Test Automation - The Challenge

- Integration of different types of equipment from a variety of manufacturers
- Each device needs to follow the same test schedule
- Data output may be in multiple, incompatible formats, requiring manual labor to generate consistent reports, which is very time consuming

*Letters represent a variety of manufacturers*
The **iTest** real-time test automation platform addresses all these challenges.
Test Automation Systems are required for a wide range of applications, from simple to complex:

- **Simple and repetitive**
  (e.g. component testing)

- **Mid-level**
  (e.g. small engine, durability, end-of-line)

- **Complex**
  (e.g. Hybrid e-motor test system with simulation capabilities)
Platform Overview

**iTest.Micro**
- Pre-configured "Out of the box"
- Library of standard applications

**iTest.Standard**
- Configurable & expandable
- Typical applications:
  - Durability
  - End of line
  - Performance testing

**iTest.Pro**
- Fully configurable and expandable
- Typical applications:
  - R&D
  - Simulation
  - Advanced custom
Platform Fundamentals

- Powerful scripting engine
- API for 3rd party OCX and DLL development
- 12k user channels
- Parallel execution
- 20 kHz logging
- 1kHz control
- EtherCAT
- Long term commitment
- Continuous development
- Provides all tools required for application development
- 3rd party device support
Modular by Design – use Steve’s format

System core code is designed for performance and flexibility using direct memory access
Graphical user interface designed to make it quick and easy to implement the desired displays for the test system
• Visual interactive displays and controls
• Automated test schedules
• Runtime editing capabilities
• Message manager
• Support for legacy displays
Display Editing

• Build new displays from scratch
• Copy Elements
• Edit Properties individually or in groups
2D Map / Drag Drop Into Properties

- 2D Map enhancements allow use without Scripting
  - Axis is tied to channel, Rate is a property
  - ex. 2D map as limit value input

- Drag and Drop Properties
  - Channel name into property manager
  - Easy system configuration
FlexEdit

• User interface allowing configuration of the runtime system. Some configurations may be changed during runtime (no rebuild required)

• Workflow guides operator through a required process. Completed tasks can be checked off to indicate progress

• Mapping Tools
  – CAS, CAN, ASAP3 are available in FlexEdit
Schedule Creation and Editing

- Define new test schedules, including column types, channel associations, actions and messages.
- Schedule steps can be defined as time based and/or task based.
- Each step can have a mode control associated with it, and can change from step to step bumplessly.
- Master Schedule feature supports Schedule of Schedules and/or Schedule of Procedures.
- Allows runtime editing without a rebuild.
Master Schedule

- Additional layer of automation allowing higher-level sequencing of schedules and procedures.
- Write tests without the use of scripts or other programming methods.
- Defined and controlled at run-time via the Master Schedule Panel.
- Many master schedules can be created, however, only one master schedule can be active at a given time.
System Limits

• System constantly monitors if channels are inside defined limits for protection

• Monitoring can be test-segment specific (e.g. lower oil pressure allowed during engine start)

• Warnings or violations can be indicated via the controls and specific procedures can be initiated
• Define delay times for noisy signals
• Warning and fault actions for HW protection
• Modify for test segment specific operation
  (e.g. Lower oil pressure allowed during engine start)
• Values can be parameterized
Data Quality

Prevents wasted test time

• Groups for specific test segments (e.g. IDLE vs. WOT)
• Plausibility check options, including High/Low, Tolerance, Formula
• DQ violation handler
• Tool to evaluate DQ violations
Data Logging

• Define Channels to log (Log Order Lists)
  Create Channel list one time for multiple logs or different log types

• Define log types - transient, average, snapshot

• Can be test-segment specific

• Multiple concurrent data logs

• Log rate can change during test
  (e.g. slow data for overview and increased rate during some events)

• Black box “flight recorder”
Data Storage

- Multiple files can be created in parallel
- File names can be defined, incremented or created in code
- Data output is converted to ASCII format that is compatible with most data analysis software packages
- Data files are organized by project and can be managed and synchronized with LabWorX
ASAM MDF v4.1 File Format Support

• Currently used for transient logging
• Compresses binary format
• Most tools in automotive R&D support
  – UniPlot, NI Diadem, FlexPro…
Data Log Browser

• Standalone data viewing tool
• Browse data files and easily graph data
• Draw reference lines and calculate difference
I/O Channel Configuration / 2D Maps

