

Green Hills Software



The Technology Leader in Embedded Software Corporate Overview



Company overview

Green Hills Software is the technology leader in real-time operating systems and device software optimization for 32- and 64-bit embedded systems.

As electronic products grow more sophisticated and complex, embedded software has become the most time-consuming, highest-risk, and expensive aspect of product development. Green Hills Software empowers developers and organizations to address this challenge with a comprehensive range of innovative products and services designed specifically for 21st century embedded system requirements. These solutions enable developers to build totally reliable, absolutely secure, and maximum performance applications—in the least time and with the lowest manufacturing and development costs.

Leading electronics manufacturers depend on Green Hills Software's products to develop the software for everything from inkjet printers to supersonic fighter jets—including automotive electronics, avionics systems, communications equipment, computer peripherals, consumer electronics, defense electronics, industrial control systems, medical devices, and space systems.

Founded in 1982, Green Hills Software is the most successful embedded software supplier. The company has been profitable for 22 straight years, has grown an average of 30% per year since inception, and has been the fastest-growing real-time operating system supplier every year since 2001. Consequently, Green Hills Software is the best choice when it comes to selecting a reliable and stable long-term development partner.



Representative customers



Boeing

X-45C Joint Unmanned Combat Air Systems, F-15, B-52, AV-8B Harrier, C-17 transport, F/A-18, B-1B and Space Shuttle avionics



Ford Motor Company

Power-train control modules on the Lincoln Aviator, Jaguar, Lincoln LS, and many other Ford cars and trucks



Goodrich Corporation

To achieve FAA DO-178B certification for the Level A Full Authority Digital Engine Control system (FADEC)



Hewlett-Packard

Photosmart 230 photo printer as well as HP inkjet and all-in-one printers for office and home use



Lockheed Martin

F-35 Joint Strike Fighter, F-16, S-3, P-3, AEGIS, MLRS, and F/A-22



Northrop Grumman

To achieve FAA DO-178B Level A certification for the inertial navigation system for the Airbus A380 and other commercial transport aircraft



PEIKER acoustic

Future in-car automotive electronics programs such as a hands-free Bluetooth mobile telephone car kit



Rockwell Collins

FAA DO-178B Level A certified Avionics Management and Display System for the Sikorsky S-92, winner of the Collier Trophy for aviation excellence and achievement



Nera

Next-generation point-to-point microwave radio links

Products and technology

Real-time operating systems

- ▲ ***μ-velOSity™* royalty-free microkernel**
Small, fast, easy-to-learn operating system for the most cost-sensitive and resource-constrained devices
- ▲ ***velOSity™* royalty-free kernel**
Small footprint RTOS with full range of middleware and board support packages
- ▲ **INTEGRITY® royalty-free, POSIX® certified RTOS**
For totally reliable and absolutely secure applications
- ▲ **INTEGRITY® Padded Cell™**
Safely run Linux and other legacy software in high-security and high-reliability systems

Software development tools

- ▲ **MULTI® and AdaMULTI™ development environments**
Quickly develop, thoroughly debug, completely test, and fully optimize embedded and real-time applications
- ▲ **TimeMachine™ debugging suite**
Go back in time to find every bug in minutes
- ▲ **Green Hills® optimizing compilers**
The fastest, smallest code from C, C++, Ada 95, and FORTRAN
- ▲ **EventAnalyzer™ analysis tool**
Visualize and optimize applications' real-time behavior
- ▲ **ResourceAnalyzer™ run-time analysis tool**
Visual consumption of CPU and memory resources

Processor probes

- ▲ **SuperTrace™ probe**
The fastest trace, download, and debug
- ▲ **Green Hills probe**
High-performance real-time debugging
- ▲ **Slingshot™ debug device**
Fast and easy target connection

Safety-critical products

- ▲ **INTEGRITY-178B royalty-free, safety-critical RTOS**
Securely partitioned RTOS for applications containing multiple levels of safety criticality
- ▲ **G-Cover™ code coverage analyzer**
Language-independent block and branch coverage analysis on production, non-instrumented code
- ▲ **GMART™ minimal Ada run-time**
Multi-tasking run-time system with support for determinism and schedulability analysis
- ▲ **GSTART™ safe tasking Ada runtime**
SPARK-compliant minimal run-time system enables static analysis of single-threaded applications

Industry-specific platforms

- ▲ **Platform for Automotive Infotainment**—addresses in-car infotainment and telematics systems. This platform is available with the INTEGRITY RTOS or *velOSity* kernel as well as middleware for 2D and 3D graphics, GPS, navigation, text-to-speech, Bluetooth, voice processing, CD and MP3 decoding, Internet and wireless LAN, MOST, CAN, and USB. It is also pre-integrated with reference hardware from Analog Devices and Freescale.
- ▲ **Platform for Avionics**—includes the INTEGRITY and INTEGRITY-178B RTOSes, support for the aviation industry standard ARINC 653-1 application software interface, and the documentation required for FAA safety certification. INTEGRITY-178B has been certified to the FAA's most stringent standard for flight-critical avionics systems, RTCA/DO-178B Level A. The Platform for Avionics is available with the MULTI IDE. For safety critical applications, it supports development with MISRA C, Embedded C++, and both the SPARC and Ravenscar Ada language subsets.
- ▲ **Platform for Industrial Safety**—targets industrial devices requiring safety certifications, including process controllers, programmable logic controllers (PLCs) and flame, gas and temperature sensors. Based on the INTEGRITY RTOS, which is in the final stages of certification to IEC standard 61508 at Safety Integrity Level 3, this platform also includes a full set of the certification-required safety documentation.
- ▲ **Platform for Medical Devices**—designed to meet FDA requirements for up to Class III medical devices, the most stringent type of FDA certification. The Platform for Medical Devices includes the INTEGRITY RTOS and the safety and RTOS life cycle documentation required for Class III approval.
- ▲ **Platform for Software Defined Radios**—complies with the Software Defined Radio (SDR) standard Software Communications Architecture (SCA) Operating Environment. This platform enables the development and deployment of next generation software-configurable radios for military, avionics and commercial applications, including the Joint Tactical Radio System.
- ▲ **Platform for Wireless Devices**—adds WiMAX support to Green Hills Software's WiFi reference platform. This platform supports the development of mobile devices and infrastructure equipment incorporating IEEE 802.11a/b/g/ and/or WiMAX interfaces. Along with the INTEGRITY RTOS or *velOSity* kernel, this platform includes IPv4 or dual mode IPv4/v6 protocol stacks, a broad range of security protocols, and optional pre-loaded and tested reference hardware.

