud) through InterLink, a component that abstracts Kubernetes pod execution to remote resources using an extended Virtual Kubelet architecture. Complementing this, the interTwin Data Lake provides a federated data layer that enables efficient data access and management across multiple storage sites, supporting FAIR-aligned data practices to facilitate interoperability and reuse. It is built on technologies like Rucio, FTS and integrates identity and authorization via EGI Check-in.

To support site integration and user collaboration, the project introduces Teapot, a multi-tenant WebDAV interface developed within interTwin. Teapot enables storage sites without native WebDAV support to add WebDAV access seamlessly while preserving file ownership, making it fully compatible with HPC storage systems. This approach allows sites to securely expose storage to diverse user communities. Teapot also integrates with ALISE, which lets users link local accounts with multiple external identities, facilitating seamless access across federated environments.

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