DSI international, inc.

eXpress™ Newsletter

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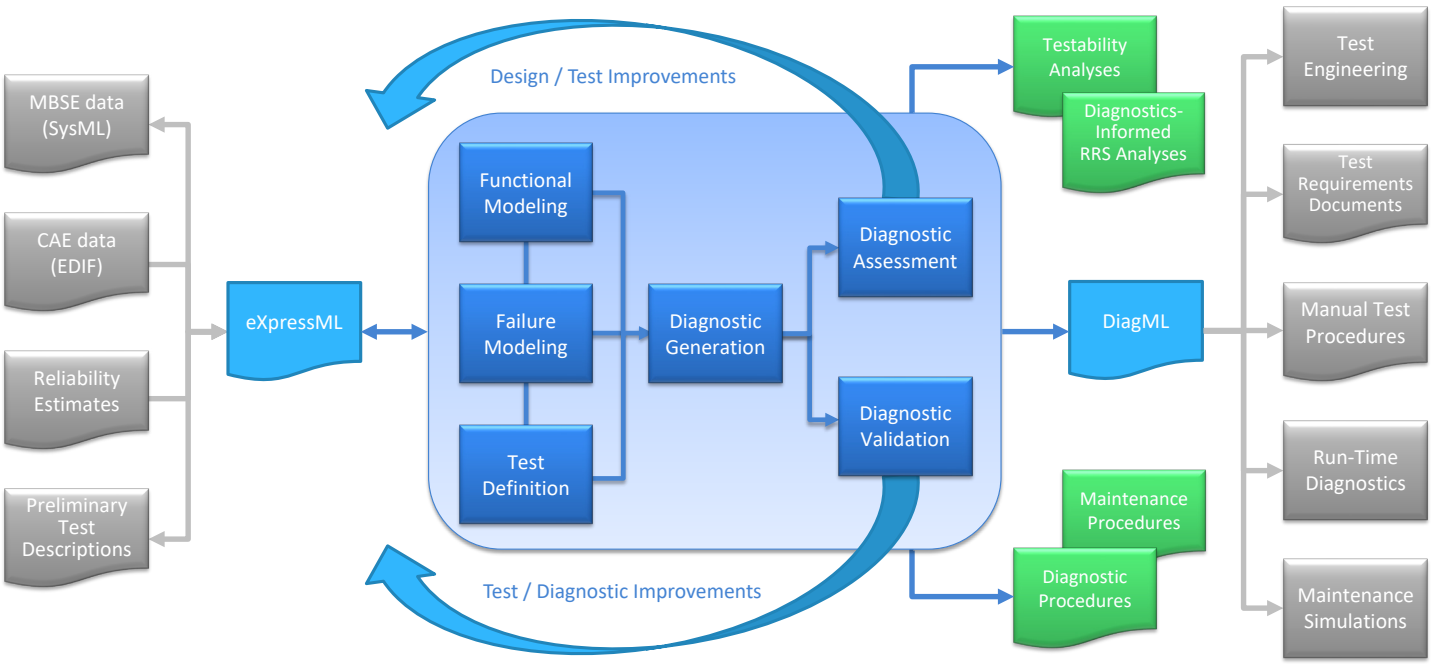
Turning the Digital Gaze Inward

Digital engineering is clearly an idea whose time has come. As more and more enterprises commit themselves to model-based engineering solutions, industry is finding itself on the verge of a new era in which interoperability and multi-purposing become the norm rather than the exception.

Diagnostic Engineering is comprised of two activities—the assessment of a design's diagnostic capability and the development of the actual diagnostic procedures used during production, maintenance and system health monitoring. Often, these activities are performed by different groups using different data.

Model-Based Diagnostic Engineering



There's little doubt this burgeoning emphasis on interdisciplinary sharing will ultimately improve both data integrity and process efficiency. It is important, though, that individual disciplines also turn their gaze inward, seeking out ways in which a digital upgrade can transform their own *internal* process flow.

