

# Designing Test Environments for Cyber-Physical Systems

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## Abstract

The transformation of industrial assets into networked entities promises to increase the productivity of manufacturing processes significantly. It is a prerequisite for the close integration of these assets into production environments that increasingly rely on computerized planning, execution, and monitoring systems. The result of combining a (mechanical) asset with extensive computational capabilities and network resource is called a “Cyber-Physical System” (CPS). In production environments, the quality of these systems is under (at least) the same scrutiny as that of physical-only systems. However, the complexity in achieving this quality level is amplified by the fact that additional, software-induced vulnerabilities are introduced. New approaches to the definition of acceptance criteria, testing strategies, and risk management are required. We describe the quality parameters of CPS, which are intended to guide the design of acceptance criteria. We also describe the challenges in testing CPS and outline the design of a test environment using an example of advanced machine tools.

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