

INtime

Key features and capabilities

- Field-proven real-time technology
- Seamless real-time operation for Windows XP, XP Embedded, 2000 and Windows Server 2003
- Support for multiprocessor systems (SMP and HT) — options for shared or exclusive real-time resource allocation of multiprocessor CPUs
- Fully integrated with Microsoft Visual Studio .NET — edit, compile, link and debug real-time applications without leaving Visual Studio .NET environment
- Integrated on-line help
- Scalable architecture — real-time applications can run locally with Windows or across multiple nodes
- Full memory protection and address isolation for real-time applications
- Real-time TCP/IP communications stack — operates independently of the Windows network stack
- DeviceNet, PROFIBUS, CANopen and ControlNet drivers available
- Real-time USB stack supports OHCI, UHCI and EHCI controllers
- GPIO (IEEE-488) and motion control real-time device drivers available
- Direct I/O and memory-mapped access to all hardware
- Precise 100 μs system timer granularity for periodic event interrupts
- Mailboxes, semaphores, alarms, regions and shared memory IPC mechanisms
- EC++ libraries conform to the latest ANSI standards — with support for exception handling and namespaces
- Real-time Shared Libraries (RSLs) for loadable real-time libraries
- INtime Explorer tool (INtex) for real-time object browsing and crash analysis
- INscope real-time system performance analysis tool

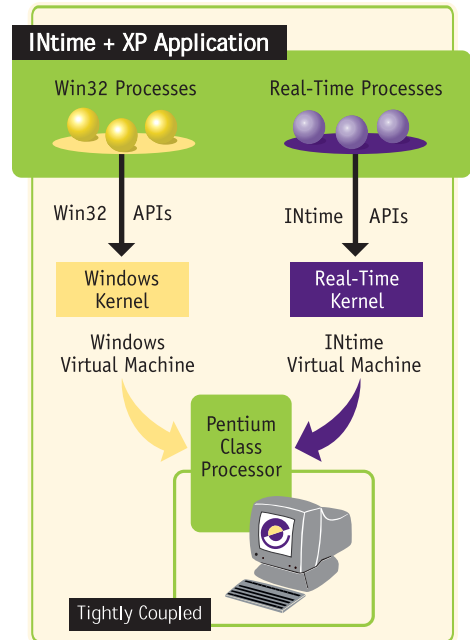
INtime® 3.0 Real-time Operating System (RTOS) Extension for Windows

The best solution for adding hard real-time performance to Windows

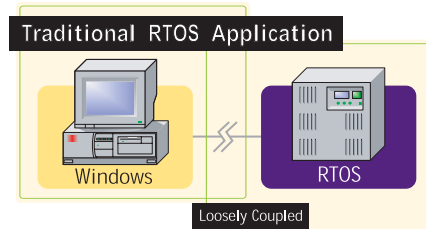
The INtime® RTOS extension for Microsoft® Windows® is the only fully-protected solution available for building hard real-time applications that run concurrently with the Windows operating system on a single hardware platform. Based on 25 years of reliable field-proven iRMX® RTOS technology, INtime combines robust industrial-grade control with enterprise-rich Windows functionality so applications can take full advantage of every Windows feature and thousands of off-the-shelf applications, without having to sacrifice real-time responsiveness. Using TenAsys software to implement real-time Windows applications reduces software complexity, removes redundant hardware cost, and speeds time-to-market.

INtime software delivers accurate and repeatable microsecond-level response times without compromising the safety, security, reliability or performance of your system. This dichotomy is managed with the INtime protected mode programming model. Just as Windows applications execute in user mode (ring 3) for greater stability, real-time applications can also execute in user mode. Competing solutions require real-

time applications to run completely unprotected inside the Windows kernel (ring 0) where programming errors that result in bad pointers, stack overruns, page faults, etc. compromise the stability of both the real-time environment and the Windows environment. This is never the case if your real-time application runs within the INtime protected real-time system.