With the advent of model-based diagnostic engineering, organizations will no longer have an excuse for keeping these activities separate. Fielded diagnostics will utilize the same tests and procedures as design-time assessments, eliminating a serious disconnect that plagues most design-for-sustainment activities.

Inside this Issue...

Latest Software Versions

• ***eXpress***	7.5.3	8/23
• ***eXpress*** Design Viewer	2.2.0	5/23
• Run-Time Authoring Tool	6.2.5	7/23
• DSI Workbench	5.1.4	5/23
• STAGE	Act II, Scene 3	10/16

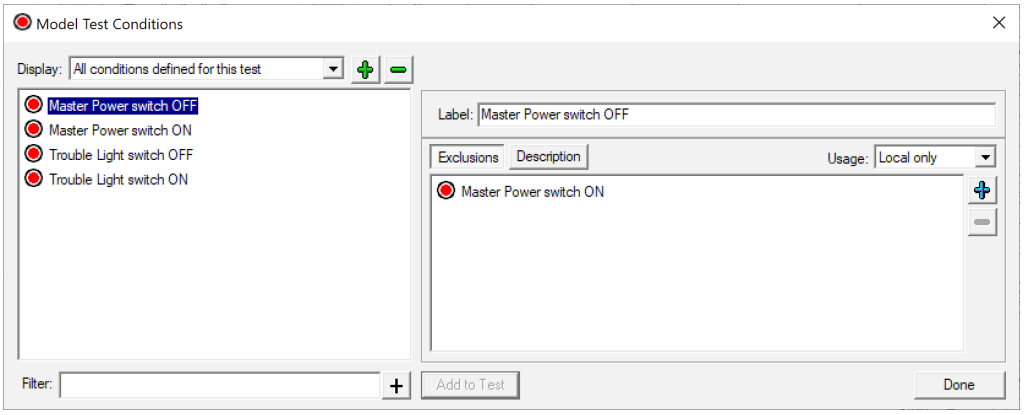
New in *eXpress* 7.5.3 — Conditions & Substeps

Two new test implementation property types have been added in the latest version of ***eXpress***—test conditions and substeps. Along with the existing test implementation properties (measurements, stimuli, limits & resources), these allow manual or automatic procedures to be defined for individual tests in an ***eXpress*** model.

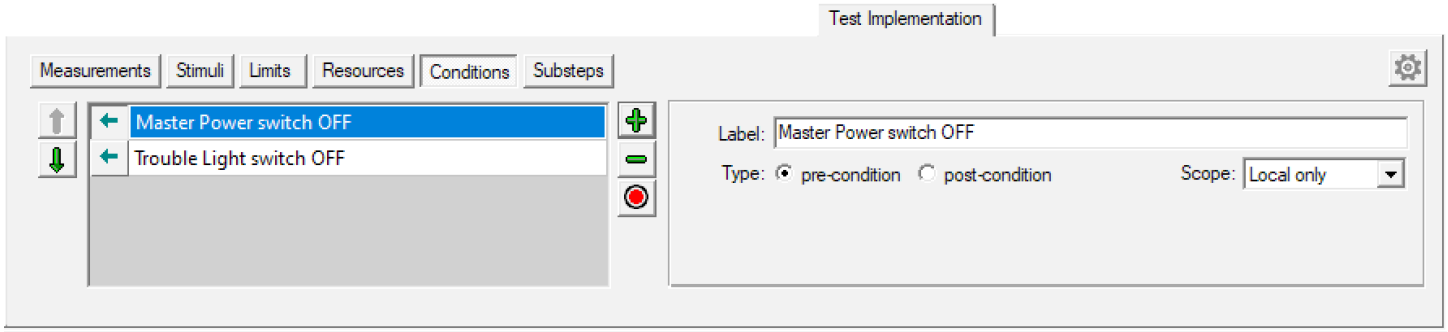
Before conditions can be referenced within a test, they must be added to the model.

