

Abstract

A Design Framework for Aggregation in a System of Digital Twins

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The presented design framework enables systematic, effective decisions when designing a system of digital twins to represent a complex physical system. The design framework is broadly applicable and enables traceability of design choices. The framework's steps comprise the needs and constraints analysis, physical system decomposition, services allocation, performance and quality considerations, implementation considerations, and verification and validation. These steps were moulded into six design patterns, by focussing on key quality attributes. The design framework and design patterns were demonstrated and validated through three case studies: a heliostat field, a water distribution system and a smart city.