Optimizing for Space : Measurements and Possibilities for Improvement

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Abstract

GCC's optimization for space seems to have been often neglected, in favor of performance tuning. With this work we aim at determining the weakpoints of GCC concerning its optimization capability for space. We compare (1) GCC with two non-free ARM cross-compiler toolchains, (2) how GCC evolved from release 3.2.2 to version 3.3, and (3) two runtime libraries for the Linux kernel. All tests were performed using the C front end and for the ARM target both as standalone and as Linux executables. The test suite is comprised of applications from well-known benchmark suites such as SPEC and Mediabench. An optimal combination of compiler (and linker) options with respect to minimal code size is elaborated as well. We conclude that GCC 3.3 steadily improves with respect to version 3.2.2 and that it is only about 11% behind a high-performance non-free compiler. At the same time, we were able to document a number of issues that deserve further investigation in order to improve code generation for space.