For each condition, all mutually exclusive conditions are specified (on/off, open/closed, etc.).

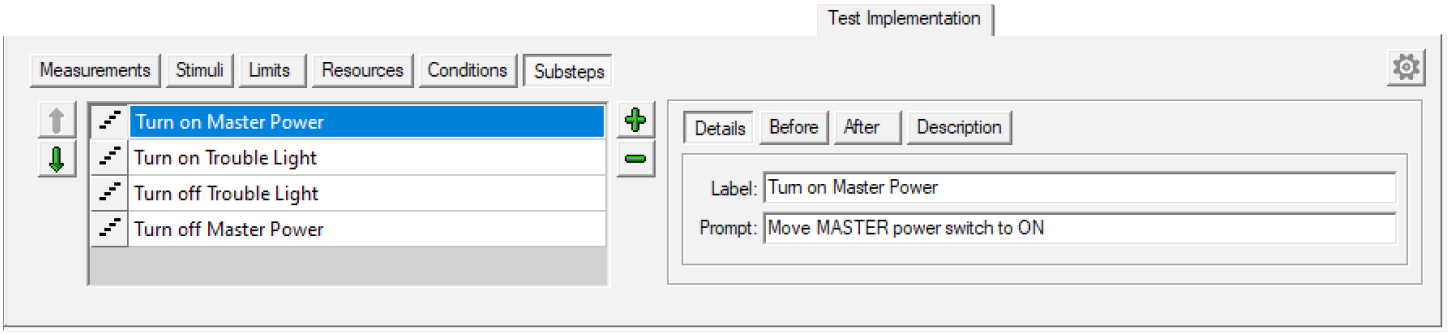
Unlike object states, conditions are not mapped to functions and have no impact upon test coverage.



Once they have been defined, conditions can be referenced within individual tests, where they are marked as being either *pre-conditions* (expected conditions prior to the test being performed) or *post-conditions* (conditions that result from having performed the test).



Unlike conditions, substeps are defined directly within the test itself. They represent the various tasks involved in performing that test. For each substep, there are “before” and “after” lists where pre-conditions and post-conditions can be defined for that substep, along with the required resources.



Now, although it is usually not the responsibility of diagnostic engineers to define detailed test procedures, we recognize that digital integration is constantly creating new *synapses* in the digital universe. The ***eXpress*** test implementation properties enable this information to be imported & exported along with the test definitions, thereby maximizing the usefulness of eXpressML and DiagML models within a digital thread.

Improved in *eXpress* 7.5.3 — FTA Scalability

With the increased interoperability provided by digital integration, engineers are now able to rapidly create models with sometimes astonishing amounts of detail. Soon it will no longer be unusual for top-down engineering analysis activities like Fault Tree Analysis or Sneak Circuit Analysis to be performed for an entire system, yet incorporate design details down to individual components or circuits.

This type of scalability has long been a feature of the ***eXpress*** diagnostics, which have been optimized so that diagnostic procedures containing millions of test nodes—isolating faults at any level of indenture—can be generated quickly and efficiently for even the largest of systems.

