



Advanced ESAD and ISD Factory and Field Test Systems

2012 Fuze Conference

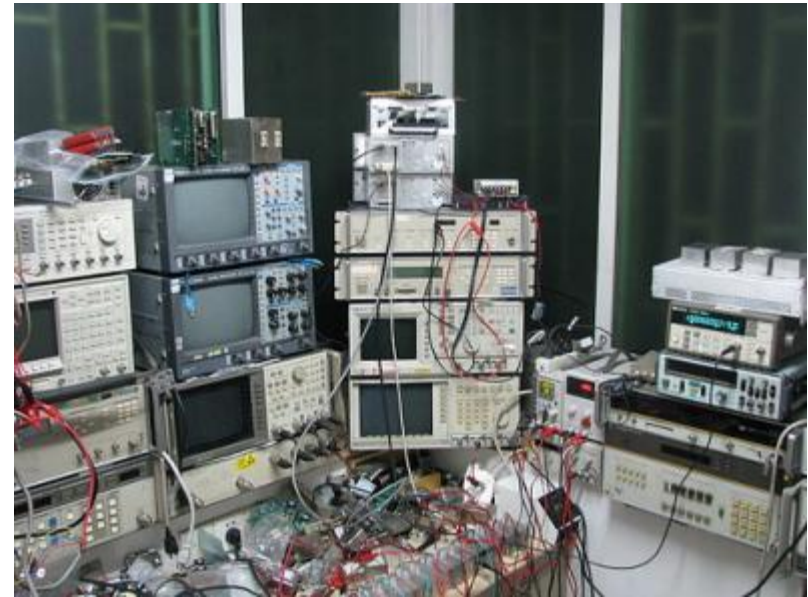
Roy Streetz

ENGAGE. ENABLE. EXCEL.

Does This Sound Familiar?



- *"This new test system will require all new hardware and software and will take 18 months to develop."*
- *"That change has a major impact to the software and will take months to code and validate."*
- *"We only have one test technician who knows how to operate that piece of test equipment."*
- *"If only we could run the same tests at the range as we do at the factory."*
- *"The test system is not available because it is being calibrated."*

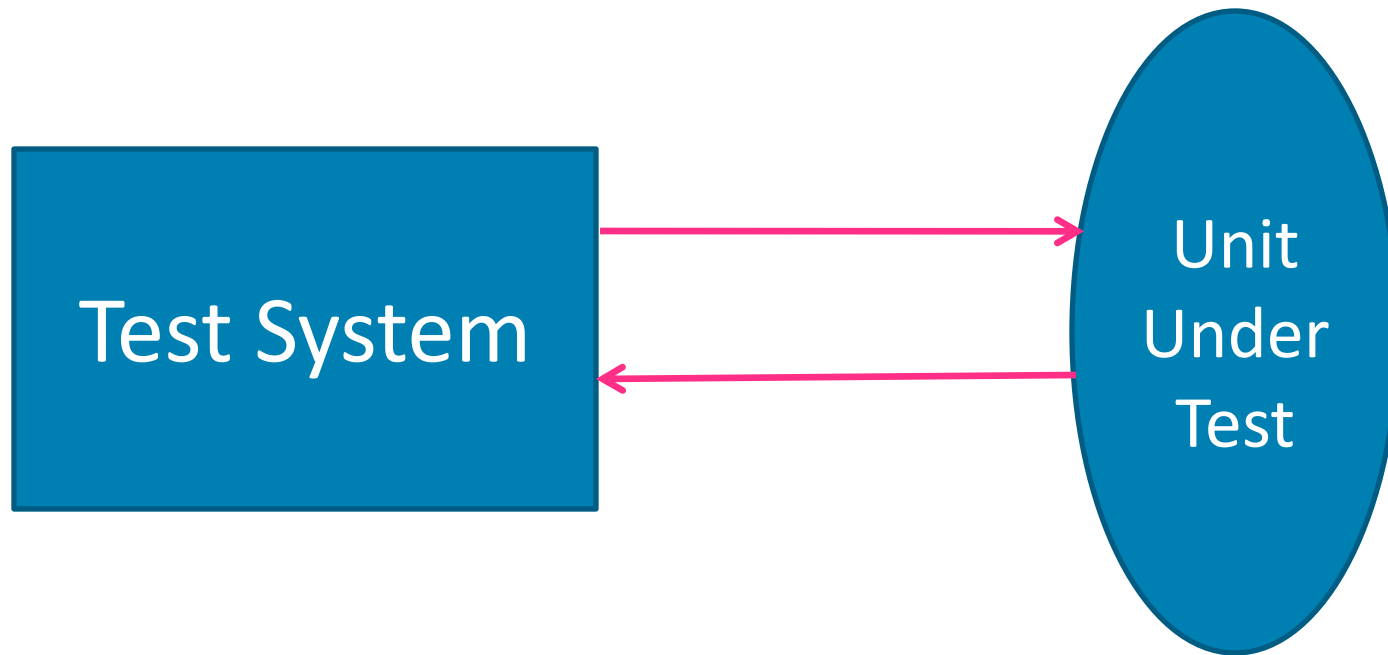


Regression:
"when you fix one bug, you
introduce several newer bugs."