Royalty-free operating systems

With the Green Hills family of operating system products, you can develop a software base that can evolve from low- to high-end products with little modification:

- ▲ *μ-veOSity* is ideal at the low end where minimal footprint, maximum speed, and low cost are paramount
- ▲ *veOSity* is a good fit where middleware and comprehensive board support packages are essential
- ▲ INTEGRITY is the optimal choice for the high end where maximum reliability, safety and security are critical

This family of operating systems provides developers with a seamless migration path for future designs that grow in complexity and requirements. For example, if an application evolves to require virtual memory support (via the MMU on certain microprocessors), INTEGRITY can be substituted for *veOSity* or *μ-veOSity* with only minimal code changes.

By standardizing on Green Hills Software, your development teams can share:

- ▲ upwards-compatible application source base
- ▲ upwards-compatible operating system API
- ▲ common development toolset across the entire range of products

No other vendor provides the same level or range of operating system scalability.

Real-time response

Unlike other real-time operating systems that disable interrupts in every kernel service call, the *veOSity* kernel and INTEGRITY RTOS can guarantee the absolute minimum interrupt latency by never disabling interrupts. Not only do these RTOSes provide the minimum response time, but the absolute worst case response time is extremely fast and guaranteed (e.g., 190 nanoseconds on a 233 MHz PowerPC 750).

μ-veOSity microkernel

The *μ-veOSity*™ microkernel is the smallest of Green Hills Software's family of royalty-free operating systems. It is implemented as a C library and so can be easily ported to multiple target architectures. Its simple design as well as integration with the best-in-class MULTI tools make *μ-veOSity* both easy to learn and simple to use.

All these features—royalty-free, small size, easy portability, simple design, and included source code—combine to make *μ-veOSity* the best choice for any cost-sensitive and resource-constrained embedded development application.

veOSity kernel

The *veOSity*™ kernel is small, fast and royalty-free—making it perfect for high-volume, cost-sensitive, and deeply-embedded applications. The *veOSity* kernel is integrated with Green Hills Software's best-in-class MULTI embedded software tools and provides a rich set of kernel services, device drivers, BSPs and middleware.

With a minimum RAM requirement of 4 KB, the *veOSity* kernel is perfect for the most resource constrained systems. Designed for speed, its ultra-fast context switch time (.8 μsec, at 233 MHz, PowerPC) and fast kernel service call times make it ideal for systems where CPU resources are at a premium.

INTEGRITY RTOS

The INTEGRITY RTOS uses hardware memory protection to isolate and protect embedded applications and provide the utmost in security and reliability.

Secure partitioning guarantees each task the resources it needs to run correctly and fully protects the operating system and user tasks from errant and malicious code, including denial-of-service attacks, hackers, worms, and Trojan horses.

Unlike other memory-protected operating systems, the INTEGRITY RTOS does not sacrifice real-time performance for security and protection.

μ-veOSity

veOSity

INTEGRITY

Lowest
Manufacturing Cost

upwards-compatible application source base

Total Reliability
& Absolute Security

1.6 KB minimum ROM footprint
Fast boot time
Easy-to-learn, simple-to-use

Small size, fast boot time
Comprehensive middleware, drivers,
& board support packages

Complete memory protection
Securely partitioned
POSIX® conformant

INTEGRITY RTOS, continued

Advanced features

- ▲ Distributed processing and high availability
- ▲ Dynamic downloading of user applications
- ▲ Field upgrade and debug
- ▲ Certified POSIX interface*
- ▲ Built for SCA v2.2 conformance

Ultimate availability

The INTEGRITY RTOS provides the highest level of availability through mechanisms such as:

- ▲ Protection in both the space and time domains
- ▲ Secure tasks, interprocess communication, and device drivers
- ▲ Support for hot swap
- ▲ Shared, thread-safe Ada 95, C, C++, EC++, and ETC++ run-time libraries for multiple programs.

Integrate utility

The Integrate™ utility is a unique industry-leading innovation that enables system developers to establish an initial state of tasks, connections, and other kernel objects across multiple address spaces. With the Integrate utility, developers can verify system security and guarantee resource availability.

Using the Integrate tool's powerful graphical interface, developers can configure all resources in an entire INTEGRITY system, including address spaces, clocks, tasks, semaphores, and connections. Adding new address spaces and tasks or creating connections between address spaces is as simple as clicking and dragging the appropriate icon.

Green Hills supported processors

Green Hills Software provides complete solutions for developing embedded and real-time applications on a wide range of target processors.