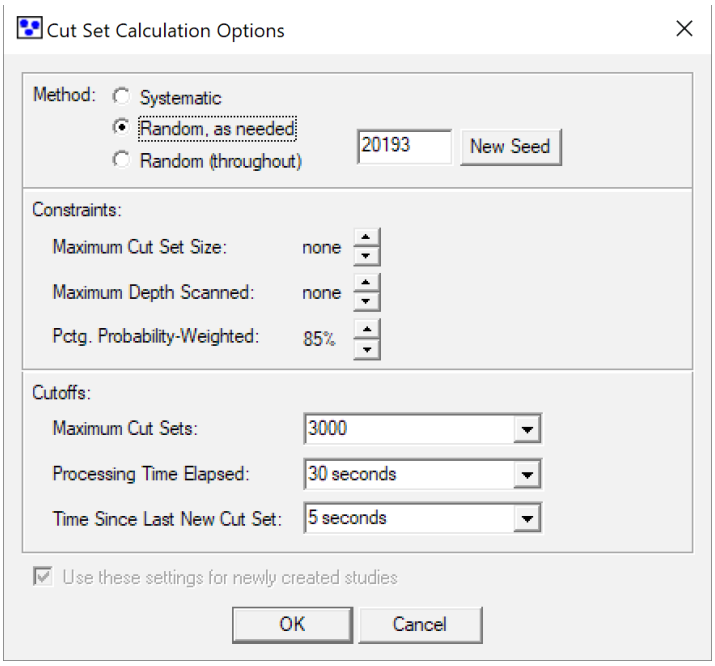
In the latest release of ***eXpress***, we have introduced a series of enhancements to the FTA module so that fault tree analysis can be performed quickly and efficiently for large, complex fault trees (where standard analysis techniques would result in millions of cut sets).

Cut sets are the specific combinations of failures that can result in a critical event, so it is imperative that the software be able to identify cut sets effectively for large systems. Accordingly, the most impactful enhancement to the ***eXpress*** Fault Tree Analysis module is the ability to identify cut sets by traversing the fault tree randomly, rather than systematically.

By default, when the systematic approach identifies more than a specified number of cut sets (the default is 3000), the software automatically switches modes and identifies cut sets randomly until a specified cutoff is met (total number, processing time, etc.).

A Monte Carlo process is used so that the software quickly finds the cut sets that are most likely to occur. The analyst can specify what percentage of random traversals should be probability-weighted (the default is 85%) with the remainder being fully random.

This allows the most likely cut sets to be identified, without completely ignoring less likely failure combinations (or, more specifically, combinations of failures whose failure rates *indicate* that they are less likely).



Additional improvements to handle large fault trees include:

- preventing the display of infeasibly large fault trees as a single diagram
  (with the option to either disable the graphic representation of the tree or view using multiple pages)
- ability to disable the calculation of the “optimized” fault tree
  (in which events are reorganized to prevent branches with multiple occurrences of the same event)
- a new “Fault Tree Info” dialog that displays information about the highlighted event and/or the overall tree
  (this allows a fault tree to be investigated using the Explorer Tree when the graphic diagram is disabled)
- improved fault tree navigation
  (including a new “Center Selections” operation)

It's That Time of Year Again...

With autumn on the horizon and summer beginning to appear in our rear-view mirror, our annual road trip once again brings us to the east coast for AUTOTESTCON.

August 28–31, 2023.
Gaylord National Convention Center
National Harbor, Maryland, USA

Come say Hi at our booth in the Exhibit Hall, where we will be performing new and improved demos of a standards-based digital thread for diagnostic and test engineering.

Spherea's Benjamin Bossa with DSI Workbench at ATC 2022.

On Wednesday afternoon, during the technical sessions, Eric Gould, Ion Neag and Chris Gorringe will present their paper "Standards-Based Digital Thread as Authoritative Source of Truth."

Also, Eric and Ion will be teaching a Monday morning tutorial on digital thread technology in which they will delve into the formats used (and discuss some of the lessons learned) while implementing a standards-based digital thread for test & diagnostic engineering.

Training Course Schedule

Course Number	Prerequisite	Course Description	Dates	Location	POC
CE-334	none	Continuing Education: Working with Attributes in Hierarchical Models	September 12, 2023 One 90-minute session	Virtual: Webex	info@dsiintl.com
TLS-100	2 hours home study prior to first session (video)	System Diagnostics Concepts and Applications Basic Modeling & Introduction to Testing	Starting September 25, 2023 Eight 4-hour sessions (Mon-Thu for 2 weeks)	Virtual: Webex In Person: Orange, CA	info@dsiintl.com
CE-335	none	Continuing Education: The ***eXpress*** Error Checker	October 10, 2023 One 90-minute session	Virtual: Webex	info@dsiintl.com

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