A Simple Model For Testing

- The test system provides stimulus to a unit under test, and then verifies a response from the unit under test.



- The only significant difference from one UUT to the next is the number and type of signals and pinout.



- Common architecture
 - Hardware that is reusable from program to program
 - Hardware that is commercially available
 - Software and algorithms that are re-usable from program to program
 - Network connectivity
- Real Time Execution
- Simple, easy, friendly GUI
 - User
 - Test case developer
- Accessible data
 - Reporting
 - Trend analysis
- Built-in calibration
- Portable





- Server
- Power supplies
- Touch-screen monitor
- UPS
- Network Switch
- SQL database
- System emulator
 - Send signals to UUT
 - Receive signals from UUT



System emulator

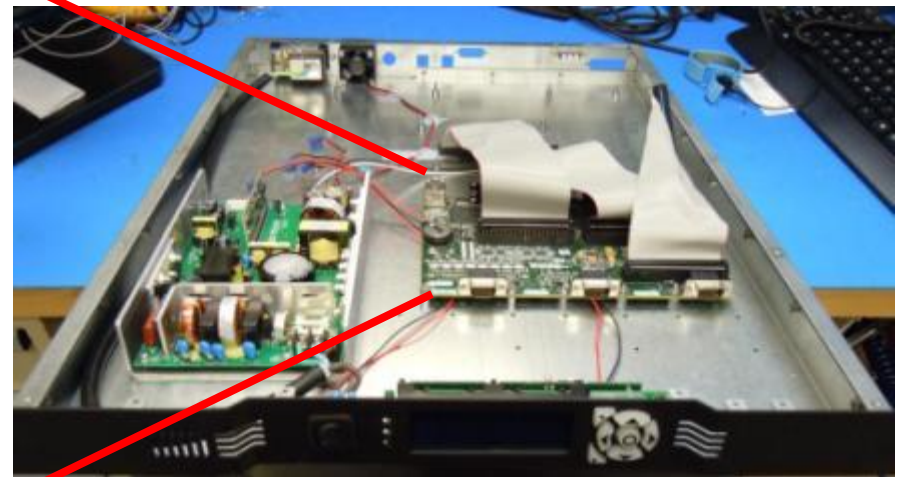
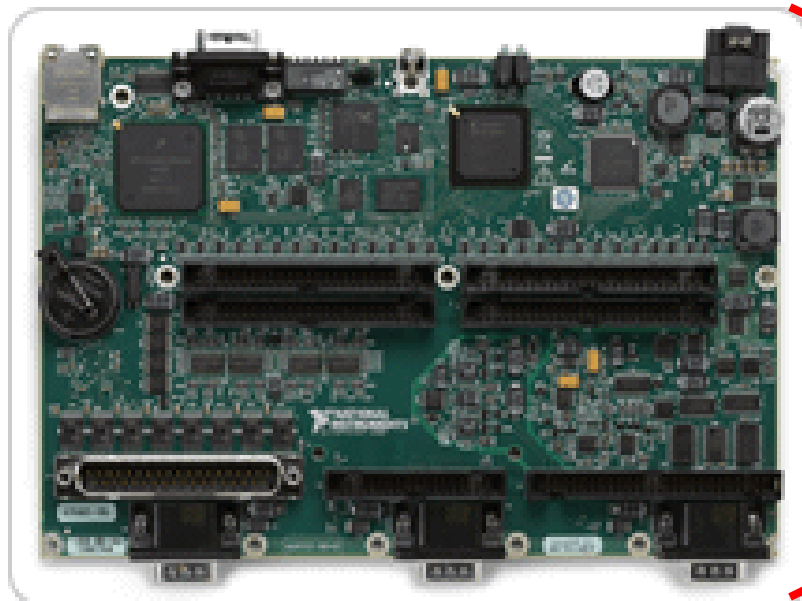


