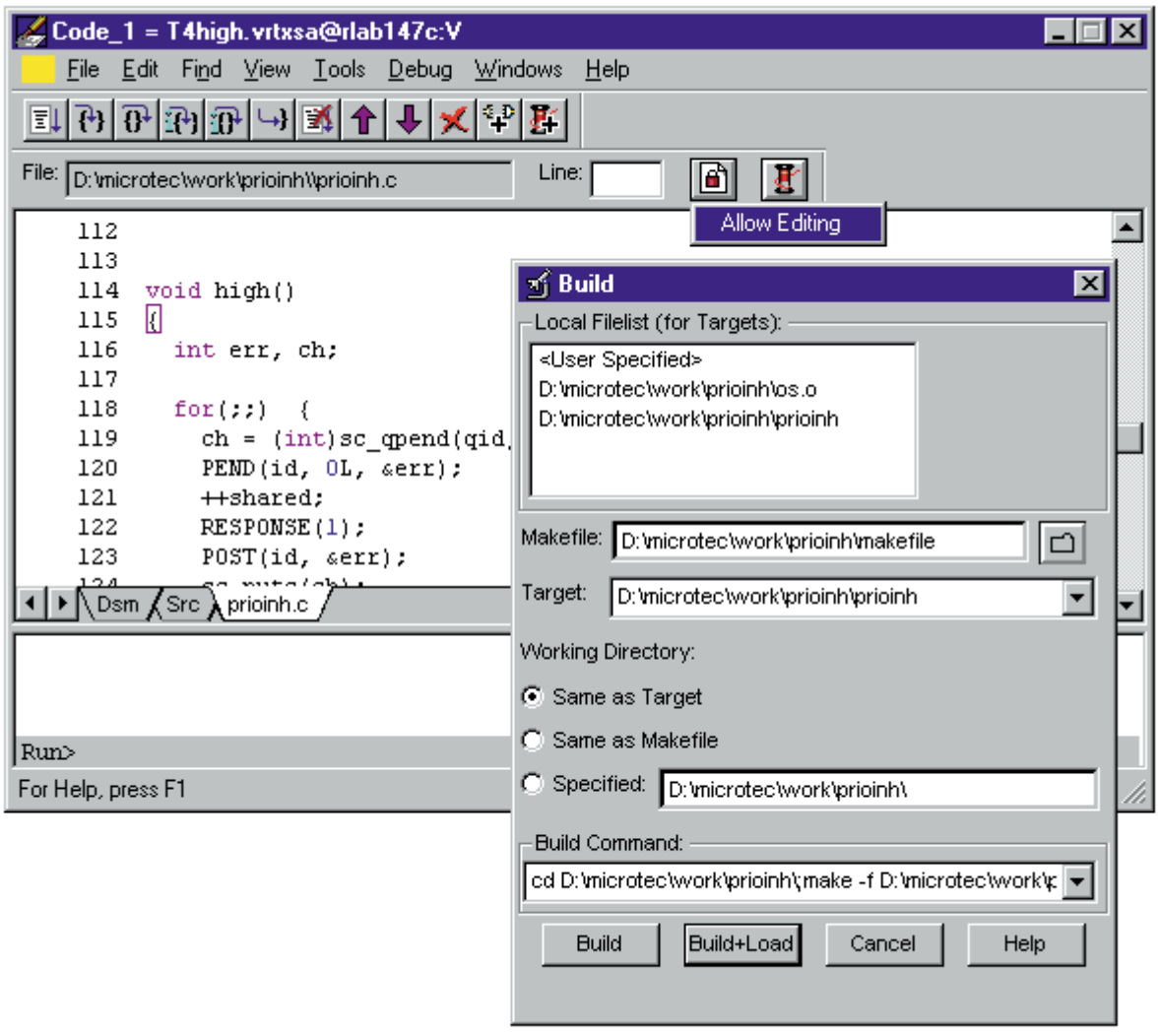
XRAY Debugger

Major Product Features:

- Tightly integrated tools accelerate edit-compile-download-debug cycle
- Support for multithreaded, multiboard and heterogeneous environment debugging enables clear understanding of complex embedded applications
- Unique ‘window-per-task’and ‘window- per-board’ user interface simplifies debugging multitasking/ multiprocessing/multiboard applications
- Enhanced C++ debugging support speeds development of object- oriented applications
- Common interface for simulation, emulation, and multitasking debugging reduces learning curve
- Easy integration brings advanced debug capabilities to third-party tools and real-time operating systems



XRAY Debugger improves developer productivity by completely integrating edit and build facilities into the debugger. The language-sensitive editor provides automatic indentation, C structure expansion, and source-code coloring which highlights different program entities such as keywords, constants, and comments. To ensure that changes to source files can be easily tracked, XRAY Debugger includes well-integrated support for popular source code control tools, such as ClearCase, RCS, and SCCS.

