

Crossfire

Validation of Library Integrity

Getting a consistent cell-library out the door is a tough job. All too often during the design-process, library integrity problems like un-routable pins, incorrect Verilog or missing delay arcs lead to failing tools, cryptic error messages and at best to unnecessary extra design-effort. In times of shortening product life cycles, increasing market pressure and design complexity, high quality libraries are a must to complete a design in time.

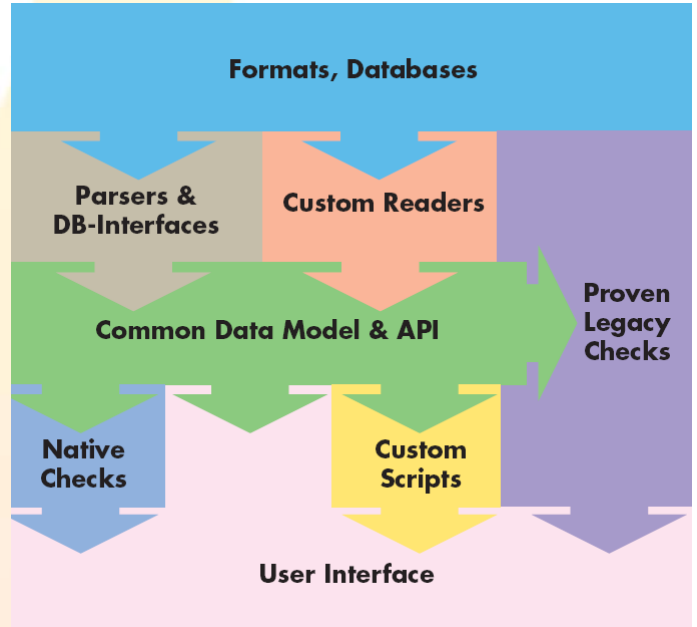
Crossfire addresses this problem by providing automated validation of library integrity. Crossfire will read all the various formats, databases and views, from schematic to Verilog, Liberty and physical layout, and cross-checks the cell-descriptions to ensure consistency. In addition, Crossfire will assess cell quality aspects such as pin routability and timing table sanity.

By providing such automated integrity checks, Crossfire is filling a gap left by the variety of tools, formats and EDA vendors involved in producing and consuming cell-libraries. Each tool demands its own format, and will optimize a design, based only on the descriptions in its private format. Since EDA vendors offer little or no support in this area, consistency between formats has traditionally been at the mercy of cell library development teams. The standard library integrity validation solution offered by Crossfire can integrate complementary in-house developed solutions to create a complete library signoff environment.

Crossfire is used by both cell-library teams and design-flow teams within CAD organizations. Before a new revision of a cell library or a tool flow is released to the design community, a Crossfire run assesses quality and tool-compatibility of the cell-library. Crossfire's extensive error reporting directs users immediately towards the cells that contain potential hurdles for timely completion of deep submicron ASIC design.

Crossfire Solution

Crossfire works by layering a common datamodel over all the supplied formats. All integrity checks operate on this common datamodel, either through the Crossfire GUI or through the API inside customer specific checks. This is illustrated in the following figure:

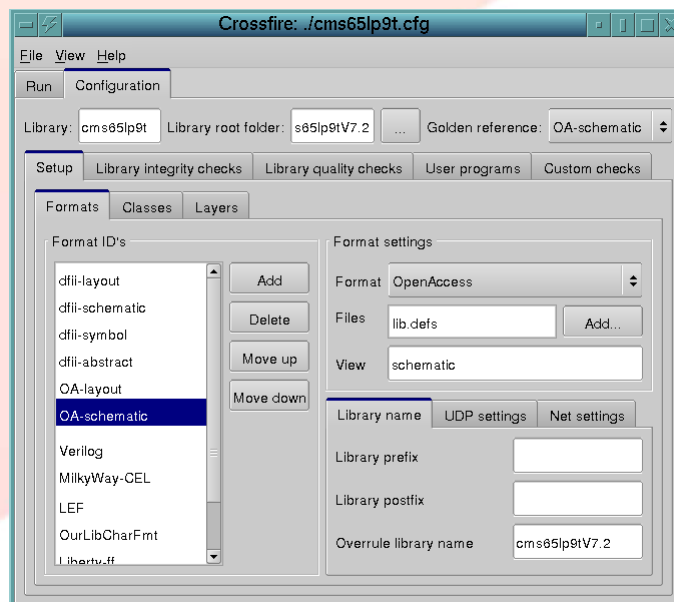


By using a common datamodel and API, each additional format that requires validation just needs to be added to the datamodel, after which all existing checks are available for the new format. Crossfire supports most industry standard cell-library descriptions, users also have the option to define readers for in-house developed cell-library formats.