- Firmware
 - Resides on NI sbRIO
 - Microcontroller - communications
 - FPGA – real time test execution engine
 - Has not changed since initial implementation in May-2010
- Software
 - C#
 - Resides on test station server or laptop
 - Standard set of 9 stimulus commands
 - Standard set of 25 verify commands
- Test cases are built from the standard set of stimulus and verify commands
- Test scenarios are built from a group of test cases

Real Time Execution



- National Instruments sbRIO provides real time execution of test cases
 - On-board microcontroller and FPGA
 - 24 digital I/O lines
 - 24 analog-in lines
 - 4 analog-out lines





- Touch screen is intuitive
- Information is clear and easy to read
- Visual pass/fail feedback
- Capability to view plots of signal transitions
- Training takes about 20 minutes





- Developer establishes Stimulus Commands

- Step name
- Time
- Select command type (9 choices)
- Establish value
- Identify output signal channel

The Stimulus Command dialog box contains the following fields and controls:

- Stimulus Step Name:** A text field with the value "Start Launch Pulse".
- Time (in secs):** A text field with the value "1.0".
- Command:** A dropdown menu showing "Analog Output".
- Table:** A table with two columns: "Analog Signal" and "Output Value". It has 5 empty rows.
- Notes:** A text area with "Enter Text" and "Enter More Text" prompts.
- Buttons:** "Update", "Cancel", and "Help" at the bottom right.

- Developer establishes Verify Commands

- Select command type (25 choices)
- Identify start and stop time
- Identify other parameters as required
- Identify input signal channel

The Verification Command dialog box contains the following fields and controls:

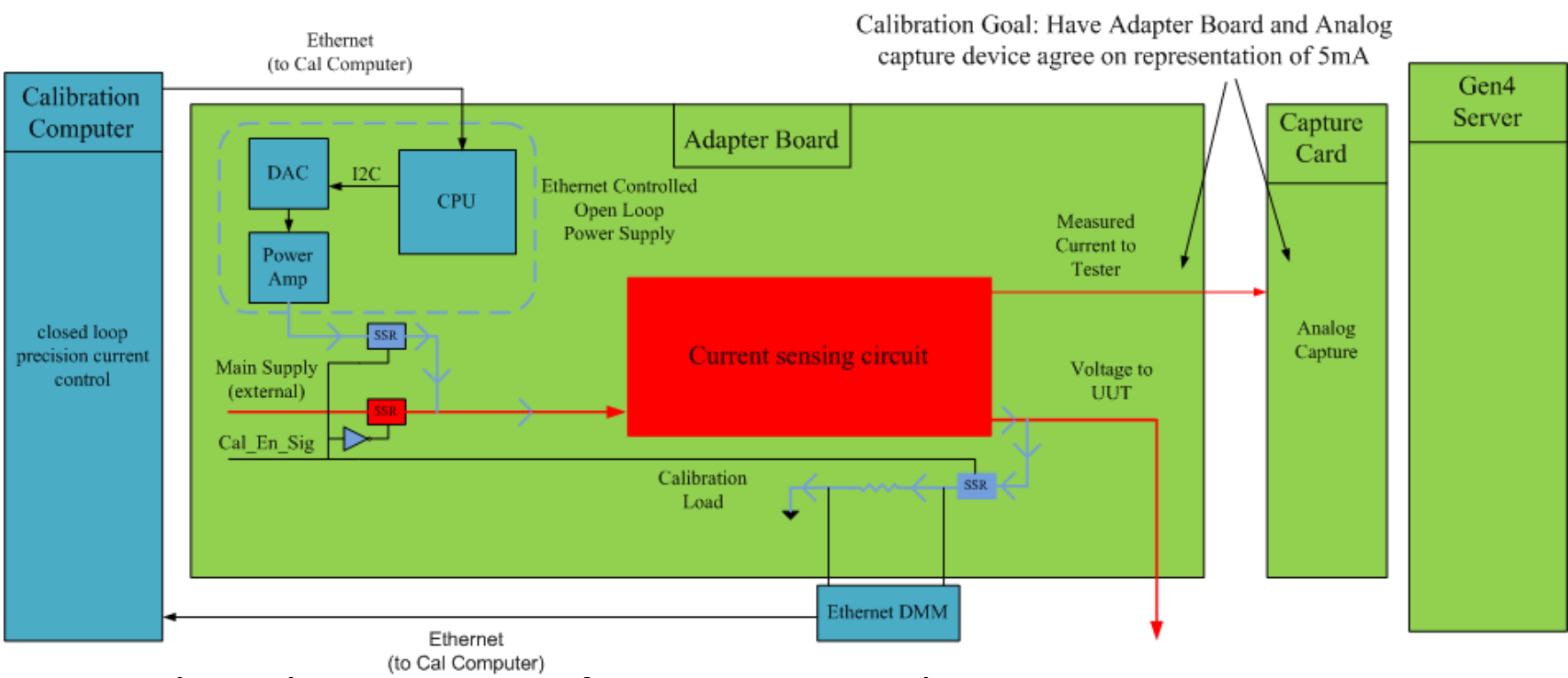
- Command:** A dropdown menu showing "Verify Threshold Crossing".
- Analog Signal:** A dropdown menu showing "+5V_HORN".
- Time Window (in Secs):** Two text fields for "Start" (1.0) and "Stop" (1.1).
- Scale Factor:** A text field with the value "1.0".
- Threshold Value:** A text field with the value "5.0".
- Units:** A dropdown menu showing "Volts".
- Crossing Direction:** A dropdown menu showing "Positive".
- Requirement Reference:** A text field with the value "Document Name, Requirement ID".
- Notes:** A text area with "Enter Text" and "Enter More Text" prompts.
- Graph:** A plot showing a signal crossing a threshold. The y-axis is labeled "Units" and the x-axis is labeled "Time (in secs)". A horizontal dashed line represents the "Threshold". A curve rises from below the threshold, crosses it, and then levels off. A green shaded area under the curve is labeled "Start Time" and "Stop Time".
- Buttons:** "Update", "Cancel", and "Help" at the bottom right.