The Mentor Graphics Embedded Software Division provides flexible and powerful embedded software development products and services. The company's proven VRTX® Real-Time Operating System, industry-standard XRAY® Debugger and optimizing Microtec® C & C++ Compilers can be used individually or together to provide a complete and highly integrated embedded software development environment.

XRAY Debugger

Many versions of XRAY are offered to suit your particular application needs. In addition, using the XRAY Integration Kit, XRAY can be customized or integrated with third-party tools or real-time operating systems. All versions of XRAY share a common user interface and a set of advanced features for debugging C and C++ applications.

RTOS Integrations

- XRAY for Spectra Backplane—For use with the Mentor Graphics VRTX Real-Time Operating System; supports advanced debugging of complex multitasking and multiprocessing applications
- XRAY for ChorusOS™—For use with the ChorusOS real-time operating system from Sun Microsystems, Inc.
- XRAY for pRISM+™—For use with the pSOS real-time operating system from Integrated Systems, Inc.

Call for availability of XRAY Debugger versions for other popular real-time operating systems at 1-800-950-5554.

Execution Vehicles

- XRAY Simulator—Instruction set simulator that provides accurate simulation of target processor response, allowing concurrent hardware and software co-design
- XRAY Monitor—Versatile, comprehensive tool that provides full access to on-board resources for real-time application debugging on a desktop PC or UNIX workstation
- XRAY OCD—Easy-to-use on-chip debug connection to target processor with either BDM or JTAG ability for real-time application development
- XRAY HP Probe - Powerful hardware-assist solution to handle complex hardware and software integration problems at any stage in the development cycle

Call for availability of XRAY Debugger versions for other popular hardware-assist solutions at 1-800-950-5554.
The XRAY Debugger provides an integrated set of debugging tools optimized for developing embedded systems software including complex multi-threaded applications. As the industry-standard debugger for over 10 years, XRAY is compatible with many third-party compilers and emulators. XRAY may be used as a stand-alone tool, as part of the Microtec Toolkit with the Microtec Compilers, in an integrated development environment as part of the VRTX Development System which includes the Mentor Graphics VRTX Real-Time Operating System and the Microtec Compilers, or with an array of third-party tools and real-time operating systems.

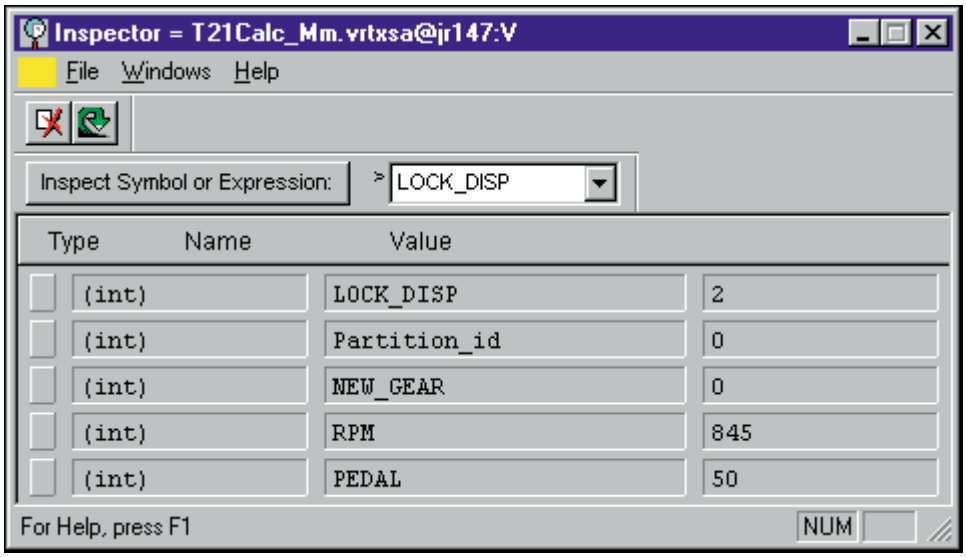
Single Solution for All Phases of Development

Because today's embedded systems span from simple control applications requiring minimal memory resources to multimegabyte multiprocessing applications, XRAY integrates a wide array of tools to meet the full range of requirements. By providing a common interface to the complete set of tools you need to debug an embedded application, XRAY eliminates the time needed to learn new user interfaces.