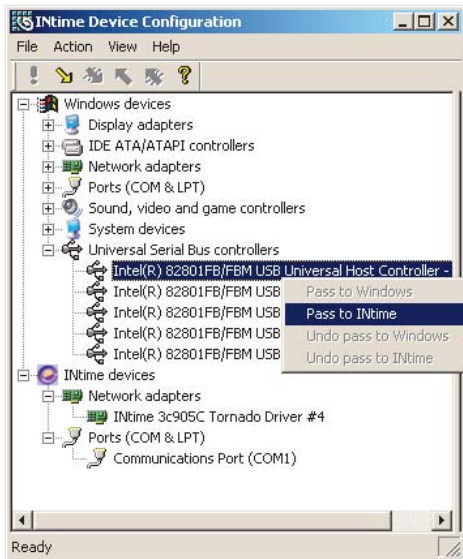
TenAsys real-time operating systems have been proven in thousands of applications worldwide, running millions of flawless execution hours. The INtime real-time kernel supports 256 priority levels and round robin scheduling. It includes a full complement of inter-process communication and synchronization mechanisms for the high-end real-time needs of the most demanding applications.



Support for all uniprocessor and multiprocessor HALs

The INtime RTOS extension for Windows can be used on any platform that employs a standard Microsoft HAL: uniprocessor or multiprocessor. Allowing INtime applications to be deployed on virtually every Windows XP, Windows 2000 and Windows Server system available today.

Comprehensive HAL support simplifies configuration of INtime development and run-time systems by maximizing your hardware platform options; giving you the ability to optimize your system platform as a function of price, performance and features.

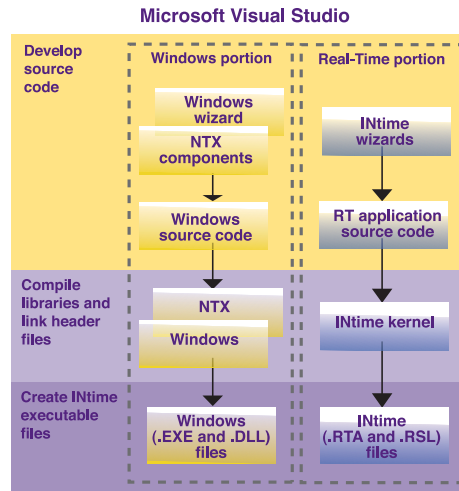


Flexible real-time interrupt isolation

The INtime RTOS supports APIC interrupts, providing significant flexibility when isolating hardware for exclusive real-time use. APIC. An interrupt configuration tool simplifies the process of allocating interrupts between Windows and the real-time environment.

Versatile multiprocessor options

Symmetric multiprocessor (SMP) and Intel Hyper-Threading Technology (HT) systems can be deployed in two different modes: shared or exclusive. In a shared multiprocessor system one CPU is split between the INtime RTOS exten-



sion and Windows (similar to a uniprocessor system), with all other CPUs dedicated to Windows. Configuring a multiprocessor system for exclusive operation dedicates one CPU to the INtime RTOS and its real-time processes, with the remaining CPUs dedicated to Windows and its processes.

Familiar development environment

INtime applications are edited, compiled and debugged with the same Microsoft Visual Studio tools you currently use to build standard Windows applications. There is no reason to purchase or learn new development tools to build INtime applications.

The Windows elements of an INtime application have full access to standard Win32 APIs and MFC libraries; INtime software adds TenAsys' NTX interface to communicate be-

tween Windows and real-time objects of a system. The INtime real-time programming environment includes a native Win32-like API, as well as optional iRMX and iWin32 APIs for porting existing real-time code to the INtime environment. The entire INtime API (NTX and real-time)

is documented using customary context-sensitive help.

