

Master's Thesis Proposal: Verifying debug information

Background

IAR Embedded Workbench is a C/C++ Integrated Development Environment (IDE). It compiles and links C/C++ source code into executable code and includes a debugger to help finding problems in the resulting application.

The compiler generates *debug information* that is used for supporting source level debugging of the application. When an application is built for debugging, the information should be both correct and complete. However, when different levels of optimization are applied, completeness (and sometimes correctness) can degrade in various ways

The task

The task is to develop a way to automatically verify correctness and completeness of a significant part of the debug information. Some possible ways this might be achieved are:

- Develop a way to annotate source code that allows a tool to verify interesting properties of the debug information.
- Generate source code in some way that makes it possible to verify the resulting debug information for that source code.
- Parse existing source code and generate data that can be used for verifying the debug information.

In all cases, verification would likely involve running scripted debugger sessions and checking its behavior. It is understood that the result will be a prototype and that not all relevant properties must be checked.

Examples of what the debug information contains:

- A mapping between source statements/expressions and code addresses.
- Reachability information between step points to allow a debugger to support source level stepping while allowing the target program to run full speed between stops.
- Information about the storage used for variables to support inspection and modification of their values.
- Information to support the inspection of the entire call chain at each point in an application.

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