- | | |
|------------------------------|-------------------|
| ▲ PowerPC | ▲ Lexra |
| ▲ ARM/Thumb/StrongARM/XScale | ▲ FirePath |
| ▲ MIPS32/MIPS64/MIPS16 | ▲ TriCore |
| ▲ x86/Pentium | ▲ M•CORE |
| ▲ ColdFire | ▲ SH |
| ▲ 680x0/683xx/CPU32 | ▲ ST100 |
| ▲ V8xx | ▲ i960 |
| ▲ Blackfin | ▲ SH-DSP |
| ▲ DaVinci | ▲ SPARC/SPARClite |
| ▲ OMAP | ▲ RH32 |
| ▲ ARC | ▲ RAD6000 |
| ▲ StarCore | ▲ ZSP |
| ▲ FR | ▲ Intrinsity |
| ▲ Alpha | |

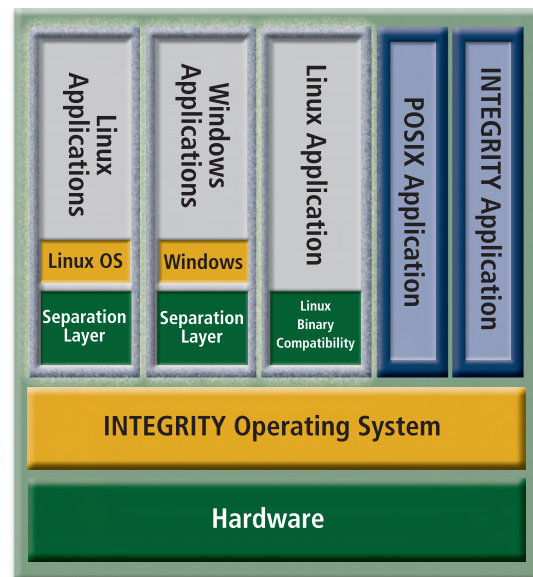
Please contact Green Hills Software for information on newly released processor support.

* The INTEGRITY RTOS has been certified to the 1003.1™ System Interfaces Product Standard and is listed on the certification register at <http://get.posixcertified.ieee.org/register.html>

INTEGRITY Padded Cell

INTEGRITY Padded Cell is an extension to the INTEGRITY RTOS that enables the incorporation of guest applications and traditional operating systems such as Linux and Windows into high-security, high-reliability applications.

INTEGRITY Padded Cell combines the INTEGRITY operating system with Green Hills Software's Padded Cell™ secure virtualization software and uses a separation layer to run guest operating systems as user-mode INTEGRITY applications. Multiple Padded Cell applications can run concurrently on a single physical computer, each hosting its own guest operating system. An impenetrable wall around each guest operating system ensures that errant, insecure, or malicious code can never compromise the security or reliability of the rest of the system—either inadvertently or via a hostile attack.



Padded Cell technology enables multiple operating systems to run concurrently on a single physical computer, each separated by an impenetrable wall.

INTEGRITY for enterprise

Along with its family of embedded real-time operating systems, Green Hills Software offers INTEGRITY operating systems for secure computing and communications. As the only commercially-available OS built on MILS (Multiple Independent Levels of Security and Safety) separation kernel technology, INTEGRITY enables applications and users at different security levels and from different domains to share the same computing resources.

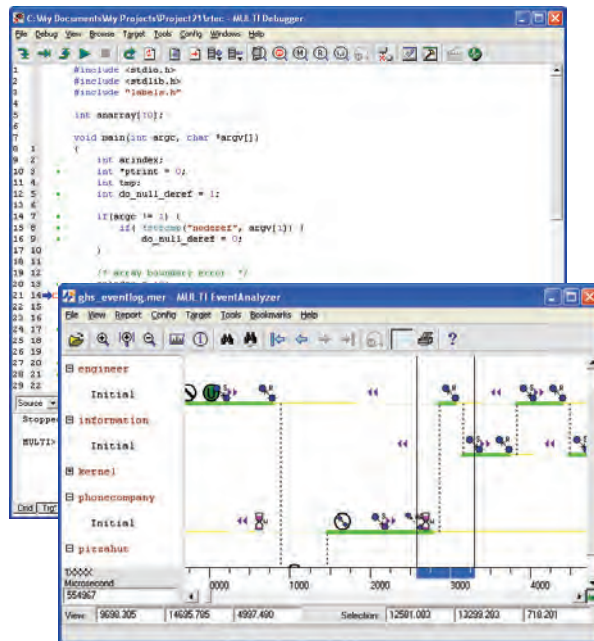
By providing end-to-end solutions for everything from embedded computers to handheld devices to workstations and servers, INTEGRITY can significantly increase the availability and accessibility of information and reduce the number of required computers to minimize weight, power consumption, size and cost.

Integrated tools support

All of the development tools in Green Hills Software's MULTI development environment can be used with the INTEGRITY RTOS, *ve/OSity* kernel, and *μ-ve/OSity* microkernel. Beside run-control debugging using one of Green Hills Software's processor probes, the *ve/OSity* and INTEGRITY operating systems support run-mode debugging via a BSP's Ethernet or serial driver.