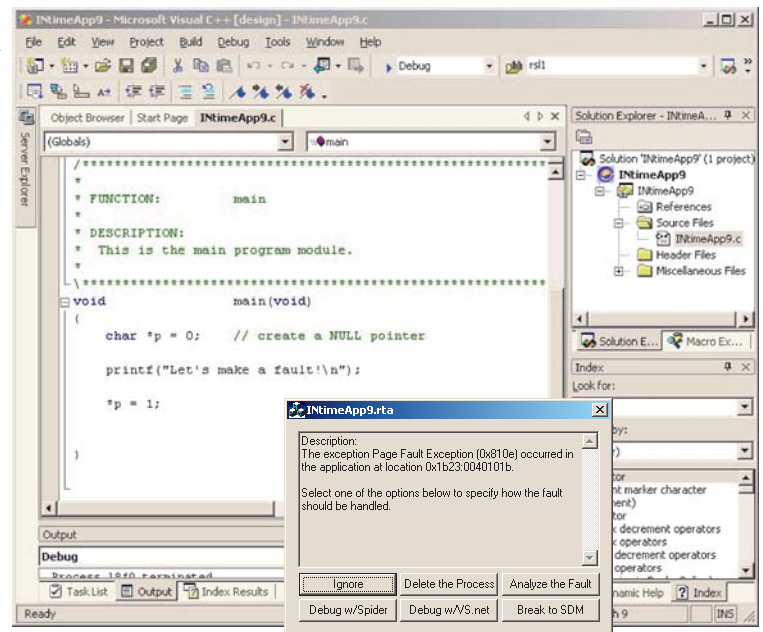
INtime project wizards, included in the Visual Studio development environment, enable quickly building real-time applications. The wizards guide you through many of the design decisions, automatically generating usable code.

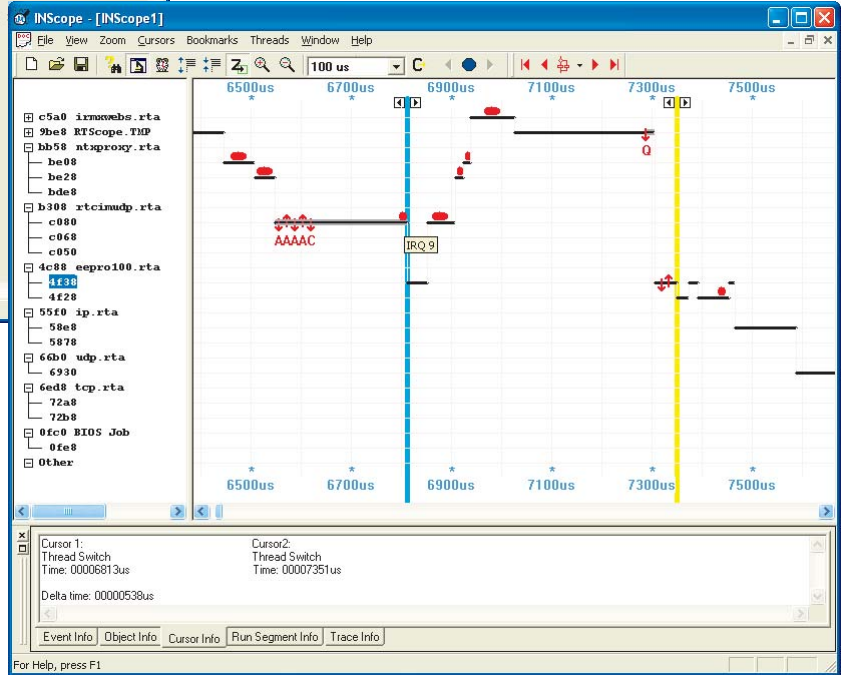
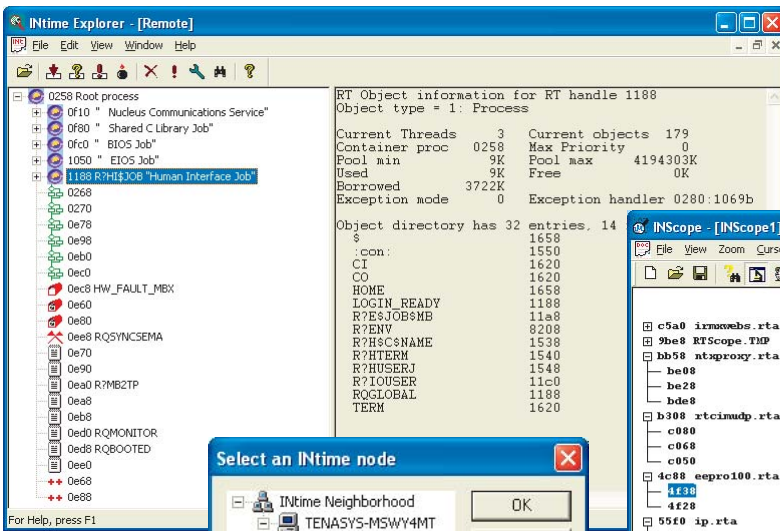
Integrated real-time debugger