XRAY is the only debugger to fully support all phases of embedded development, from simulation to real-time integration, even including hardware-software co-simulation. XRAY Simulator enables you to develop both software and hardware in parallel by allowing application development to proceed without target hardware. Through its integration with the Mentor Graphics Seamless™ Co-Verification Environment,™ XRAY

even enables you to begin software-hardware integration before the real target becomes available.

To debug the application on the embedded target itself, XRAY provides a variety of cross-debugging options. XRAY OCD provides a simple ‘plug-and-play’ connection for processors that utilize a low-cost cable. XRAY Monitor enables a target connection to be established through an ethernet, serial, or ROM Emulator link to a compact target-resident monitor for processors that do not provide on-chip debugging support. XRAY has also been integrated with several in-circuit emulators, providing a powerful solution for bringing up boards or diagnosing complex real-time problems. To meet the needs of projects using a Real-Time Operating System (RTOS), XRAY has been integrated with RTOS development environments, including our own VRTX, Sun Microsystems’ ChorusOS, and ISI’s pRISM+.



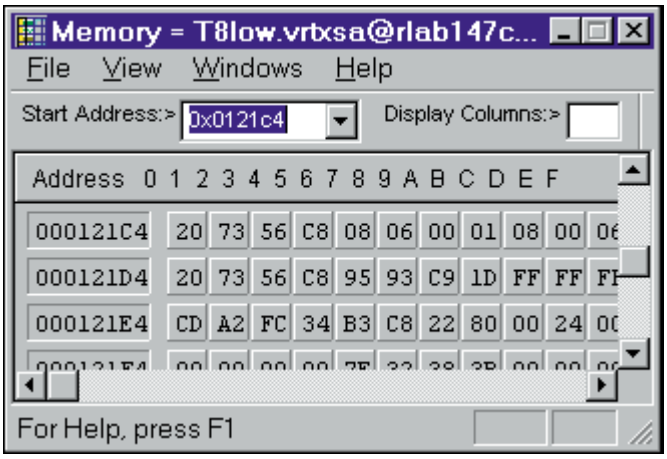
The advanced capabilities in XRAY greatly improve debugging productivity. Its inspector window accurately displays complex data types, such as structures. In addition, it supports ‘point-and-click’ traversal of dynamic data structures such as linked lists

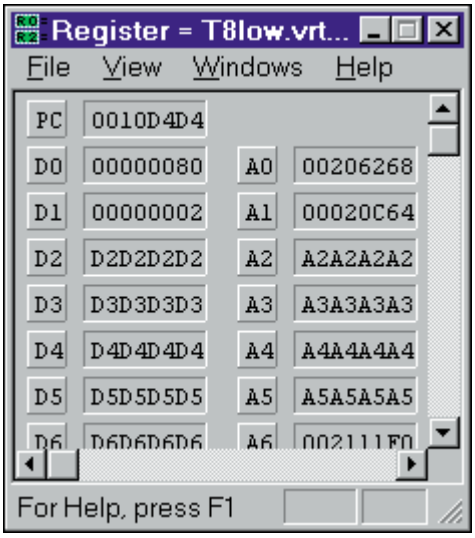
Fast Edit-Compile-Download-Debug Cycle

XRAY maximizes productivity by integrating all of the tools needed by today’s complex projects, such as the compiler, linker, debugger, make, and source-code control tools into a single easy-to-use environment. This eliminates the need to constantly switch between tools with different interfaces.

To maximize ease of use, XRAY’s graphical user interface provides access to many commands with a single mouse click by using context-sensitive pop-up menus. To avoid screen clutter, tool and status bars are completely configurable and related groups of windows can be iconified with a single mouse click.