EventAnalyzer™

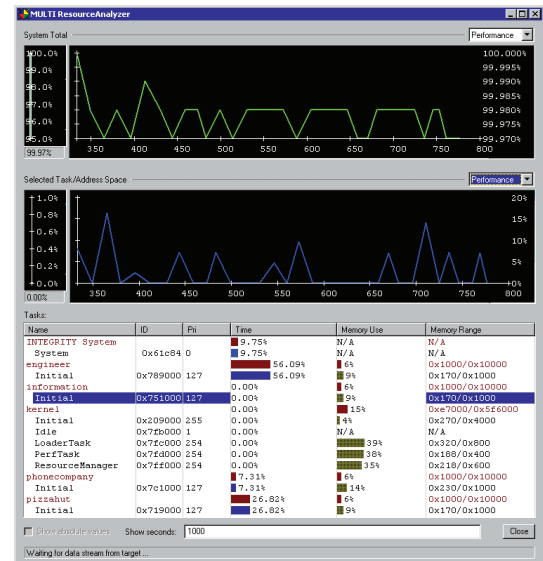
With the powerful EventAnalyzer, users of Green Hills operating systems can understand the complex real-time interactions of their system. Standard debugging techniques simply cannot detect certain problems. Important events such as semaphore calls, task context-switches, and interrupts are logged on the target in real-time. This data is transferred to the host for graphical display in the EventAnalyzer GUI.



Any event displayed in the EventAnalyzer view window can be selected for debugging with a single click, opening a debug window that shows the event's source code, ready to debug.

ResourceAnalyzer™

The MULTI IDE's ResourceAnalyzer advanced development and run-time analysis tool provides extensive visibility into CPU execution at the task and address space level. It provides a graphical interface to critical system information including task stack usage, address space memory use, CPU time use history, and memory use history.

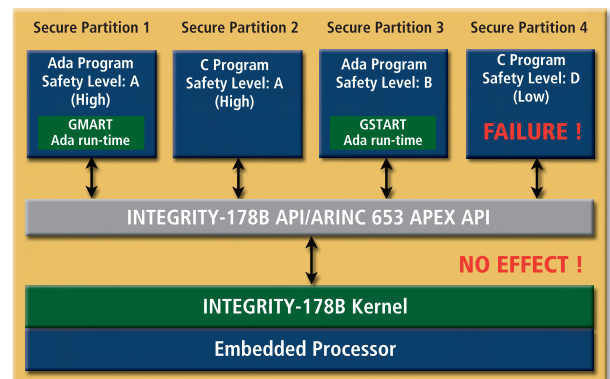


The ResourceAnalyzer tool provides extensive visibility into CPU execution at the task and address space level.

INTEGRITY-178B for safety-critical applications

The INTEGRITY-178B RTOS is ARINC 653-1 compliant and securely-partitioned, targeting demanding safety critical applications that contain multiple programs with different levels of safety criticality, all executing on a single processor. The INTEGRITY-178B RTOS has been engineered from the ground up to provide security and determinism. As a result it guarantees protection across both the time and space domains.

The INTEGRITY-178B ARINC 653 Application/EXecutive (APEX) interface provides a recognized standard interface between the operating system of an avionics computer resource (ACR) and the application software. Its ability to fully support ARINC 653-1 while complying with DO-178B Level A provides a COTS baseline avionics operating environment that meets standards already adopted and accepted by the commercial avionics industry for Integrated Modular Avionics.



With its secure partitioning, the INTEGRITY-178B RTOS has been proven in applications certified by the FAA to RTCA/DO-178B Level A, the most stringent safety standard for avionics software.

Communications software

Green Hills Software provides a complete suite of integrated and tested products that enable embedded system developers to add communications, networking, and management to their designs that require general networking support and those that demand the most comprehensive and robust network security. These products were developed from the ground up to address the requirements of embedded systems spanning a range of markets, including wireless, automotive, consumer, residential, gateways, enterprise router, cellular infrastructure and cellular phones. As a result, these products not only provide a complete feature set, but they have minimal memory requirements and provide both performance and portability.

These products are seamlessly integrated with the *ve/OSity* kernel, INTEGRITY RTOS and MULTI IDE, providing a total solution for all your networking needs.

IPNET dual-mode IPv4/IPv6 router stack

IPNET is a full-featured TCP/IP stack supporting both IPv4 and IPv6. The IPNET stack supports advanced routing capabilities including virtual routing, which enables IPNET to assume the responsibility of multiple TCP/IP stacks. Being a router stack IPNET is integrated with routing protocols such as OSPF, RIP, BGP from all leading routing protocol vendors. IPNET is the first commercial TCP/IP stack that has been approved to use the IPv6 READY logo both as host and router.

IPNET main features include:

- ▲ Virtual routing
- ▲ Multicast routing
- ▲ IPIP/GRE tunneling
- ▲ QoS/Diffserv
- ▲ VLAN
- ▲ NAT, NAT-PT
- ▲ IPv6

IPLITE dual-mode IPv4/IPv6 host stack

IPLITE is a compact TCP/IP stack with a very small footprint. IPLITE supports both IPv4 and IPv6 and is scalable, so that functionality not required for the application can be configured out at build time. IPLITE is a true subset of IPNET and has the same interfaces, allowing a seamless upgrade to IPNET.

Network security

Most networking applications require various levels of security. IPsec and IKE are available for both IPLITE and IPNET (IPsec comes bundled with IPNET). For secure management, SSL and SSH are available.

