INtime® Software Preserves Abbott Laboratories Intellectual Property While Adding New Features to its PRISM*Blood Screening Analyzers

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Figure 1. The Abbott Laboratories PRISM system

The need to preserve prior investments in real-time software code is a defining factor influencing decisions made in embedded system design. This is particularly important for long-lifecycle applications where stringent agency certification or approval is required. The risks involved in recoding proven real-time software can be huge. Besides the significant cost of agency recertification, subtle incompatibilities can erode customer confidence and destroy chances of meeting market windows. Abbott Laboratories selected INtime® for Windows* as a platform for its blood screening analyzer to maintain software compatibility with legacy systems while enabling the addition of competitive new features to their products.

Overview

"There is a lot going on in the system at any given moment, and the need to maintain the integrity of each sample test is critical," said Brian Murphy PRISM Software Manager at the Abbott Diagnostics Division. "Our real-time software needs to manage hundreds of tasks reliably. There are tasks responsible for controlling each station of each channel, the bar code scanners (one for reagent kits and one for sample racks), the sample manager XY-table, the sample manager pipetting assembly, sample scheduling, data reduction, report generation, report printing, updating the results database, Abbott retest server and external vendor laboratory information system communication, information display, resource/reagent monitoring, heater control, event logging, cycle coordination, and quite a few more," notes Brian Murphy. "When we developed the newest PRISM, we needed to make sure that we didn't change the fundamental elements of the process."

Solution

The core control mechanism in the new PRISM instrument is a quad core Intel architecture-based PC running TenAsys Corporation's INtime for Windows– with the INtime real-time software running on one core and Windows Embedded Standard version 7 running on the rest. Moving to the new platform gives Abbott access to more cost-effective hardware and up-to-date interfaces for communication and I/O, such as USB. Additional advantages include the ability to more easily incorporate new communication protocols for interaction with external systems and to adapt more sophisticated data reporting methods.

In the new system, the control PC connects to multiple microcontroller-based pump controllers and motion controllers within the unit via a BITBUS interface (BITBUS is a simple serial master/slave communications interface that transfers data at 375 kbps.) and bar code scanners. Six different testing channels are supported: five for measurement and one for backup. The control PC sets up each channel as a separate job, or real-time application, to be managed by INtime® Software. Deterministic software is needed to ensure that all instrument channels remain synchronized throughout the process so that reliable operation is maintained. Reliability and accurate timing are essential; even a small number of mistakes or misreads in the handling of each of the 280 samples in the machine would substantially decrease throughput. "And maximizing throughput and uptime of the PRISM machines is critical," said Murphy. "In a lot of the labs that run PRISM, our customers run the machines three shifts per day for 6.5 days per week." The PRISM consists of 10 racks of 28 sample tubes and each rack can be loaded and unloaded upon completion, on the fly during Sample Processing, during an 8.5 hour batch run.

TenAsys' INtime for Windows provides real-time OS functions that run alongside Microsoft Windows Embedded. In Abbott's older machines, Intel's iRMX86® RTOS hosted the operator interface as well as all control tasks. Now, machine control functions are handled by real-time tasks running on the INtime software, freeing Abbott to incorporate new and updated operator interface features via applications running on the Windows* 7 operating system. For example, an old menu-driven interface was replaced with a touchscreen graphic user interface (GUI).

Results

The choice to use INtime for Windows simplified the platform transition, allowing Abbott to port their proven software with minimal changes and then to make upgrades as new OS technology is announced. "The new Microsoft Visual Studio* Integrated Development Environment (IDE) has helped us keep up to date and perform upgrades such as going from MS Visual Studio 2005* to MS Visual Studio 2010*," said Brian Murphy. This approach was critical to maintaining development schedules and for simplifying compliance with the US Food and Drug Administration's (FDA) strict product certification rules. "By migrating the system processor to the latest PC hardware and software technology, we saved costs and obtained access to the latest industry-standard hardware resources," said Murphy. "Embedding a PC in the analyzer has given us the additional benefit of being able to run our development software environment directly on the target hardware, saving development time and effort and simplifying PRISM software and hardware upgrades compared to using separate development workstations."