XRAY integrates editing functions directly into debugger source code windows and provides point-and-click support for quickly rebuilding your application. Although XRAY provides make facilities, it also allows you to use any build or make tool you choose. If the compiler detects any syntax or semantic errors during the build process, you can automatically locate them with a single mouse click. This enables you to quickly make any necessary code changes.





Low-level debugging features provide the ability to display registers including floating point registers, and memory in multiple formats.

Source-Level Debugging

XRAY provides a powerful set of source-level debugging features specifically tailored for embedded applications. You can debug your application in C, C++, or assembler, or even mixed C/C++ and assembler. In particular, XRAY provides a rich set of C++ debugging extensions for features such as C++ templates and exception-handling.

Since embedded systems are often mission critical, it is important to debug your final production code. To support this requirement, many debugging features are available regardless of whether optimization is turned on or off by the compiler.

XRAY provides all of the standard debugging features, including execution and data access breakpoints, variable display and modification, single-stepping, and stack traceback. Advanced functionality includes traversal and display of dynamic data structures, symbolic support for #defines, and a graphical symbol browser. These last two features are especially useful in large applications where it is often difficult to remember exact names and definitions. In this case, XRAY eliminates time-consuming searches through header files.

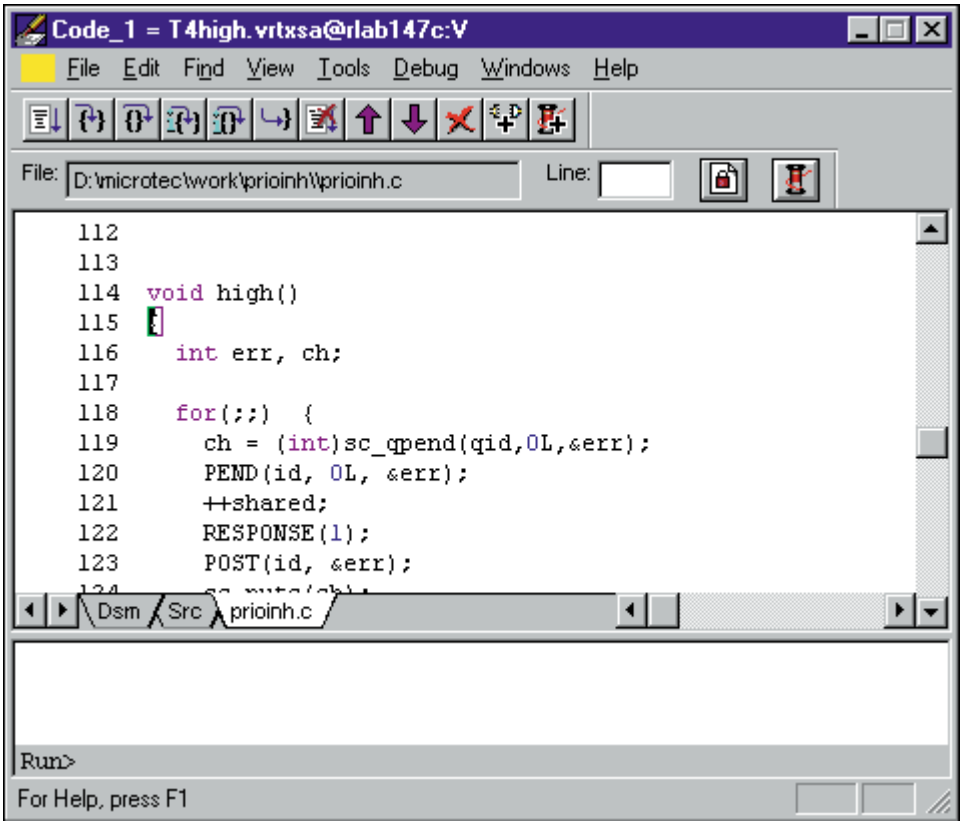
XRAY's robust, C-like command language enables you to tune debugging functionality to the specific needs of your project, even allowing you to add new debugger windows. You can create powerful conditional breakpoints, such as breaking after the nth iteration of a loop, or custom displays of data structures, such as protocol packets. You can also automate debugging and testing sessions, reducing the need for time-consuming manual verification.

