

# INtime® for Windows\* Enables RSI's New Motion Control Platform

Hardware partitioning makes system consolidation possible.



“INtime® Software’s seamless integration with Windows allows our customers to focus on developing their applications in a familiar programming environment.”



TenAsys’ INtime® for Windows\* enables Robotic Systems Integration (RSI) to offer its OEM customers the benefits of a powerful Windows-based development environment, with flexible, multi-axis motion control functionality, all on one cost-effective computing platform.

## Overview

With the increased processing power of Intel\* technology-based PCs, a complex machine that used to require an expensive and dedicated hardware-based motion control solution can now be accomplished on one multi-core PC running a real-time operating system (RTOS). RSI of Chicago, Illinois is one of the leaders in PC-based motion controls technology with its RapidCode API, programmable in C++ and C# for .NET. The company’s mission is to help its customers build smarter machines faster. TenAsys’ INtime for Windows helps RSI’s soft motion controller provide benefits to companies in various industries such as medical, electronics, manufacturing, surgical robots, material cutting, semiconductor packaging, military, and aerospace applications.

## Challenge

The performance and reliability of RSI’s previous motion system products were limited by an inflexible architecture using an analog motion controller and a large number of cables, making it very difficult to customize. The company wanted to replace the analog motion controller with a digital software platform that was easy to program and maintain using a well-supported development environment. The platform also required industry-standard I/O interfaces to devices such as servo amplifiers and motion sensors. Capable motion software, easily customizable in order to accommodate various customer requests such as adding more motion axes to support proprietary interface components, was also needed. With cost savings due to economies of scale as an additional goal, the PC platform was a natural choice to fulfill the customer’s basic hardware requirements.

## Solution

In order to bring reliable real-time functionality to the PC platform, RSI selected the INtime for Windows by TenAsys® Corporation of Beaverton, Oregon. INtime for Windows runs alongside Windows\*, and is able to meet the timing demands of

high-performance multi-axis motion control by explicit hardware partitioning of the underlying processor architecture to give real-time processes direct control over their own CPU core(s). The hardware partitioning is done using standard Windows application program interfaces (APIs), enabling Windows to run without any modification. This makes very efficient use of processor resources compared to other multi-OS configurations requiring hypervisors, as there is no hypervisor layer that consumes computing cycles. INtime Software has been enhanced to make optimal use of the constantly evolving Intel Architecture hardware and software platforms, including providing ongoing support for the Microsoft Visual Studio\* development environment and INtime Software APIs to create Windows HMI and controller applications.

(RSI's RMP soft motion controller can be developed in Windows 10 using Visual Studio 2015.)

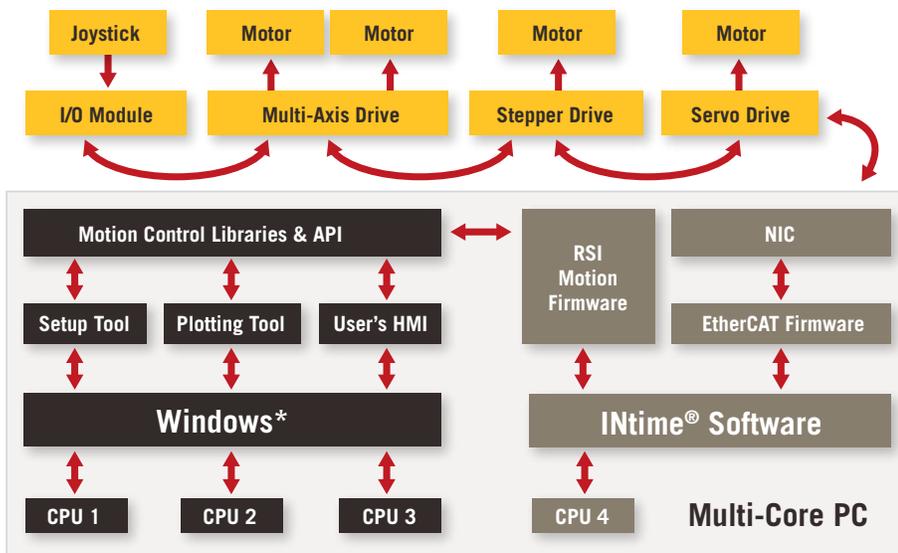
The Figure below shows the architecture of a typical motion system using RSI's software. The real-time portion of the system typically runs on one processor core whereas the Windows portion may run on as many as three cores in a quad-core PC.

### Results

“The great thing about INtime for Windows is that it literally runs in the background,” said Raj Bhasin, Director of RSI. “Unlike other real-time operating systems, which require the use of separate computing platforms for development and execution of the application software, our motion library handles the real-time interaction with the RTOS and all user application development

uses standard Windows tools. INtime Software's seamless integration with Windows allows our customers to focus on developing their applications in a familiar programming environment, while real-time processes are being handled behind the scenes on the same processor platform.”

Raj estimates that a quad-core Intel\* Core\* i7 processor can support up to 64 motion axes operating simultaneously with a loop time of 250 microseconds. RSI's technology illustrates how multi-core PC architecture can host a very powerful multi-function motion system, with the ability to add functionality that would otherwise require additional computing platforms, increasing system costs. The economic advantage that this brings will continue to drive the migration from hardware-centric motion control solutions to software-centric ones.



*The PC-based motion system enabled by RSI and TenAsys software runs motion tools and other standard Windows applications on some cores and the real-time motion runtime environment on a separate core.*