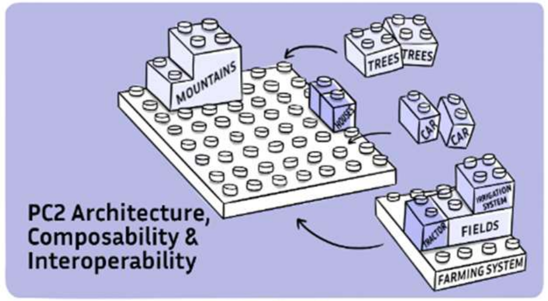

EDT

Projet Ciblé 2 - DT Compose

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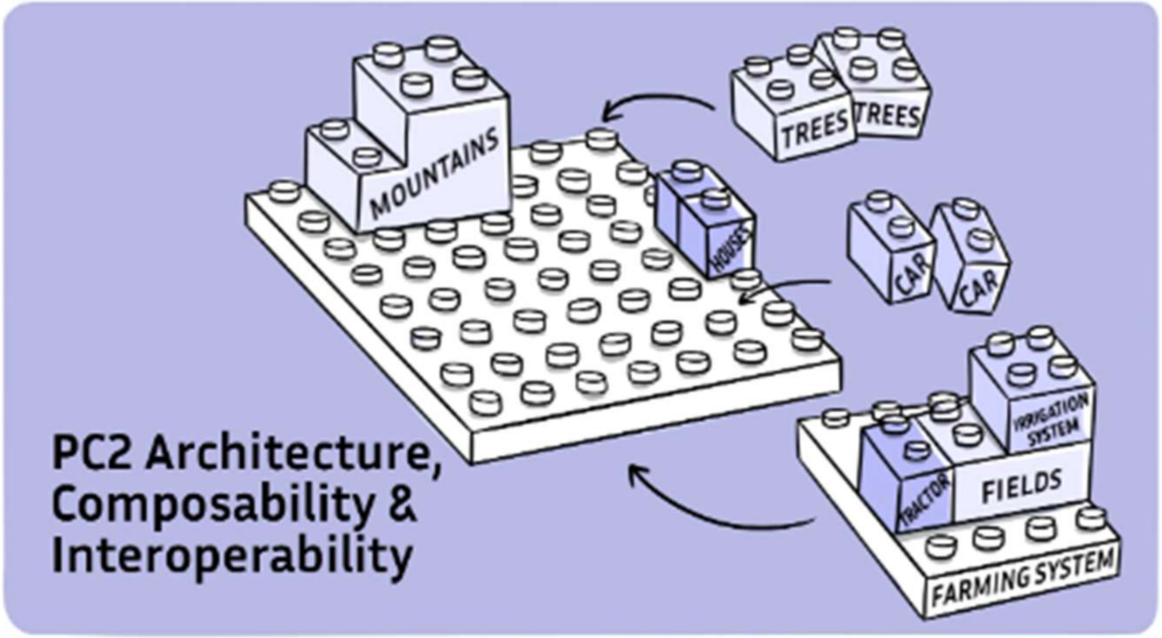
Context

- State of the Art : DTs are most often monolithic entities
  - crafted in an ad hoc fashion with respect to a given Physical Twin (PT)
- To allow an industrial scaling of this technology, we must make it possible to build DTs from modular parts, and make them modular
  - in the same way that Eiffel changed civil engineering in the late 19th century with the modular construction of the Eiffel Tower
- Composition at:
  - Design time
  - Deployment time
  - Ad hoc: federation, Web of DTs, Systems of Systems…



Main Objectives

- Modularization of DTs to enable flexible composition with Fidelity and Uncertainty management
  - DT-aware components
  - Address challenges related to variability management, trustworthiness, economics, and ethics.
- Composition of DTs at the deployment level to allow orchestration
  - Interoperability of several DTs to form federations/Webs of DTs/SoS
  - Knowledge Graph, Ontology and Semantic Web technologies
- Composition of the services offered by DTs both for introspection & intersession:
  - data and knowledge acquisition and aggregation
  - scalable machine learning (eg Neuromorphic networks with dynamic evolution)
  - dynamic adaption

DT Compose : 3 workpackages

WP 2.1 : DT Reference Architecture with management of Variability, Fidelity and Uncertainty within a unified meta-data theory.	Architecture with management of Variability, Fidelity and Uncertainty.
WP 2.2 : DT Modularisation and Composability.	Build DTs and their associated services from pre-existing parts or reversed engineering, both at design time and deployment time.
WP 2.3 : DT Semantic Interoperability.	Represent the alignments between ontologies of independently designed DTs. Improve DT's Knowledge Graph Quality. Keep semantic tracks of DT experiments.

DT Compose : 3 workpackages

WP 2.1 : DT Reference Architecture with management of Variability, Fidelity and Uncertainty within a unified meta-data theory.	Lead: DiverSE (Inria), with P4S (IMT), VERIMAG (INP UGA), UPPA
WP 2.2 : DT Modularisation and Composability.	Lead: P4S (IMT), with DiverSE (Inria), VERIMAG (INP UGA), CIAD (U. de Bourgogne).
WP 2.3 : DT Semantic Interoperability.	Lead: Moex (Inria), with Wimmics (Inria), IRIT/SM@RT (Univ. Toulouse Jean Jaures)

Livrables

18	D2.1	Document	SoTa	State of the Art
24	D2.2	Document	Relevant UCs	First propositions elaborated in each of the workpackages and selection of relevant Use Cases
36	D2.3	Software	PoC	Proof of Concept of Federator & Alignator
36	D2.4	Document	Reference Architecture	DT Reference Architecture for composing DTs with respect to Semantic Alignment, Validation, Variability, Fidelity and Uncertainty
42	D2.5	Software	Prototypes	First version of Federator and Alignator
48	D2.6	Software	Demonstrators	First version of the demonstrator of the selected Use Cases integrated in the platform
54	D2.7	Document	Reports	Set of PhD thesis
60	D2.8	Software	Final Demonstrators	Demonstrator based on Federator and Alignator, fully integrated in the platform illustrating the propositions and experimentation realized along the project

DT Compose : 3 WPs – 8 thèses

WP1	Composing DTs with Variability, Fidelity and Uncertainty	Designing digital twins for composing systems of digital twins	Composing and configuring DT to meet user requirements (energy, performance, budget)
WP2	Digital Twin assembly by model federation	Designing an explainable neurosymbolic architecture with an evolving topology for the design of cognitive digital twins	Integration and synchronization of digital twins for co-simulation
WP3	Link Twin - Interconnection of digital twin knowledge	Continuous semantic alignment between digital twin system	