

A Game-Theoretic Model for Distributed Programming by Contract

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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.