Pi Innovo :

How LabVIEW and PXI keep the music playing at 200 mph

"By placing NI technologies at the heart of the test system, we designed and delivered a customisable automated test solution in just a few working days." - Richard Thomas

The Challenge

Creating an in-car entertainment (ICE) test system, which verifies device performance under harsh vibrations and temperatures, within incredibly tight time and budget constraints.

The Solution

Integrating PTP Sequencer to deliver a cost-effective and highly scalable LabVIEW software solution in a very short time so that Pi Innovo could reuse its existing NI test equipment and have a fully working system in a matter of days.

In high-performance road vehicles, automotive components are subject to harsh conditions; severe vibrations and extreme temperatures are caused by the close proximity to the engine bay. As such, ICE systems and their associated electronic peripherals are required to endure many years of demanding operation without failure. **Rigorous testing** that condenses the equivalent of several years of harsh operating conditions into just a few days is required to qualify the components for long-term use.

Pi Innovo, world-class specialists in electronic solutions for the automotive and transportation markets, approached Product Technology Partners Ltd. (PTP), an NI Silver Alliance Partner, to design and deliver a **bespoke LabVIEW software solution** for existing NI PXI hardware. The company needed a new vibration and temperature approval testing system for automotive audio equipment within a tight timeline.

Hardware

Pi Innovo had an existing NI PXI chassis fitted with various modules, including radio frequency (RF); audio signal generation; programmatic power supply control; switching matrices; and USB multiport control. Up to five devices under test (DUTs) were connected in parallel, each requiring a USB connection to the host, in addition to an RF signal for the antenna input.

The PXI power supply, switch matrix, and USB connectivity modules sequentially connected to each of five wired DUTs, and the PXI-5671 2.7 GHz RF vector signal generator produced controlled analogue and digital radio signals to test audio device functionality. The devices were subjected to controlled temperatures and long periods of vibration, before being booted up in sequence to test USB communications, FM radio, DAB, and Sirius functionality, for continued system integrity.

Software Design

The software design consisted of several levels. With the top-level test executive software built using LabVIEW, a test operator can configure and operate the system, which calls into a library of wrappers that provide extended functionality, such as report generation and status feedback. The individual test modules, written using LabVIEW, perform the brunt of the testing work, relying on several cohesive APIs that provide dedicated interfaces to the hardware.

To assist with DUT diagnosis, manual test applications, also created with LabVIEW, can call and operate any of the tests outside of the automated sequence.