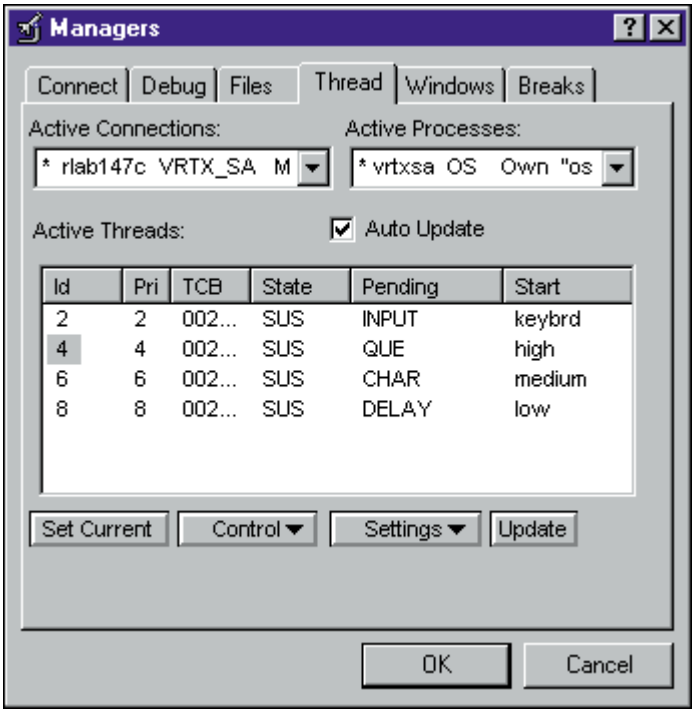
Multiprocessor, Multitasking and Multiboard Support

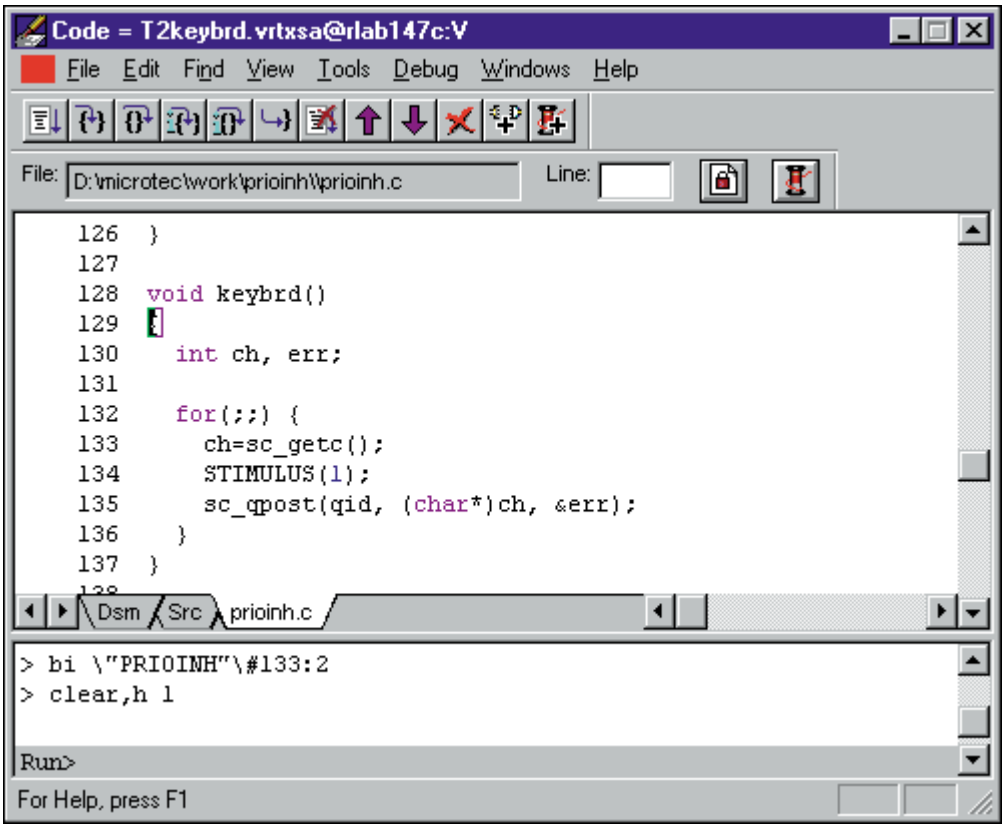
As embedded systems become ever more complex, developers are increasingly using designs featuring multiple threads running on a real-time operating system and/or on multiple CPUs. To effectively debug these applications, it is important to be able to examine different execution threads and coordinate debugging activities between them even from multiple boards and different CPU types.