Supported protocols

Networking stacks

- ▲ IPNET—IPv4/IPv6 Virtual Routing TCP/IP Stack
- ▲ PLITE—Ultra Compact IPv4/IPv6 Protocol Stack

VPN protocols

- ▲ IKE—Internet Key Exchange
- ▲ IPsec—Internet Protocol Security
- ▲ L2TP—Layer 2 Tunneling Protocol

Security protocols

- ▲ Firewall—Packet Filter Package
- ▲ SSH—Secure Shell
- ▲ SSL—Secure Socket Layer
- ▲ WEBS—Secure Embedded Web Server

General libraries and utilities

- ▲ CRYPTO—Encryption Library

IP mobility protocols

- ▲ Mobile Node, Home Agent, Foreign Agent

Wireless 802.11 solutions

- ▲ 802.11a/b/g client side reference driver
- ▲ Assess point reference solution

Networking protocols

- ▲ Networking Applications—DHCP, DNS, FTP, TFTP
- ▲ DHCP Server IPv4 & IPv6
- ▲ LDAP—Lightweight Directory Access Protocol
- ▲ PPPoE—PPP over Ethernet
- ▲ RIP—Routing Information Protocol
- ▲ RADIUS—Remote Authentication Dial-In User Service
- ▲ SNMP—Simple Network Management Protocol
- ▲ SNTP—Simple Network Time Protocol

Network management

- ▲ SNMPv1/2c/3—Simple Network

Management protocols

- ▲ Emanate SNMP target agent
- ▲ Web/HTTP Server

Embedded Internet protocols

- ▲ Web Servers
- ▲ HTTP Clients
- ▲ XML/SOAP Client
- ▲ UPnP with Media Server
- ▲ CLI—Command Line Interface
- ▲ SMTP/POP3—Email send/receive

Distributed communications

- ▲ CORBA—Real-time Object Request Broker

MULTI integrated development environment

The MULTI integrated development environment (IDE) provides a comprehensive set of tools for developing and debugging embedded applications using C, C++, EC++, ETC++, and FORTRAN. For applications developed in Ada 95, Green Hills Software provides the AdaMULTI IDE. Both products run on Windows, Linux, or UNIX hosts and support remote debugging to a variety of target environments.

The MULTI and AdaMULTI IDEs provide a direct graphical interface with all Green Hills optimizing compilers and numerous third party vendors' compilers as well as offer a wide range of tools and features, including:

- ▲ Project builder
- ▲ New project wizard
- ▲ Source-level debugger
- ▲ Performance profiler
- ▲ Run-time error checker
- ▲ Graphical browser
- ▲ Language-sensitive text editor
- ▲ Version control system
- ▲ Code coverage analysis
- ▲ RTOS EventAnalyzer
- ▲ Memory leak detection

Open interface

The MULTI and AdaMULTI IDEs provide an open interface that allows developers to easily use their favorite components from within the development environment.

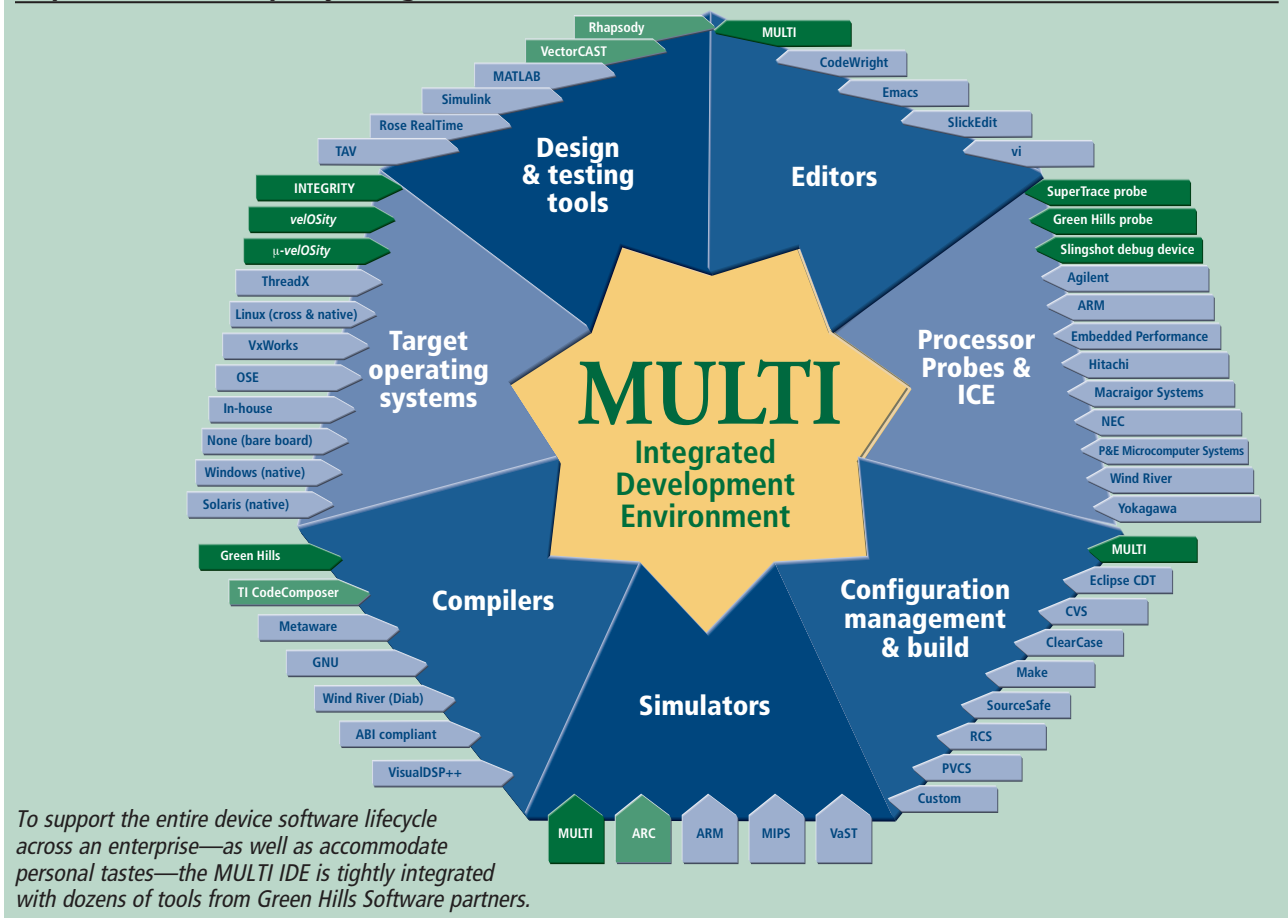
- ▲ ELF/DWARF standard interface for C and C++ compilers
- ▲ PowerPC and StarCore EABI for libraries
- ▲ MDI from MIPS Technologies for simulators
- ▲ RDI from ARM UK, Ltd. for ROM monitors, simulators, and Multi-ICE

