



GREEN HILLS SOFTWARE'S EMBEDDED DEVELOPMENT TOOLS MULTI IDE FOR EMBEDDED LINUX®

MULTI FOR EMBEDDED LINUX

Green Hills Software's MULTI® Integrated Development Environment (IDE) works seamlessly with the Linux® real-time operating system and provides detailed, process-aware information to embedded developers.

OPTIMIZING COMPILERS

- C
- C++
- Embedded C++
- Run-Time Libraries

MULTI INTEGRATED DEVELOPMENT ENVIRONMENT

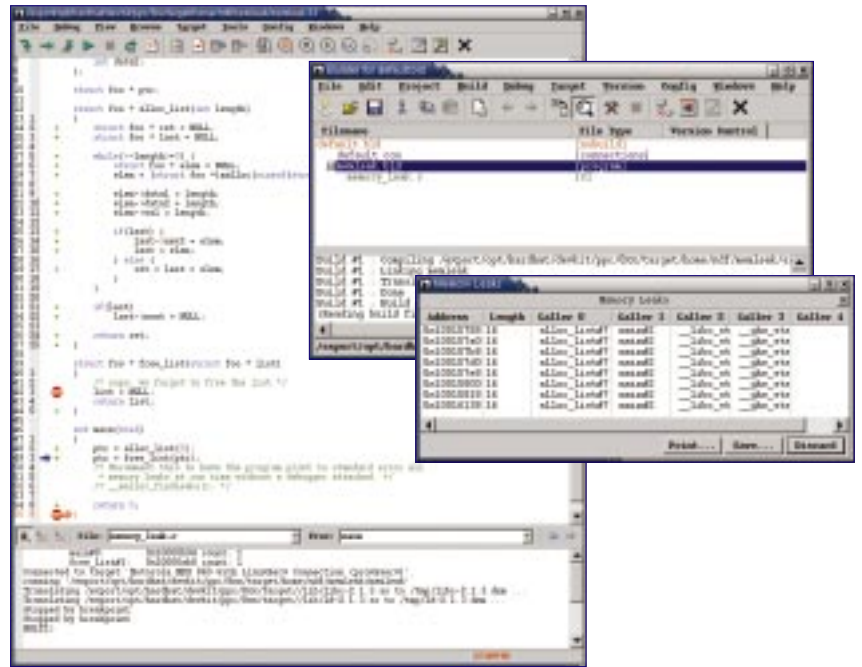
- Source Level Debugger
- Project Builder
- Language-Sensitive Text Editor
- Version Control System
- Graphical Browser
- Performance Profiler
- Run-Time Error Checking
- Remote Target Connection

For general information about each of these product offerings, please refer to our "Total Solutions for Embedded Software Development" brochure.



EMBEDDED LINUX INTEGRATION

MULTI, together with the Green Hills family of optimizing C, C++, and EC++ compilers, provide a fully integrated real-time software development environment for Linux-



based applications that encompasses source-level debugging, window-oriented editing, automated program building, execution profiling, and project/version control. Applications developed with MULTI run on the target under the Linux operating system. Applications can also be compiled using the GNU C/C++ compiler and debugged with MULTI.

MULTI interacts with Linux-based target applications via Green Hills Software's Linux target debug agent, using an Ethernet connection.

MULTI enables users to achieve structural knowledge and control over process level program execution. Additionally, users gain a full understanding of program and data structures through MULTI's powerful run control, data manipulation and browsing capabilities. These include mixed assembly and high-level language formats, a language-sensitive expression evaluator, and special support for C++ (such as Class Browser, object display and template debug capability). The

debugger recognizes pointers and automatically displays the objects that they reference. It also displays a stack trace that simplifies the analysis of hierarchical program structure.

MULTI's Linux debug agent enables advanced process level debugging. A more powerful debug agent than gdbserve, it enables MULTI to debug and tune applications with full visibility of the interaction between multiple processes.

MULTI displays a process window showing a complete list of processes currently running on the target board. This list is updated periodically as processes are created, destroyed, or change state. Developers have the option of attaching to or debugging a currently running process by clicking on its entry in the process window.



MULTI IDE FOR EMBEDDED LINUX



As users attach to processes, MULTI creates a separate debugger window. Within each window, programmers can independently set conditional and temporary breakpoints, single step, all without interrupting the execution of the rest of the system. Programmers are also able to debug new processes that are forked as they communicate through pipes, semaphores, etc. Local and global variables, complex expressions and structured elements such as arrays and records are displayed within the context of their own process.

LANGUAGE SUPPORT

Green Hills Software supports mixed development using its renowned C, C++ and EC++ Optimizing Compilers. The Green Hills® Optimizing Compilers consist of a language-specific front end, a global optimizer, and a target-specific optimizer and code generator. The compilers use the same global optimizer regardless of language or target, and the same target-specific optimizers and code generators regardless of language. Optimizations may be optionally weighted for either code speed or minimum size.

This modular approach to compiler building allows Green Hills to add support for new microprocessors quickly while also continuing to maintain a high degree of reliability. To date, Green Hills has developed optimizing compilers and related tools for 33 microprocessor architectures. The Green Hills Tool Chain consists of a Macro Assembler, Librarian, Linker and Utility Programs.

OPTIMIZING C COMPILERS

The Green Hills Optimizing C Compilers conform fully to ANSI X3.159-1989 Standard C (ISO/IEC 9899 and FIPS PUB 160). Green Hills C Compilers are validated with thousands of tests before release using both industry standard and internally generated procedures. Users can select from five dialects of the C language, including strict ANSI, permissive ANSI, transition mode, K&R C, and Gnu C.

OPTIMIZING C++ AND EC++

Green Hills C++ is a "Scalable C++" compiler that includes a variety of user-selectable language feature combinations to meet specific needs. The C++ Compilers conform to the ANSI/ISO C++ standard. Ranging from bare-bones C up through full-blown ANSI C++, Green Hills Optimizing C++ Compilers offer many options in between, including EC++.

The C++ language provides a powerful capability that enables errors to be automatically caught and handled during program execution. Traditionally, multi-tasking applications have not been able to take advantage of these features because the underlying C++ implementation does not support thread-safe, or reentrant, exception handling structures. In contrast, Green Hills C++ and C++ run-time libraries provide the industry's first thread-safe exception handling for the Embedded Linux real-time operating system. This unique integration enables programmers to unlock the full potential and power of the C++ language.

Green Hills EC++ Compiler is a subset of ANSI C++ that is designed to meet the needs of embedded systems developers, offer full compatibility with C++, and retain all the major object-oriented advantages of C++. Compared to ANSI C++, EC++ offers reduced code size, increased deterministic behavior, and ease of use -- making it for more appropriate for embedded development.

Green Hills C++ Compilers are exercised using thousands of tests before release, including both formal ANSI and many internal validation tests. Six dialects of the C++ programming language are supported. Beyond that, a large number of language features can optionally be turned on or disabled by the user.

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