Real-time processes and variables are monitored and debugged using the Visual Studio .NET debugger. INtime software includes a real-time debugger plug-in for Visual Studio .NET giving developers full access to breakpoints, source-level single-stepping, and watch variables for real-time applications; all within the standard Visual Studio development environment.

Spider, a stand-alone real-time debugger, is included for Visual Studio 6 developers; it can also be used as an alternate debugger for use with the Visual Studio .NET development environment.

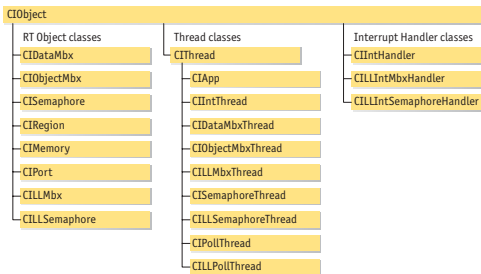
Both debuggers are fully aware of the INtime run-time environment and real-time API and can be used to debug ASM, C or C++ real-time applications. They can also be used to capture and debug real-time process faults generated as the result of divide by zero errors, bad pointer accesses, page faults, stack faults, and other CPU exceptions.





Full C and EC++ support

The INtime ANSI-compliant C and EC++ libraries include support for exception handling and namespaces. An INtime RtClass library provides a complete hierarchy of INtime real-time objects.



Shared real-time libraries: RSLs

INtime real-time shared libraries are functionally equivalent to Windows DLLs. RSLs provide a means for multiple real-time processes to share the same code. An integrated Visual Studio wizard generates RSL project templates and a sample application to illustrate their use and operation.

Dynamic object browser: INTex

The INtime explorer tool (INTex) enables browsing objects on the INtime real-time kernel. Used either locally or remotely, INTex can examine processes, threads, semaphores, mailboxes, etc., to understand where the objects are located in memory and their current state.

INtime real-time threads that fault, for any reason, do not crash the system. Instead, they are suspended and a crash log can be generated for off-line examination or a real-time debugger may be used for immediate analysis.

Real-time system analysis: INscope

The INtime real-time performance analyzer, INscope, facilitates the acquisition of precise time and sequence data of real-time threads. INscope is a Windows application that allows you to trace the execution of an INtime application. Results for thread switches, system library calls and interrupts are displayed on a graphical trace.

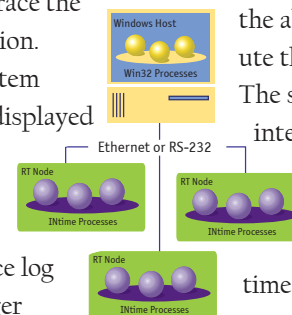
INscope includes an API that gives developers the ability to add custom events to the trace log and precisely control trace trigger points. The INscope API can be used to verify proper operation of time-critical code, as well as proper sequence of events, within real-time applications.

Distributed real-time nodes with Windows-based control

The INtime “remote node” configuration is ideal for embedded, real-time applications that require elements of a real-time Windows system be physically distributed from the center of logical operation. A remote node is an INtime real-time kernel running on a computer distinct from the Windows workstation.

