eXpress™ Newsletter

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DSI's New Electronic Design Automation (EDA) Import Module

Integrating your testability environment with the design engineering environment allows for vital information to be exchanged, at a time in the development process when concurrent engineering has far reaching benefits. However, realizing a link between these two environments presents challenges that can often exceed most of the potential benefits. To ensure that the benefits are achieved with the least overhead, having both a well-defined process and a smooth translation capability is essential.

The need for integrating testability and design engineering arises from the desire to reduce long-term maintenance costs through savvy testability practices and allows testability metrics to influence design changes. This simple feedback of information can be characterized by two paths of data—the flow of design data to the testability environment, and the feedback of recommendations back to the design environment. As the data in each path can be radically different, we will examine each path independently.

Over the last several decades, DSI has provided various imports from EDIF, Mentor, Cadence, etc. We are now proud to announce the latest generation of import. This new import capability is the highest quality import available today, and utilizes a new XML standard called EDAXML (an XML form of EDIF). As part of this new capability, we have teamed up with E-Tools who provide a CAD/CAE interoperability product called E-Studio, which can convert to and from nearly all of today's major CAD tools (Cadence, Mentor, DesignArchitect, Viewlogic/Innoveda, PADS, P-CAD, OrCAD and most any EDIF formatted file). When integrated with ***eXpress***, the two tools provide the capability to import objects, ports, nets and attributes with full naming retention while mirroring object layout and positioning.

CAD/CAE tools, also known as EDA tools, are used at many points in the development process. Moving data into the Testability environment can take different paths depending on when the initial transfer first takes place, as well as the actual configuration in which the EDA tools and Testability tools were implemented.

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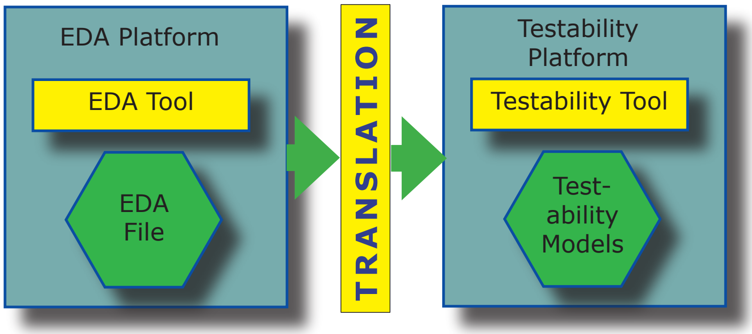
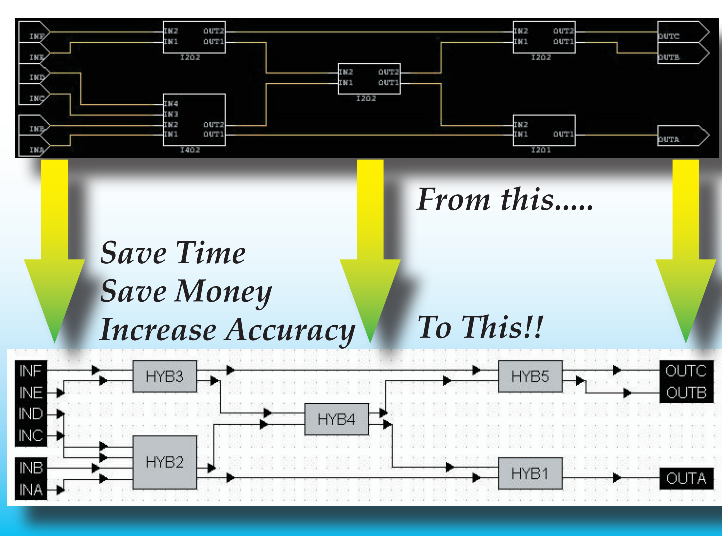
The architecture by which data is moved from the EDA to the Testability environment involves two key translation steps. The diagram below shows a generalized overview of the two step process. Depending on a customer's needs, the deployment scenario may vary.



