IntervalZero

ProductBrief

February 2015

RTX64 2014 with Service Pack 1

Overview

RTX64 is a key component of the IntervalZero RTOS Platform that also includes x86 and x64 multi-core multiprocessors, and the Windows operating system to outperform real-time hardware such as DSPs and MCUs and reduce the development costs for systems that require determinism or hard real-time.

Symmetric multiprocessing-enabled RTX64 takes full advantage of 64-bit memory and performance capabilities. Uniquely, the RTX64 RTOS scheduler enables embedded real-time applications to directly access the 512GB of addressable physical memory available on 64-bit Windows.

This is critical to modern day real-time systems and represents a gigantic leap from the 4GB physical memory limit of traditional 32-bit Windows systems. The 4GB barrier has stymied innovation in many industries that depend on real-time systems and that require memory access far beyond 4GB.

Determinism

- Guaranteed Precision – set timer periods down to 1 microsecond, and Interrupt Service Thread (IST) latencies of less than 10 microseconds
- Separation from Windows – Windows processes cannot interfere with real-time applications
- Scalability – one scheduler is used across all real-time processors. Symmetric multiprocessing (SMP) aware scheduler utilizes both priority-driven and pre-emptive algorithms to ensure critical thread context switches; and yields to threads of high priority occur in the sub-microsecond range

Control

- Flexibility to configure how much or little processing capability is used for real-time processes (1 to 63 processors)
- Full control of real-time process threads with the ability to load balance as needed. RTX64 provides the ability to set thread and interrupt affinities.
- Peace of mind if Windows issues a STOP message or shutdown; real-time applications have the ability to continue running to safety shutdown

Simplify

- Use a single operating system for applications. RTX64 is supported on Windows 7 SP1, Windows Embedded Standard 7 SP1, Windows 8, and Windows Embedded Standard 8
- Use commercial off-the shelf (COTS) target system; no special hardware required
- Use one development environment - Visual studio 2012 or Visual Studio 2013

- Use common languages (C/C++) for Windows and real-time applications
- Use common Win32 API; same code can be run as a Windows or real-time process
- Use managed code for Windows application and still communicate with your real-time applications
- No driver model to follow; real-time process can talk directly to hardware
- Use standard IPC communication between Windows applications and real-time processes (events, mutexes, and semaphores)
- Use shared memory between Windows and real-time process for sharing of data

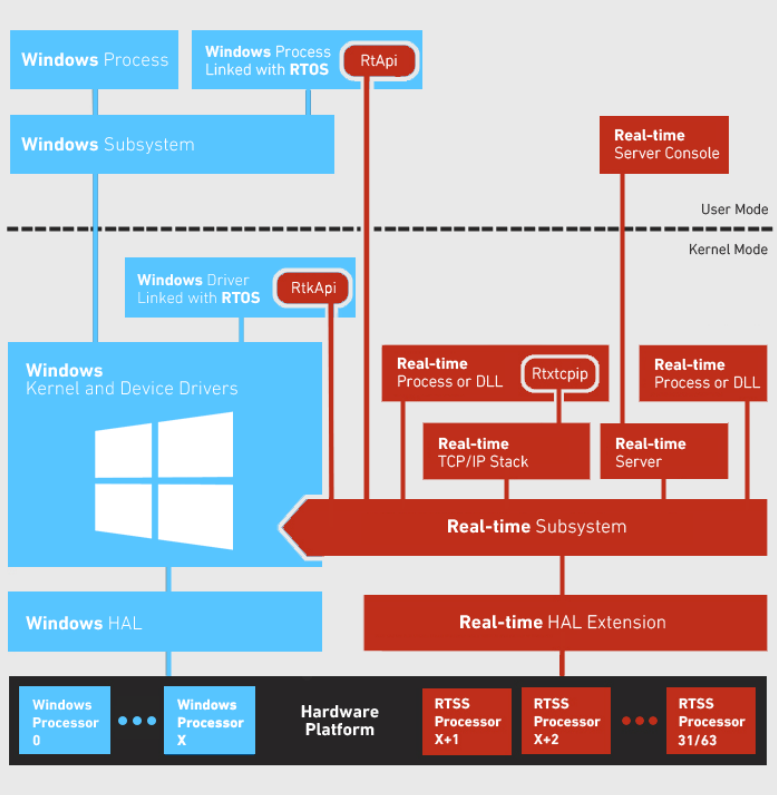
Reduce Costs

- Eliminate additional system to perform the HMI
- Eliminate proprietary controller and communications cards
- Improved asset utilization: Take advantage of underused multi-core capacity
- Reduced manufacturing costs and fewer physical parts

Improve Efficiency

- Eliminate some inventory costs and reduce maintenance costs
- Field upgrades are accomplished through software download rather than board replacement

Architecture



Key Features

Real-time Runtime

- Scalable from 1 to 63 real-time processors
- SMP aware scheduler utilizes both priority-driven and pre-emptive algorithms to ensure critical thread context switches; and yields to threads of high priority occur in the sub-microsecond range.
- Configurable thread and interrupt affinity
- Configurable timer period
- Ability to attach to line-based and message-based (MSI/MSI-X) interrupts
- Shutdown handling on Windows STOP or shutdown
- Deterministic memory
- Access to Windows file system and registry
- Dynamic-link library support through RTDLLs, which can be loaded implicitly or explicitly
- Real-time Inter Process Communication between Windows user processes and real-time processes
    - Native and managed interface for 32-bit or 64-bit Windows processes
    - Objects available: events, mutexes, and semaphore
    - Data sharing through shared memory
- Real-time Inter Process Communication between Windows kernel drivers and real-time processes
    - Native interface for 64-bit Windows drivers
    - Objects available: events, mutexes, and semaphore
    - Data sharing through shared memory
- Windows user groups for limiting access to RTX64 features
- Tools and Utilities
    - Activation and Configuration - activate subsystem components and configure RTSS cores
    - Control Panel – configuration the subsystem
    - Server Console – display print messages
    - SRTM – view system timer to timer handler response on a given core
    - KSRTM – view system timer to interrupt service routine (ISR) response
    - Latency View – view and compare system timer response latencies on multiple cores at the same time
    - Task Manager – display a list of running RTSS processes and Windows processes and drivers linked to RTX64
    - Monitor – configures profiling of RTSS
    - RtPerfMonitor – view total CPU usages on RTSS cores

Software Development Kit

- Headers and libraries for application development
    - Real-time API (RTAPI) similar to Windows Win32 API
    - Real-time kernel API (RTKAPI)
    - Real-time Network API (RTNAPI)
    - Real-time Network Driver API (RTNDAPI)
    - Managed Code Interface (IntervalZero.RTX64)
- Microsoft Visual Studio 2012 support
    - Wizard for application and dll development
    - API Code snippets
    - Microsoft Visual Studio C-Runtime support
    - Local and remote debugger support via launch within Visual Studio
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- Microsoft WinDbg extension and RTSS symbols
- Sample source to show basic concepts

Product Documentation

- Documentation consisting of installation and user guides, API references, and details on real-time programming concepts

Additional Purchasable Features

- RT-TCP/IP Stack provides the following networking capabilities to the RTX64 Subsystem:
    - TCP/UDP/IP networking for RTX64 processes
    - Support for IPv4 and IPv6
    - Winsock support
    - RAW Sockets
    - MAC layer filtering
    - Virtual Network – point to point connection between Windows and RTSS
    - RT-TCP/IP network drivers for a number of common Network interface Cards
    - Utilities (RtssArp, RtssIpConfig, RtssPing, and RtssRoute)