A Game-Theoretic Model for Distributed Programming by Contract

Anders Starcke Henriksen     Tom Hvitved     Andrzej Filinski

Department of Computer Science
University of Copenhagen
Universitetsparken 1
DK-2100 Copenhagen, Denmark
{starcke, hvitved, andrzej}@diku.dk

Abstract: We present an extension of the programming-by-contract (PBC) paradigm to a concurrent and distributed environment. Classical PBC is characterized by absolute conformance of code to its specification, assigning blame in case of failures, and a hierarchical, cooperative decomposition model – none of which extend naturally to a distributed environment with multiple administrative peers. We therefore propose a more nuanced contract model based on quantifiable performance of implementations; assuming responsibility for success, and a fundamentally adversarial model of system integration, where each component provider is optimizing its behavior locally, with respect to potentially conflicting demands. This model gives rise to a game-theoretic formulation of contract-governed process interactions that supports compositional reasoning about contract conformance.