Remote nodes give developers all the advantages of INtime software, adding the ability to scale and distribute their real-time applications. The same INtime API and NTX interface is used to facilitate communication between Windows applications and real-time elements. Real-time executables developed for a conventional INtime system run unmodified on a remote node.

INtime remote nodes also include a local file system, so real-time remote nodes need not be dependent upon 24x7



communication links with Windows in order to load and function.

Real-time access to TCP/IP networks

INtime real-time applications have direct access to a TCP/IP stack without requiring Windows as an intermediary. Applications use a standard sockets API to communicate with dedicated, real-time Ethernet hardware.

Device drivers for a variety of standard Ethernet hardware is included. Visit the TenAsys website or contact us directly for information regarding specific Ethernet device drivers.

Industrial I/O drivers

DeviceNet, PROFIBUS, CANopen, ControlNet, and other industrial communication protocols can be easily incorporated into INtime applications using either direct I/O or real-time device drivers. Without compromising the INtime protected-mode programming

model, real-time applications always have direct access to I/O. The requirement to learn difficult kernel-mode debugging techniques or create unique device drivers in order to access specialized I/O devices is a thing of the past. (Contact TenAsys directly for information regarding specific industrial I/O device drivers.)

USB client development support

A real-time USB stack is included for all three standard USB host controller interfaces: OHCI, UHCI and EHCI.

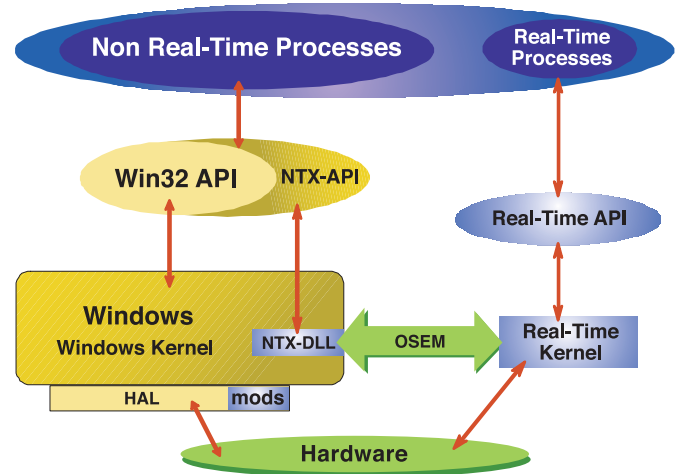
Through this stack, INtime applications can directly utilize USB 1.1/2.0 interfaces for real-time data transfers.

The INtime development environment includes a set of components that enable the creation of USB client software. These components include sample client drivers, header files and libraries.

System Requirements

Minimum Requirements for a Windows PC-compatible host with INtime:

- Intel® Pentium® microprocessor (equivalent or higher) running Windows XP, XP Embedded, 2000, or Server 2003.
- At least 4MB of excess DRAM available for dedicated INtime usage.
- Microsoft Visual C/C++ Developers Studio v6 or .NET (v7).



Ordering Information

INTIME3-DK (INtime Development Kit)

Development license for use on a single Windows computer and two development target run-time licenses. Includes all INtime libraries and APIs; installation and configuration tools; Windows-based performance monitoring, debug and characterization tools; Microsoft Visual Studio 6 and .NET real-time wizards, on-line help and debugger plug-in (.NET only); real-time C/EC++ libraries and headers; and numerous sample applications. Also includes a one year technical support and maintenance agreement.

INTIME3-NK (INtime Network Development Kit)

INtime software development license and development target run-time licenses (see above for content details) configured as a floating network license for six networked development workstations with twelve target run-time licenses.

INTIME3-TL

INtime development target run-time license. One license is required for each CPU kernel on which INtime is used for development, test, and limited deployment scenarios.

INTIME3-RT

INtime production target run-time license. One license is required for each CPU kernel on which INtime is deployed. A redistribution agreement is required. Volume pricing is available.



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