Informatik 11
Embedded Software

RWTH AACHEN UNIVERSITY

Master Thesis

Just-in-Time Compilation of Python Fragments

Problem Statement

In our research project, we develop a runtime verification framework with look-ahead capabilities for Python programs. We analyze Python programs not directly, but the generated Python Bytecode which is an assembly-like intermediate representation for Python programs. Runtime verification checks, while the program is executing, whether a given property is fulfilled and returns a verdict. In order to derive a verdict about future program states a faster version of the program shall be executed.

The idea is to use a Just-In-Time compiler to generate a binary of the original Python program which can be executed natively on the operating system. To achieve this goal the necessary data structures and program instruction needs to be converted to an appropriate intermediate representation which is influced by the used library provied by the JIT compiler.

The used approach should be separated into two stages. The first occurs before the program execution and should do most of the computations which are not based on the concrete variable values druing the execution. While the runtime verification is executed, the second phase should provide only a minimal amount of information to the JIT compiler. This is done in order to reduce the time needed while the program is running.

Your Tasks

In this thesis a just-in-time compilation approach for Python Bytecode should be developed and is to be evaluated using an industrial use case.

- Literature research on JIT libraries for assembly-like languages
- Adaption and implementation of a promising approach which can handle pointer aliasing
- Evaluation on an industrial use case

Your Profile

The analysis should be implemented in Python and therefore intermediate language skills are preferred. Optional is knowledge about formal methods and slicing, but general understanding of program analysis is helpful.

Contact

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