Automated Test System at ABB Automation Products AB

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The Challenge: Building a PC-based, automated test system for verifying products in accordance with test specifications. We wanted to reduce test times from three weeks to one to two days and build the system with commercially developed products.

The Solution: Using a PXI-based system controlled by NI TestStand and NI LabVIEW.

Introduction
ABB is the world's leading supplier of electrical equipment. ABB Automation Products AB provides, among other things, products that protect people and property.

The System
The test object is a microprocessor-based protection relay. It consists of a complex arrangement of integrated protective functions, including impedance and overcurrent protection. Parameters for these protective functions pass from LabVIEW graphical development environment via the serial port. The test system, which is built around TestStand test executive, then controls and measures all protective functions on the protection relay to verify compliance with the specifications. We use scripts to create test sequences that facilitate development of new tests. Consequently, we only need a text editor to edit data.

Software
- LabVIEW 6i (with GOOP implementation) for Windows NT
- TestStand for Windows NT

Hardware
- PXI-1000B chassis (8-slot chassis)
- PXI-PCI-8335 (MXI™-3 link)
- PXI-6071E (multifunction I/O)
- PXI-2565 (relay-based switch)
- PXI-2503 (relay-based switch)
- PXI-8420 (4 serial ports)
- Omicron Generator CMC-256 EP

The Development Process
To make the LabVIEW application more maintenance friendly, we used graphical object oriented programming (GOOP) as the development methodology. Because LabVIEW is compatible with the code we currently use at ABB Automation Products AB, we reduced our development time. To execute the program without connecting hardware, a simulation mode we constructed, simplifies the development of new test cases. We also used a graphical user interface (GUI) for managing I/O in the system. On this project, the guiding principle was that the generator generates stimuli to the unit under test (UUT), and the PXI feeds back the

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responses from the UUT. We controlled an Omicron generator using an ActiveX interface, which was very easy to control from LabVIEW. LabVIEW is divided into several layers, which facilitates the development of new user interfaces or new functionality. The application-related components are designated as objects in the system’s application layer. The layer that handles hardware is called the hardware abstraction layer (HAL). HAL consists of objects such as analog I/O, digital I/O, and the generator. The figure to the right describes the call hierarchy.

Results
TestStand administers and executes the test sequences that are built into LabVIEW. The customer is very satisfied with this system because:

- Active test time increased by a factor of three, from eight to 24 hours per day
- Test time is now at least ten times faster than before
- Manual testing of the product is automated
- Complete retesting is possible even when we make minor changes to the software in the UUT
- The tests are replicative
- The level of quality is well-defined
- Test results are not influenced by the person performing the test
- Key staff members can now minimize their time
- The test organization is reduced

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