- I/O hardware channels
- Properties
- Scaling
- Ranges

Map enhancements allow use without Scripting
- Axis is tied to a channel, Rate is a property
  ex. Map as a limit value input

- Customer names and aliases
- Activate limits
- Data Quality
- Statistical functions
Calibration Tool

Allows full, multiple-point calibration or zero/span compensation; multiple channels with the same stimulus can be calibrated simultaneously.
PID Loop Definition

• Define control loop type, tuning parameters, control frequency and channel associations

• Active PID loops and setpoints can be changed during runtime; switch between modes, multiple active PIDs
PID Tune

Allows live updating of tuning parameters which can be saved to existing or newly created groups; includes a square wave generator to continuously cycle input for fine tuning the system response
Device Interface Library

• Large Device Library allows for seamless integration of instrumentation from many suppliers

• Customer can choose the best device available in the market

• Many generic device drivers are available

Note:
In case of an upgrade from ADAPT to iTest, customer can reuse licenses for modules/drivers already purchased
Scripting (VCL)

• Simple, easy-to-learn programming language for creating custom actions
• Integrated debugger
Python Scripting Support

• Python is now integrated with iTest for performing non-realtime tasks difficult to accomplish in VCL
• Python 3.4 interpreter included with iTest 3.7 install
• Integrated as “PythonEngine” driver
• Can read/write to RDB from Python
• Python mailslots supported
  – Send/Receive
• Scripts at Solution or Installation
• Several debugger options
iTest Reports

Legacy reporting tool serves as an alternative to UniPlot for quick, simple reports (pass/fail, etc.); supports multi-page reports, and multiple display objects, and includes a utility for creating report templates

Multi-language support for platform software and custom user displays
Additional Features

• Network independent – system can run standalone; data is recovered/transferred when network is restored

• Runtime changes including on-line calculations and displays (no rebuild required)

• Fast script build/compile times (e.g. 10,000 user channel system < 2 minutes)

• Security for user level access control

• Multi-language support for platform software and custom user displays
Expandability

iTest is Extensible

Grows with your test lab

- Simulation
- ORION
- Add new devices
- iTest RT | iTest Config
- iTest.Lite (Runtime)
iTest Offline Development Suite

Provides the environment for developing new solutions or updates with full simulation for test execution, data logging and event control.

Test system updates without using valuable test cell time or risking hardware.
Safety Belt

Software Protection Program that secures the value of your test system

• Keep software current
• Minimize system downtime
• Minimal yearly fixed cost
• Easy access to updates and documentation
• Reduced rates for standard training classes
• Annual releases
• Quarterly official patches
The iTest Platform is core to many A&D products.

### 2008 v2.3
- Sequences
- Alternate Names
- 1kHz Logging
- Data Quality
- Runtime Unit Conversion

### 2010 v3.0
- Battery Testing Enhancements
- Patch Sync with LabCentral
- 1kHz Control Loops
- q-series I/O support
- Test Formula

### 2011 v3.1
- 2D (Map) Lookup tables
- Data Transport Delay
- LabCentral File synchronization
- Support Encrypted Files

### 2012 v3.2
- Win7 Support
- Full Double precision support
- User Define Functions
- Native VCL Arrays
- Step Tasks and Conditions

### 2013 v3.4
- New Schedule Runner
- New SysAction State Machine
- Intime 4.2 Multi Core RTOS
- Multi Language Displays
- 10,000 User Channels
- LabCentral Module SVN
- 5kHz Logging
- FlexEdit Interface

### 2015 v3.5
- Automation Panel Interface
- Intime 5.2 RTOS New Enhanced Network Stack
- 12,000 User Channels
- Generic EtherCAT driver
- Revised help system
- FlexEdit Enhancements
- 2015 v3.5
- Automation Panel Interface

### 2016 v3.6
- Windows 10 GUI Support
- Up to 20kHz data logging
- Master Schedule
- Many AutomationPanel Enhancements
- Data Log Browser Tool
- 2D Map Enhancements
- Q.Station Support

### 2017 v3.7
- Python Integration
- ASAM MDF 4.1 Data File
- Many Test Manager Enhancements
- Many AutomationPanel Enhancements
- Many FlexEdit Enhancements
- Windows 10 RT Support
- Intime 6/Xenomai/AD-XPRTS RT OS Support
Thank you!