Testability, when taken to its full extent, involves more than just the assessment practices used to analyze the inherent diagnostic capabilities of a given system. Testability's biggest impact comes from incorporating a design influence process, hopefully throughout the entire development. Regardless of the extent to which design influence is realized, the link from the Testability Environment back to EDA is an important one.

The most common changes to the EDA design as an influence of discoveries made through Testability Analysis is that of test point placement. There are also system-level recommendations that filter down to the EDA environment such as the redundance and implementation approach.

DSI's ***eXpress*** teamed with E-Tools E-Studio now provides the capability to transition analysis data with design data in either direction.



"Been There . . . Said That . . .Wrote the book, too!"

As the role of testability grows, so does the confusion over terminology. Although standards are often the thing that bring convergence to the terminology problem, it takes time for such standards to emerge. Most recently, DSI has seen an increase in the quest for specific definitions related to Testability, Diagnostics and Health Management.

Historically, DSI has continually contributed as a pioneer of Model-Based Testability . In fact its founder, Ralph De Paul, was recognized as "The Father of Testability". DSI continues to carry the torch today as the only remaining commercial tool provider that provided first-hand input to MIL-Std 2165, MIL-Hdbk 1814 and continues to be active on future IEEE Standard Committees.

With the current void in active standards, DSI has established a set of definitions that can be used freely and uniformly.

****Add these two valuable sites to your Favorites****

www.Testability.com - widely used definitions relating to Testability, Reliability and Maintainability
www.DiagnosticModels.com - insight to the many forms, purposes and limitations of Diagnostic Model representations

Structural Model – A model that represents only connectivity and parts, usually imported from a CAD/CAE tool using a net list or a transfer format such as EDIF. The pin-outs of parts are usually identified, although their flow direction (input, output, bidirectional) may not be. Also, power and ground pins are not always enumerated within the structural model. Lacking signal flow, a structural model is ***not*** a dependency model.

Topological Model – A model that supplements a structural model with information about signal flow (both between components and *within* components). A high-quality CAD/CAE import can often derive a topological model directly from engineering data, provided that flow information or additional part libraries are available upon which to create the flow. Although a topological model can be represented in dependency model format, it is not in and of itself a diagnostic model, since it contains no information about testing.

Non-Topological Model – A model that represents elements of a system, device or process without representing the relationships between those elements. Although easier to develop than topological models, non-topological models (when used for diagnostic applications) force the user to model test coverage explicitly. Because of this, non-topological models are mostly useful for documenting legacy or fully-developed diagnostic designs, since the lack of topology renders these models more or less useless as an aid for determining test coverage. Non-topological models are sometimes also used for modeling "black box" devices, when engineering details are not available.Although a non-topological model can be represented in dependency model format (so, for example, the model could be utilized by a model-based diagnostic engineering tool), the resulting model will consist of a set of unrelated first-order dependency statements. In other words, there would be no upstream or downstream relationships between the different elements in the model. Like topological models, non-topological models are not diagnostic models in and of themselves, since they contain no information about tests.

Diagnostic Dependency Model – A single or multi-dimensional dependency model that collectively represents the relationships between testable events and the agents (functions or failure modes) responsible for those events. Because they must abstractly and conditionally account for dependencies beyond simple functionality, diagnostic models are sometimes difficult to correlate directly to a specific drawing of a system, device or process.

Functional Diagnostic Model – A diagnostic model whose agents are based exclusively on function space. Although a functional diagnostic model may include elements based on negative function space, it lacks the ability to correlate members of the two spaces. Functional diagnostic models are particularly useful as a tool for influencing a diagnostic design during early design phases (since functional descriptions of a design can be developed before the implementation specifics have been worked out). Functional diagnostic models can then be supplemented with lower-level data (sometimes imported directly from CAD/CAE databases) as it becomes available. The biggest disadvantages of functional diagnostic models are that they are not easily mapped to FMECA data and that they must sometimes be translated into failure mode diagnostic models before they can be used to implement run-time diagnostics.

Functional Diagnostic Dependency Model – A functional diagnostic model that has been represented using a single or multi-dimensional dependency model.