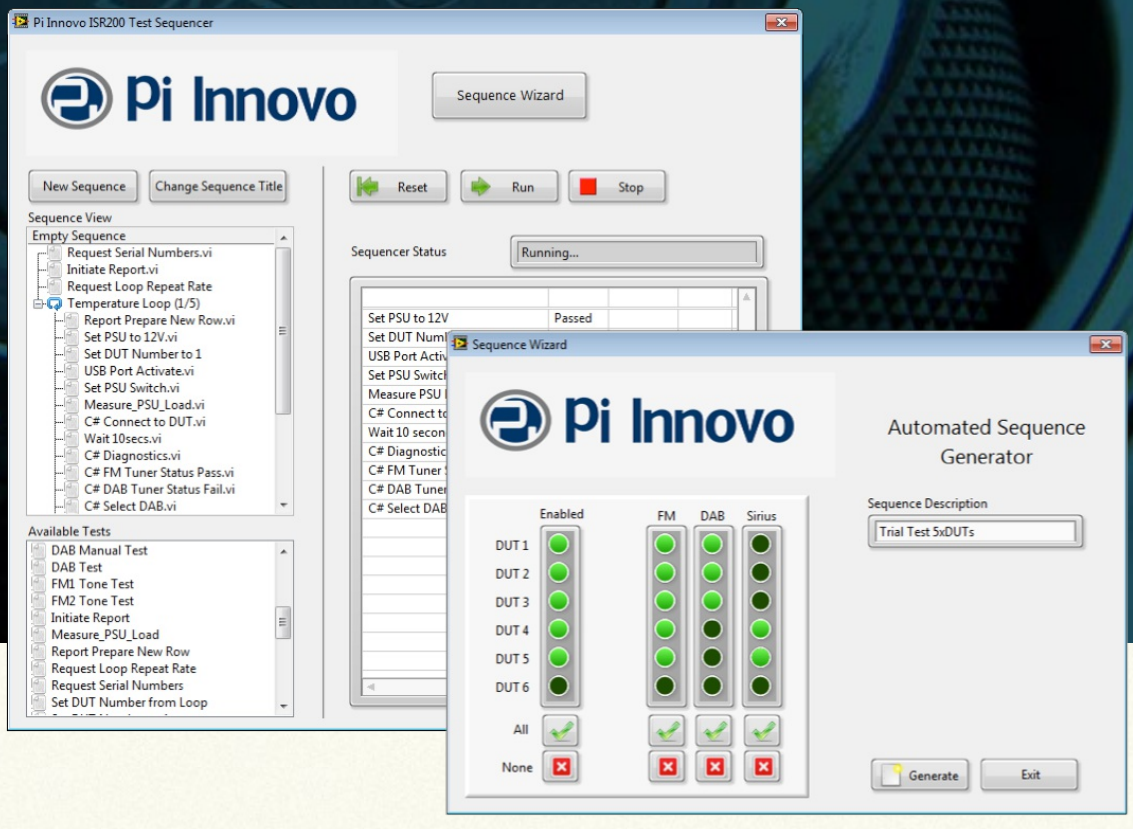
PTP Sequencer

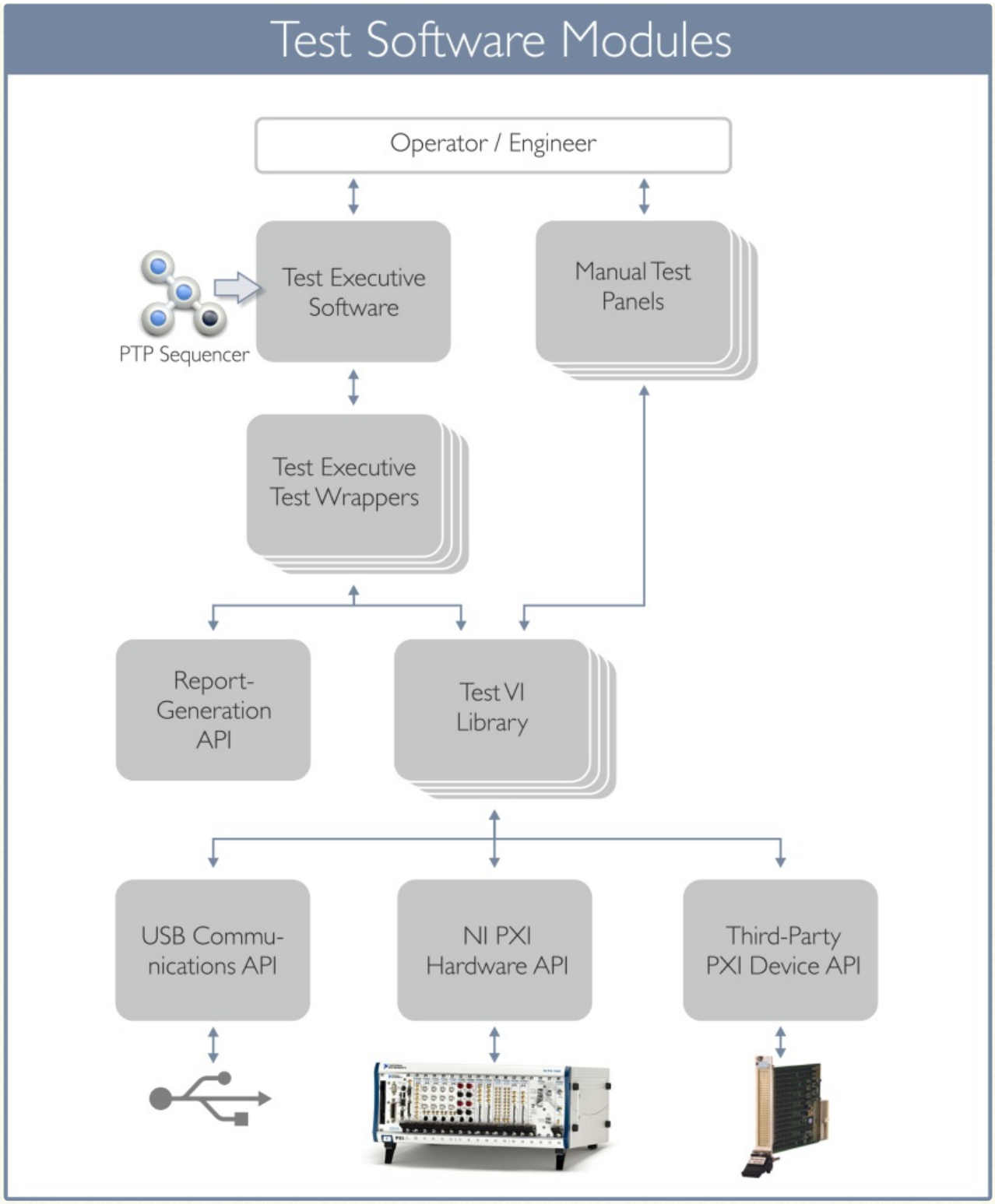
The testing solution had to be dynamic so that operators could configure the test procedures via a simple, intuitive user interface.

Therefore, PTP incorporated the PTP Sequencer toolkit, using the built in XControls to quickly create a solution that provided simple drag and drop functionality for viewing, editing and managing sequence definitions directly within the user interface. Because PTP Sequencer could automatically handle loop definitions with associated variables, it was simple to configure sequences that repeatedly tested a series of devices across a range of definable temperatures for variable periods of time.

We used a class-based, producer-consumer architecture for an easy-to-adopt, simple, contained solution. We based the development on similar architecture demonstrated in the test executive sample project provided with PTP Sequencer.

About PTP Sequencer





Sequence Wizard

To automate long sequence generation, we developed a wizard from which operators could control a DUT, select a test from a table, choose a sequence title, and **automatically generate** the test. This further streamlined the sequence generation process to reduce operator training requirements.

Summary

Using LabVIEW, the PTP Sequencer Toolkit for LabVIEW, and NI and third-party PXI hardware, we designed and delivered a highly configurable, easy-to-use automated testing solution within a very short time.

By integrating PTP Sequencer, we eliminated the need to design complicated sequence-management code, providing sophisticated user-interface components for intuitive user interaction and block diagram functionality for programmatic control.

Furthermore, easily integrating the high-performance NI PXI modular instrumentation and third-party hardware using the accessible and comprehensive LabVIEW driver network meant effortless hardware control. Consequently, by placing NI technologies at the heart of the test system, we designed and delivered a customisable automated test solution in just a few working days.

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Product Technology Partners Limited

The Mount, High Street, Toft, Cambridge CB23 2RL, United Kingdom

Phone: +44 1223 264445 - Email: info@ptpartners.co.uk