Users can invoke their favorite editors, compilers, and configuration management systems from within the MULTI IDE. Third party applications can be launched from user-customized pull-down menu options or custom action buttons.

Compiler support

In addition to integrated support for Green Hills Software's industry-leading optimizing compilers, the MULTI IDE can be used with other compilers that adhere to EABI standards—including GNU, Diab, and Metrowerks. The Green Hills compilers produce EABI compliant ELF object modules with DWARF debug information.

Unparalleled third-party integrations



Target environments

MULTI and AdaMULTI support host-target debugging in a wide variety of combinations:

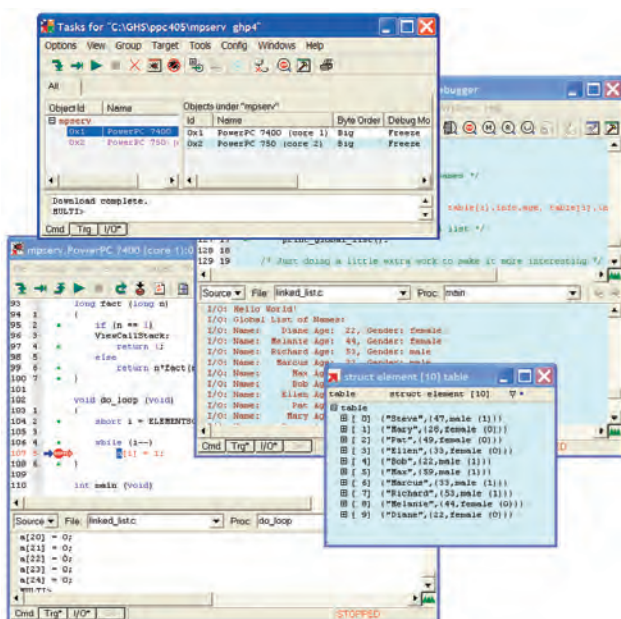
- ▲ Through on-chip debug
- ▲ Commercial RTOSeS
- ▲ Instruction set simulators
- ▲ In-circuit emulators
- ▲ ROM Monitors

A standard debugging API interfaces to a software “debug server” that uses a target-specific interface to connect MULTI and AdaMULTI to the target environment.

Multicore debugging

By combining the MULTI IDE with the Green Hills probe or SuperTrace trace probe, multiple targets on a single chip can be controlled via a single JTAG interface, reducing the number of external pins required. Through one debug connection, synchronous operations such as run, halt, step, or breakpoint can be executed seamlessly on supported CPU types.

From the Core Status view, separate color-coded debugger windows, correlated to each core, can be easily launched to debug each core independently. Special debug features, such as kernel- and task-aware debugging, are available for all cores as if they were stand-alone processors.



The MULTI IDE supports simultaneous debugging of multiple cores to verify correct program operation across processor boundaries.

TimeMachine visualization suite

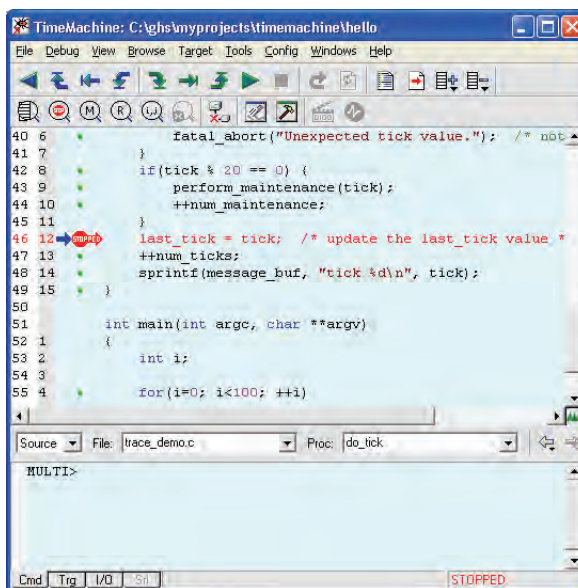
The TimeMachine suite provides a dramatic improvement over traditional methods of developing, debugging, and optimizing applications. TimeMachine tools let developers see back in time, enabling analysis of an application's behavior leading up to the manifestation of a bug or problem. This eliminates the need for trial-and-error debugging, which makes all bugs easier to fix.

For the most insidious bugs—those that are irreproducible or difficult to reproduce—the TimeMachine suite catches them when they first occur. This can save the hours or days that could be required to reproduce and diagnose a problem. Problems that might otherwise never be rooted out can now be easily fixed.

The TimeMachine visualization suite includes:

- ▲ TimeMachine source-level debugger: run and step an application back in time
- ▲ PathAnalyzer tool: visualize an application's execution flow at the function-call level
- ▲ Function flow: see a timeline identifying an application's call sequence
- ▲ Integration with the MULTI Performance Profiler and EventAnalyzer tools

TimeMachine tools take advantage of trace history collected by the MULTI instruction set simulator, μ -ve/OSity, ve/OSity and INTEGRITY simulator (ISIM), or SuperTrace probe—without any run-time intrusiveness.