Failure Mode Diagnostic Model – A diagnostic model whose agents are based exclusively on failure space. Although a failure mode diagnostic model may include elements based on negative failure space, it lacks the ability to correlate members of the two spaces. Although failure mode diagnostic models provide a useful link between FMECA analysis and run-time diagnostics, their usefulness as a tool for influencing a diagnostic design is severely limited (since failure mode diagnostic models cannot be developed until relatively late in the design process, when specific failure modes have been identified).

Failure Mode Diagnostic Dependency Model – A failure mode diagnostic model that has been represented using a single or multi-dimensional dependency model.

Hierarchical Diagnostic Model – An extension of diagnostic dependency modeling that allows for the representation of the relationships between components, functions and tests at multiple levels of a design's hierarchy. Because the relationships between higher-level (parent) and lower-level (child) functions are modeled, for example, these models can be used to support hierarchical diagnostic inference (for example, when a parent function is proven good, all of its child functions can be inferred to be good; conversely, when all of a function's children have been proven good, then the parent can be inferred to be good).

Hybrid Diagnostic Model – An extension of diagnostic dependency modeling that allows the inter-relationships between tests, functions and failures to be captured within a single representation of a system, device or process. Although a hybrid diagnostic model draws agents from both function and failure spaces, it is more sophisticated than a classic diagnostic dependency model in that it also represents the inter-relationships between functions and failure modes (rather than only the relationships between these agents and tests). Because of this, these models can be used to support hybrid diagnostic inference. Hybrid Diagnostic Models embrace the advantages of both functional and failure mode diagnostic models, allowing the same model to be utilized for early diagnostic design influence, FMECA development/ assessment, diagnostic performance predictions, and run-time diagnostic development.

Single-Signal Modeling – A simplistic approach to dependency modeling in which the diagnostic model is comprised exclusively of first-order dependency statements in which individual agent (function or failure mode) dependencies are always associated with the same first-order event dependencies. With this approach, signals are always dependent upon all upstream agents; furthermore, the number of signals of which each agent can be a dependency is constrained by the modeled topology. Single-Signal Models are typically only used for trivial classroom examples and can rarely be applied successfully to real-world applications.

Multi-Signal Modeling – An approach to dependency modeling in which individual agents (functions or failure modes) may appear in multiple first-order or nth-order dependency statements in a diagnostic model (representing different signals) with differing event dependencies. This approach, which does not necessarily require a multi-dimensional dependency model, provides the ability to trace signals through a path of components without involving every failure mode in the path. Although the term Multi-Signal Modeling appeared in the late 1990s, it represents a modeling approach that has been in use since the inception of dependency modeling in the 1950s. The biggest drawback of this approach is that multi-signal models are often time-consuming to develop and consist of large amounts of low-level data that is not easy to modify as the design changes. This effectively relegates modeling to a role of diagnostic performance prediction (typically performed relatively late in the design process), rather than early diagnostic design influence (which demands models that can be updated iteratively with relative ease). One alternative to multi-signal modeling is the more proactive approach of Passive-Active Flow Modeling.

Passive-Active Flow Modeling – An alternative to Multi-Signal Modeling that begins with a Topological Model and then, by propagating input signals along the various signal flow paths using active and passive propagation, generates a full representation of signal propagation. When combined with Test Overlay Modeling, Passive-Active Flow Modeling can generate the same complex dependency models that are produced by Multi-Signal Modeling, yet without the time-consuming signal definition task that renders most Multi-Signal Modeling efforts unsuitable for diagnostic design influence. Moreover, because Passive-Active Flow Modeling involves automatic signal propagation, it can be easily utilized with a variety of graphic representational schemes. This means that the graphical representation of a model can more closely resemble a schematic, management diagram, or picture of the system, device or process—thereby facilitating communication with engineers, managers, and customers/end users.