- All test data is stored in an SQL database
- Data is available as soon as each product test case is completed
- Test reports can be generated from the data
- A new web utility is nearing completion to allow detailed analysis of data



Built-In Calibration for Adapter Board – Design for Service



- No external power supplies required
- Possible to share one power amp with multiple current sense circuits
- Power supply can be re-used to read serial numbers “off line”
 - Calibration voltages sufficient to power UUT to read serial numbers



- The only equipment required to test a unit outside of the factory is:
 - A laptop computer
 - The factory system emulator
 - A power supply



+



+



Upcoming Features



- Thermal chamber integration
 - Tie testing to a specific state of thermal cycling
 - Tie chamber cycling to test completion
- Oscilloscope integration for very fast analog signals
- Analog signal analysis over length of signal
- In-rack calibration
 - Externally accessible points
 - Minimal down time
 - Very little user interaction





Contact Information

Roy Streetz

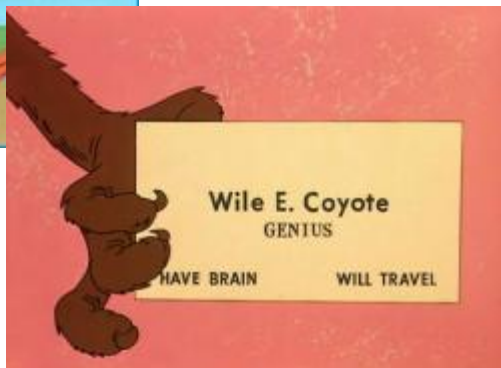
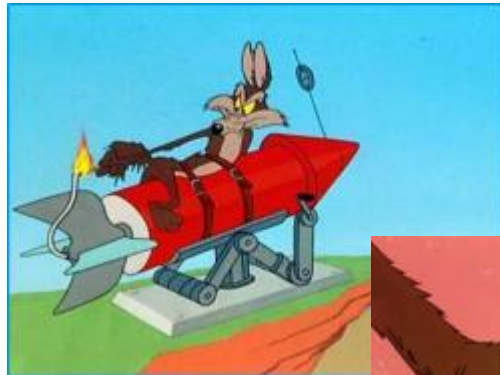
Site Engineering Leader
(937) 353-2242
roy.streetz@excelitas.com

Dr. Barry Neyer

Chief Technology Officer, Defense
(937) 865-5586
barry.neyer@excelitas.com

Andrew Stelmack

Director of Business Development
(937) 353-2252
andrew.stelmack@excelitas.com





ENGAGE. ENABLE. EXCEL.



Excelitas has developed and implemented a fourth generation electronics test system for ESADs and ISDs that can be used for product development, testing in the field, and factory test. The advantages include: real time tactical operation of the unit under test, a common hardware and software architecture that can be applied to a wide variety of ESAFs and ISDs to dramatically reduce development time and cost, scalability to fit program volume requirements, a unique graphical user interface to provide technicians with proper feedback as tests are performed, and data storage in an SQL database during factory test. Test cases in the form of command buffers and verify buffers are also stored in the database. Development engineers can create the command and verify buffers to thoroughly test their products during the development process.