With the TimeMachine suite's innovative debugger, embedded developers can find complex real-time interaction bugs and symptomless programming errors faster and more efficiently than ever before.

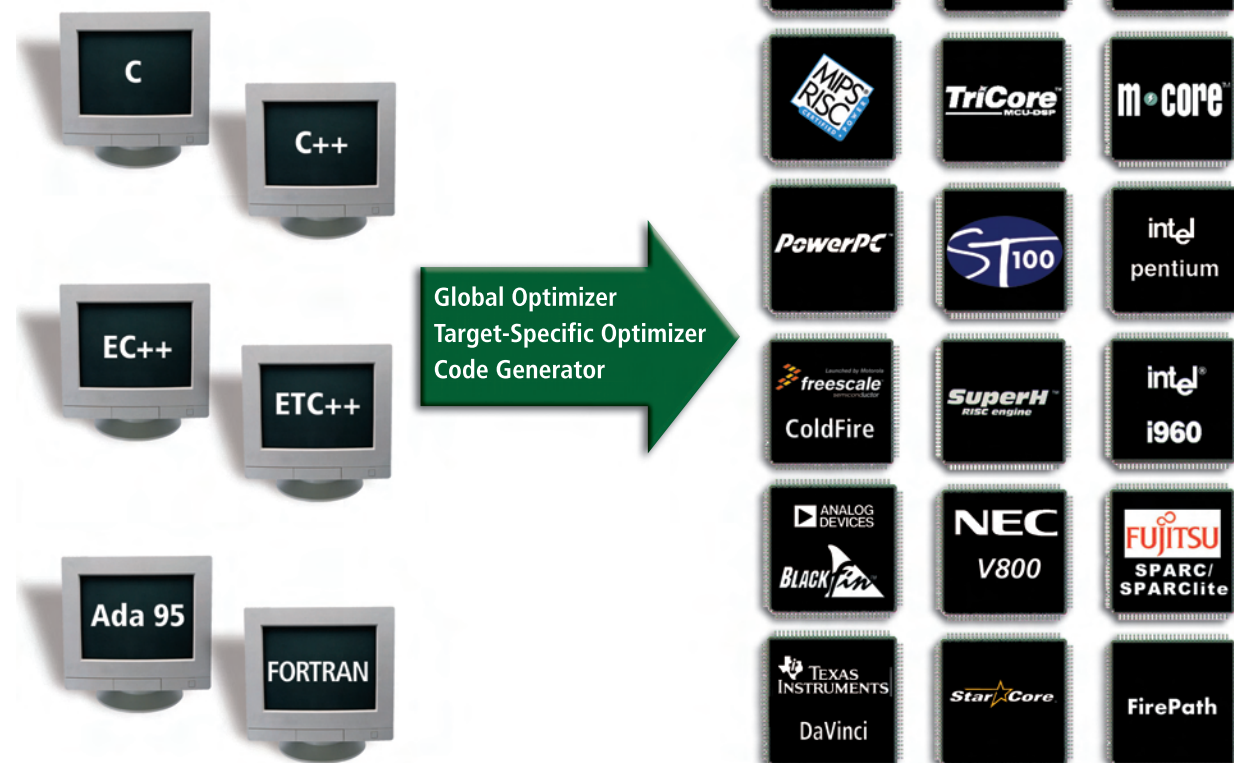
Optimizing compilers

Green Hills Software's optimizing compilers consist of a language-specific front-end, a global optimizer, and a target-specific optimizer and code generator. All Green Hills compilers use the same global optimizer regardless of language or target, as well as the same target-specific optimizers and code generators regardless of language. Optimizations may be weighted for either maximum code speed or minimum code size.

Languages

Green Hills offers six language-specific front-ends and associated run-time libraries: ANSI C, ANSI C++, EC++, ETC++, ANSI Ada 95, and ANSI FORTRAN 77:

- ▲ **ANSI C**—Green Hills C conforms fully to ANSI X3.159-1989 Standard C (ISO/IEC 9899 and FIPS PUB 160). Green Hills C has compiled the UNIX kernel, libraries, and utilities for many different microprocessors. Green Hills Software's C also supports the GNU extensions, Berkeley UNIX C extensions, Kanji in comments, string literals, and variable names.
- ▲ **ANSI C++**—Green Hills Software's C++ compilers fully conform to the ISO/IEC 14882 C++ standard. Ours is a "scalable C++" compiler that includes a variety of user-selectable language features for specific needs. From bare-bones C through full-blown ANSI C++, Green Hills Software's C++ compilers offer many options, including the new embedded C++ (EC++).



Green Hill Software's optimizing compilers support a comprehensive range of CPU families and use the same global optimizer and code generator. Code may be optimized for maximum speed or minimum size on a module-by-module basis.

- ▲ **Embedded C++**—Green Hills Software's EC++ is a proper subset of ANSI/ISO C++ intended to meet the needs of embedded application developers. EC++ offers the same object-oriented benefits of C++, but with smaller code size, deterministic behavior, and a simpler user interface. EC++ hits the sweet spot between C and C++.
- ▲ **ETC++**—Lying between EC++ and full C++, ETC++ adds STL support to EC++.
- ▲ **ANSI Ada 95**—Green Hills Software's ANSI Ada 95 conforms fully to ANSI/ISO/IEC-8652:1995 Standard Ada 95. Our Ada 95 compilers have been officially validated for 14 host/target pairs. On the PIWG benchmarks, our Ada 95 beats other Ada compilers by up to 50%.
- ▲ **ANSI FORTRAN 77**—Our FORTRAN 77 conforms fully to ANSI X3.9-1978 standard FORTRAN 77 (full language) and FIPS PUB 069-1, and adds the DOD MIL-STD 1753 FORTRAN extensions and almost all VAX/VMS FORTRAN extensions.

