Protocol-Based Interactive Debugging for Domain-Specific Languages

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Résumé

Interactive debuggers are established tools used by developers to understand programs and localize faults. They are equally valuable in the context of model-driven development, when working on executable behavioral models. However, development costs of interactive debuggers for Domain-Specific Languages (DSLs) can be significant. In order to mitigate these costs, several reusable DSL-agnostic debugging solutions have been proposed. We argue that the applicability of these solutions is limited by being tied to a fixed set of debugging services, a specific language engineering approach, or a particular user interface. In this paper, we present a novel approach to provide interactive debugging services for executable DSLs through a reusable generic architecture. We propose a protocol allowing a generic interactive debugger to communicate with heterogeneous DSL runtimes, both for controlling the execution and for configuring the debugger with domain-specific breakpoints. The proposed debugger can itself be controlled using a reinterpretation of the Debug Adapter Protocol (DAP), for an effortless integration in existing Integrated Development Environments (IDEs) that support it. Using a prototype implementation based on JSON-RPC and two heterogeneous DSL runtimes, we demonstrate that our approach provides an off-the-shelf reusable interactive debugger that supports meaningful domain-specific breakpoints, and that can be used with minimal effort within a standard IDE such as Visual Studio Code.

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