Unlike traditional debuggers that can only display a single thread of execution at any one time, XRAY was designed from the start to support multiprocessing and multitasking systems. This enables you to track and display any number of concurrent execution threads, even if they are executing on different types of processors.

To simplify correlating run-time behavior, XRAY provides a breakpoint synchronization window. This enables a breakpoint for one processor or task to trigger a breakpoint for another. You can choose between breakpoints that stop the entire system or only a single task. This latter capability allows the remainder of the system to continue to respond to critical events. To check for problems such as queue overflow, XRAY can also display operating system data structures for system objects, including tasks, queues, and semaphores.



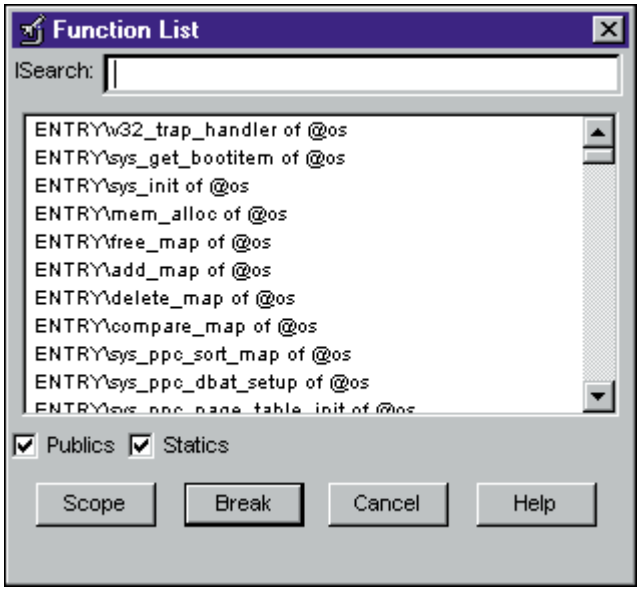




To enable you to easily track concurrent threads of execution, all of the windows associated with a particular processor or task may be given a unique color code and header. This enables you to easily distinguish them from the windows associated with a different processor or task. To avoid screen clutter, you can also iconify a group of related windows with a single click.

Source Code Browsing

In large applications, it becomes difficult to track how different modules interrelate. This results in situations where fixing a problem in one module introduces a new problem in another part of the application. To enable you to quickly understand the usage of functions and global data across your entire application, XRAY includes the Source Explorer graphical source browser. Source Explorer produces call graphs that display which modules are calling which functions, making it clear which parts of your application will be affected by a particular source code modification.



Although individual template instantiations do not exist at the source code level, XRAY enables you to set breakpoints on them. You can choose the appropriate instantiation from a list of all the different instantiations and their parameters. Other C++ debugging features include class scope, exception handling, support, breaking on overloaded functions, class inheritance relationship displays, and object-oriented and class- specific breakpoints.

Broad Availability

The Mentor Graphics Embedded Software Division products, including XRAY, are available on a wide range of hosts and targets. Contact your local sales representative or visit our web site (www.mentor.com/embedded/processors) for specific information.

Partner with the best

The Mentor Graphics Embedded Solutions Partners program includes industry leaders in many fields of embedded systems technology, including off-the-shelf boards, emulators, logic analyzers, networking protocols, and real-time operating systems.

Support and Services

Mentor Graphics provides comprehensive services to the electronic and embedded software designer through five Knowledge Centers specializing in different business areas. One of these groups, the Embedded Systems Knowledge Center, provides services to companies implementing embedded systems or companies seeking special tools for the embedded software market.

Amongst a wide range of capabilities, the Knowledge Center offers enhanced levels of support to users of Mentor Graphics embedded software design and development products; access to consultant software designers to assist in the implementation of systems; year 2000 analysis services; FAA certification services, and the development of custom tools for custom hardware. Engagements customized to the specific requirements of the customer provide valuable aid, lowering project cost and risk, with the goal of meeting specific market windows.