Processor probes

Green Hills Software's processor probes offer a variety of performance and feature options to load, control, debug, and test target systems without prior board initialization, an RTOS, or ROM monitor.

Products in this family include:

- ▲ **SuperTrace Probe**—offering the fastest trace, download, and debug
- ▲ **Green Hills probe**—offering high-performance debugging
- ▲ **Slingshot debug device**—offering fast and easy target connections

All three products are tightly integrated with Green Hills Software's MULTI development environment and support a wide array of 32-bit and 64-bit processor targets.

SuperTrace Probe

The Green Hills SuperTrace probe can capture up to one gigabyte of trace data at clock speeds over 300 MHz. These unprecedented capabilities combine with Green Hills Software's innovative TimeMachine 4-D debugger (as well as MULTI) to enable software engineers to find and fix application bugs in dramatically less time.

With its exceptionally large storage capability, the SuperTrace probe can easily collect hundreds of millions of trace frames. Compared to conventional hardware which offers only a fraction of this depth and limits the trace capture window to brief segments, the SuperTrace probe radically extends the capture window to help you find more bugs faster and easier than ever.

Coupled with either MULTI or TimeMachine, the SuperTrace probe provides RTOS-aware debugging of INTEGRITY or other RTOSes without relying on inserted debugging

code. As a result of the tight MULTI-INTEGRITY integration, data collected by the SuperTrace probe is virtual-memory aware, enabling MULTI to determine the virtual-to-physical mappings that INTEGRITY uses.

The Green Hills Probe

The Green Hills® Probe is an advanced hardware debug device that enables the MULTI debugger to load, control, debug, and test a target system without the need for prior board initialization, an RTOS, or even a ROM monitor. The Green Hills probe offers high-speed downloads of up to 500 KBps and three host interfaces.

Using either JTAG, EJTAG, or BDM port, the Green Hills probe can debug and control the core state (such as CPU internal registers) as well as the system state (external RAM and flash memory). In addition to viewing the state, the Probe provides run control and conditional and complex breakpoints both in volatile and nonvolatile memory.

In addition, the Green Hills probe can control multiple targets on a single chip through its single JTAG interface, reducing the number of external pins required. Synchronous operations such as run, halt, step, or breakpoint can be executed seamlessly on supported CPU types.

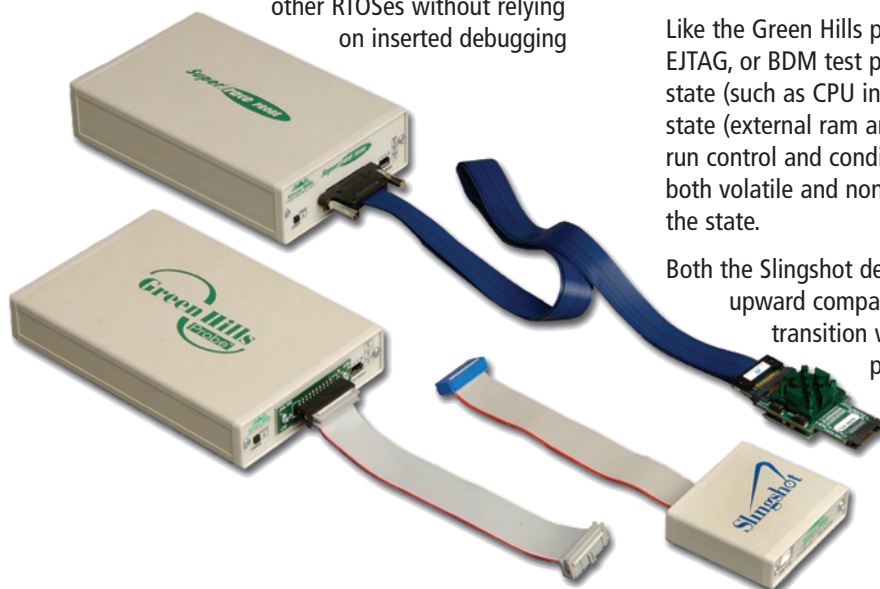
Via its three flexible host interfaces—USB, Ethernet, and RS-232 Serial—the Green Hills probe can communicate with targets from MULTI host systems running Windows, Linux, Solaris, and HP-UX.

Slingshot debug device

Slingshot is a high-performance, low cost microprocessor debug probe with a single USB 1.1 host interface and supported download speeds of up to 150 KBps. With its on-board 32-bit processor, reconfigurable logic, and compact (2 7/16" x 2 3/4" x 3/4"), Slingshot outperforms other probes three to four times its cost.

Like the Green Hills probe, Slingshot requires a single JTAG, EJTAG, or BDM test port to debug and control the core state (such as CPU internal registers) as well as the system state (external ram and flash memory). Slingshot provides run control and conditional and complex breakpoints for both volatile and nonvolatile memory along with viewing the state.

Both the Slingshot debug device and Green Hills probe are upward compatible, providing flexibility and easy transition within Green Hills Software's family of processor probes.



All of Green Hills Software's processor probes are tightly integrated with the MULTI IDE and support a variety of 32-bit and 64-bit processor targets.

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