

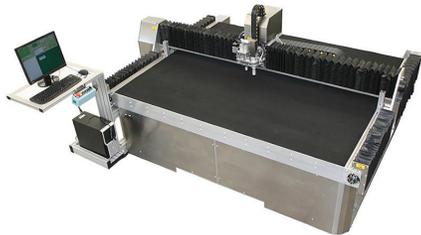
# ISAC Bases New Software CNC on INtime<sup>®</sup> for Windows\*

INtime software brings machine control and human-directed functions together on the same computing platform



“INtime was selected because of superior memory management, superior support of Ethernet, and very comprehensive debugging tools.”

An Intel-based PC architecture makes an ideal platform for implementing highly-integrated CNC machine controllers (Figure 1), reducing system costs by combining human interface functionality with deterministic machine control and network interfacing. The hardware independence that comes with hosting on a standard PC lets customers select the best platform for their needs, and follow the technology as it evolves. With TenAsys' INtime<sup>®</sup> for Windows\* at the base of the software architecture, the Costantino CNC control software suite developed by ISAC is an example of this.



**Figure 1. An Intel-based PC architecture makes an ideal platform for implementing highly-integrated CNC machine controllers**

## Overview

ISAC srl in Italy has developed a new CNC product based on the Intel PC architecture. “There are other CNC software products in the market, but either they are not reliable, or do not constitute a complete, finished product. We wanted to fill this gap,” said Andrea De Nardis, R&D Manager of ISAC.

## Challenge

CNC machines used to contain multiple computing platforms: typically one to support the operator and program development interfaces and process tracking software, and at least one to control the machining process. Multiple platforms were used because the application software supporting the functions was typically hosted on very different operating environments. Many third-party HMI and process control software packages rely on outgrowths of technology developed for PCs, while machine control software typically relies on operating systems that are optimized for responding to hardware-driven events in real-time. General purpose operating systems such as Windows or Linux are optimized for human-directed applications, but cannot respond reliably, in a predictable manner, to high-speed machine processes such as occur in high performance machine tools.

“CNC applications are very demanding of real-time response,” said Andrea De Nardis. Controlling high speed motion between target points involves completing mathematical interpolations in less than 1ms, while network interfaces such as EtherCAT require scan times as short as 250µs. Both operations need to be managed simultaneously, with no missed data, while workload processing continues in the Windows environment. “Windows cannot do that by itself,” continued De Nardis, “We noticed that even on multi-core platforms Windows performance is not good enough, especially during long-term tests. Even so-called embedded

versions of Windows do not offer the required performance characteristics to support CAM applications with powerful HMI, due to lack of memory paging and storage limitations, and they still have the same unwanted task scheduler behavior as the Windows office versions.”

## Solution

Bringing the machine control and human-directed functions together on the same computing platform requires simultaneous support for both operating environments. The key is to use a technique called embedded virtualization, which allows different operating systems, tailored for different types of tasks, to be run on the same platform while preserving the determinism of the real-time OS (see Figure 2).

ISAC engineers looked for an embedded virtualization software solution to serve as the core of the company’s Costantino

software product, evaluating different alternatives and choosing INtime for Windows by TenAsys Corp. “INtime was selected because of superior memory management that allows a process to reserve the memory amount it needs, superior support of Ethernet, and very comprehensive debugging tools including a thread analyzer and strong support by TenAsys,” said Andrea De Nardis.

TenAsys’ INtime operating systems have evolved from real-time OS technology that has been used in tens of thousands of PC architecture-based factory applications since the 1980s. Rather than so-called “real-time-Windows” solutions, which require a modification of the Windows operating environment, INtime runs along-side Windows, supporting deterministic control while continuing to run the Windows OS and all Windows applications “out of the box” without modification.

## Results

By combining processing workloads and taking advantage of the standard PC platform architecture and the embedded virtualization provided by INtime, ISAC’s new Costantino software product allows operators to create programs that monitor the real status of the controlled machine, make changes in trajectory or processing parameters, and immediately check the result. They can make use of binary format computer-aided manufacturing (CAM) software that only specialized software houses offer for the Windows platform. The benefit to ISAC’s customers is high functionality and usability at an affordable cost.

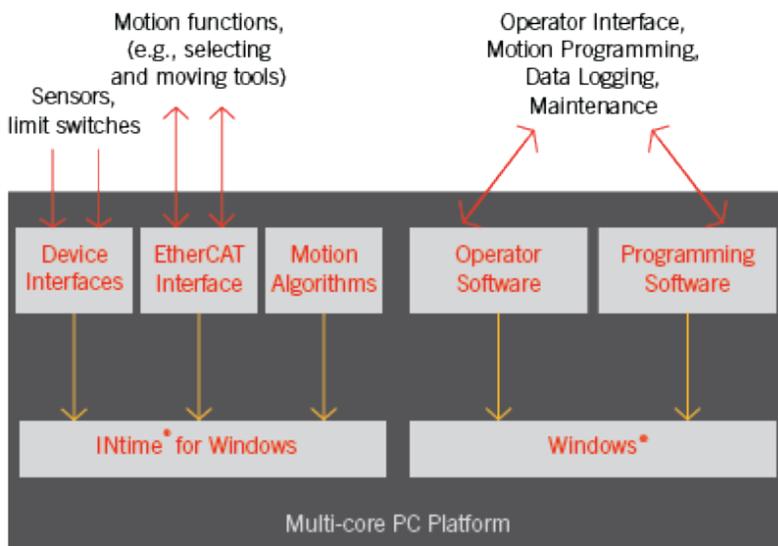


Figure 2. ISAC’s Costantino CNC software suite runs on Windows and INtime, which are co-resident on one multicore PC.