

I5: A Model-Based Framework for Architecting System-of-Systems Interoperability, Interconnectivity, Interfacing, Integration, and Interaction

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Abstract. We present I5 _ Interoperability, Interconnectivity, Interfacing, Integration, and Interaction _ a Model-Based Framework for Architecting Systems-of-Systems. Interoperability programs deliver end-to-end cooperation and collaboration capabilities and services among organizations, users, systems, and infrastructures, on top of a set of existing systems. Each system has its own programmatic and technical constraints and issues. System-level stakeholders usually prefer core functionality over integration, and expect the interconnectivity infrastructure to be transparent and simple, regardless of its actual cost, complexity, or criticality. Hence, coordinating and aligning the multiple system and team efforts in order to reach a synergetic effect is a challenge that many integration professionals in the cyber, energy, manufacturing, and traffic domains are familiar with. Traditional system-centered design methods fail to capture interconnectivity and collaboration aspects and issues, and they are of little interest to the individual systems_ stakeholders. The framework we propose is based on Object_Process Methodology, an emerging ISO standard (ISO 19450) for modeling and design of complex, dynamic, and multidisciplinary systems. Our framework facilitates a smooth transition from a set of disparate system-centered views to a consolidated, integrated model, which accounts for integration aspects, interface and payload structure and behavior, interconnectivity processes and services, and eventually emergent interoperability capabilities.