Test Overlay Modeling – A method of creating a diagnostic dependency model by overlaying short-hand test definitions upon a topological model. Each test definition (which contains information such as the test location, monitored stimuli, test symmetry, interference handling and exceptions) are applied as constraints upon the signal flow represented within the Topological Model, resulting in a full-order dependency statement for that test. The full set of dependency statements derived in this manner collectively comprise a Diagnostic Dependency Model. When combined with Passive-Active Flow Modeling, Test Overlay Modeling can generate the same complex models produced by Multi-Signal Modeling—with a fraction of the effort. Furthermore, if the Topological Model is supplemented with information relating failure modes to their affected functions, then Test Overlay Modeling can be used to generate a Hybrid Diagnostic Model. Test Overlay Modeling is an extremely effective way of reducing the time needed to develop and update detailed, low-level Diagnostic Dependency Models (thus allowing these models to be feasibly employed within an iterative design evaluation process).

eXpress* Modeling** – The diagnostic modeling methodology implemented within DSI International's ***eXpress tool. Using both Passive-Active Flow Modeling and Test Overlay Modeling techniques to reduce the time burden associated with multi-signal modeling, ***eXpress*** automatically generates full diagnostic dependency models to support its internal diagnostic development and assessment routines. This approach makes ***eXpress*** modeling uniquely suitable for analysis tasks in which a design will be updated or elaborated over time (a sore spot for traditional dependency modeling). The nature of the diagnostic models that are automatically generated by ***eXpress*** is largely dependent upon the type of data included in the ***eXpress*** model. For example, if an ***eXpress*** model contains asymmetric tests, object states or operating modes, then the resulting diagnostic model will be based on a multi-dimensional dependency model. If there are multiple design levels modeled in ***eXpress***, then a hierarchical diagnostic model will be created. If both functional and failure information has been modeled within ***eXpress***, then the automatically generated model will also be a Hybrid Diagnostic Model.

Training Schedule

Course Number	Pre-requisite	Course Description	Dates	Location	POC
100		Concepts and Applications	2 Aug, 2004	Orange, CA	Denise Aguinaga , DSI
110		Basic Modeling	2 Aug - 5 Aug, 2004	Orange, CA	Denise Aguinaga , DSI
120	110	Test Concepts and Development	5 - 6 Aug, 2004	Orange, CA	Denise Aguinaga , DSI
200	120	Diagnostic Development and Assessment	9-10 Aug, 2004	Orange, CA	Denise Aguinaga , DSI
210	200	FMECA Development and Assessment	11 Aug, 2004	Orange, CA	Denise Aguinaga , DSI

Newsletter Now Delivered via E-mail

DSI International offers the convenience of having the ***eXpress*** newsletter now delivered by E-mail. For some customers, this is a more desirable, efficient and timely method of receiving our newsletter. The postal system can sometimes be slow in delivering and companies may also be slow in distributing once mail is received. Since E-mail appears to be one of the most common methods of communication used in the workplace, it may be the best way for some to receive our newsletter. If you would prefer to receive future newsletters by way of E-mail only or both E-mail and hardcopy, please let us know.

Contact Denise Aguinaga at DSI:

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Web Hosted Knowledge-Base for eXpress

DSI International continues to expand capabilities to provide our customers with the very best educational and reference resources to address the expanding technologies of diagnostics. As part of this ongoing effort, DSI introduces a new web hosted KnowledgeBase which can provide a quick reference for those looking for specific information to either solve a problem, answer any questions or just expand the gray matter.

The KnowledgeBase will help user find answers to common questions and not so common questions.

eXpress engineering techniques

eXpress software features

DSI Experience and Expertise

Training and Much More!

The KnowledgeBase will continue to be expanded upon as more information is added and as customer inputs are provided.

So go check it out at: www.dsiintl.com/kb/default.aspx

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As the leading seller of Diagnostic Software & related Diagnostic Engineering Services, DSI understands the importance of quality service and support. To meet the needs of our customers, we offer a wide array of technical support and service programs developed to address the time-critical issues and stringent diagnostic requirements prevalent on many of today's programs. DSI is ready to help with specialized software development, diagnostic modeling and analysis, advanced mentoring, data management processes and a host of customizable support services to address specific customer needs.

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