Abstract

Smart Cyber-Physical Systems (SCPS) are distributed, open-ended and architecturally dynamic systems composed of autonomic components interacting with each other in cooperative actions and introducing system-level (emergent) behaviors that would not be possible otherwise. Very often, the components of SCPS vary with respect to purpose, behavior, and available resources.

Such characteristics of SCPS components (especially their heterogeneity combined with cooperativeness) allow for an overall resilience of the system as well as its continuous operation – the key properties the satisfaction of which is expected from any distributed system developed nowadays. Since SCPS is a relatively novel concept, there is no support in terms of design and development tools that would facilitate their engineering process.

This work aims to provide methods that address: development, verification and deployment stages of that process. In particular, the thesis focuses on delivering: (i) appropriate abstractions for SCPS modeling realization; (ii) a runtime environment for their deployment and execution; (iii) a simulation tool allowing for system-level verification. Altogether, they contribute to the DEECo framework, which is built around the DEECo component model.