Crossfire is completely graphically configurable allowing library developers to control exactly what needs to be verified for each specific format.

Crossfire Naming Consistency Checks

Every name used to identify a cell-related object is checked for consistency across the different formats offered to Crossfire. Crossfire checks in this category include existence and attributes (e.g. input, output, power, ground) for pins, terminals and nets. Formats that include physical layout descriptions are searched for matching pin-labels, related pin-shapes are checked for appropriate dimensions.





Crossfire Functional Equivalence Checks

Crossfire is able to automatically compare functional descriptions between various formats. Functionality can be a mixture of Boolean expressions, state-tables and gate- or transistor-level schematics. Crossfire will establish a full Boolean equivalence between the specified input/output relations, thereby saving tremendously on test-time when compared to SPICE-simulations. This is done for both combinatorial as well as sequential cells.

Crossfire Physical Layout Checks

Layout representations of cells can be compared at polygon level. Examples include exact equivalence of shapes and layout-vs-abstract coverage between views. Also correct abutment between any pair of neighbouring cells can be validated. As the API also includes detailed access to polygons, more sophisticated checks on the shapes of pins or the positioning of well tabs can be constructed.

Crossfire Routability Checks

An integral part of Crossfire is routability assessment for pins of cells and the overall compliance to the place & route architecture of cell abstracts. Crossfire will measure and check cell height/width for routing grid compliance, verify correct locations of supply rails and the presence of mandatory power and ground terminals. For each individual pin a route in first-metal towards the cell boundary is found or a via to second metal is dropped, all according to user-specified wire-widths and via-cell dimensions.

Crossfire Timing Representation Checks

Various formats have truly different styles of representing timing information, such as delay paths and setup/hold times. Specifically, placeholders for Verilog or VHDL timing back annotation cannot be easily compared to delay tables in the Synopsys Liberty format. Fenix-DA Crossfire is able to cross-check between these formats, thereby unveiling missing or additional delay paths, non-matching signal transitions (timing-sense) and mismatching setup/hold time conditions. Delay tables that specify intrinsic cell delays versus input slope and output load are sanity checked to contain increasing entries, to establish the validity of the delay simulation and extraction runs.

Crossfire Extendability

Crossfire is highly configurable by end-users to make it the custom library signoff solution required by each organization. Using the API, users can code their own cross-format checks, for example to validate the presence and values of cell- and pin-properties or to check the location and size of

high-drive strength output pins. The API may also be used to define readers for in-house developed library description formats. Existing checks such as DRC/LVS can be integrated into Crossfire. This not only means that scripts can be started from the Crossfire GUI but also that double-clicking a script-message will start an appropriate analysis tool, like a DRC-summary window.

Available Formats

Crossfire is able to interpret and verify a continuously growing number of cell description formats, including:

- Cadence DFII database
- Synopsys Milky Way
- Open Access
- Synopsys Liberty
- Verilog
- Cadence TLF
- LEF
- SPICE
- GDSII
- Custom-defined formats

Supported platforms & license

Crossfire is provided under a time based license (TBL) for the following hardware and operating system platforms:

- Intel x86 32 bit & Red Hat Enterprise Linux 3
- Intel x86 64 bit & Red Hat Enterprise Linux 3
- Sun, Solaris 2.8 32-bit.

Contact Fenix-DA

For more information concerning Crossfire and other Fenix-DA products please contact:

email: info@fenix-da.com

www: www.fenix-da.com

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Type	View	Cell	Pins	Labels	Nets	Abutment	Timing	Functionality	Layout	Routability	Custom
Cadence dfl	schematic	○	○	-	○	-	-	○	-	-	○
Cadence dfl	layout	○	○	○	○	○	-	-	○	○	○
Cadence dfl	abstract	○	○	○	○	○	-	-	○	○	○
Cadence dfl	symbol	○	○	-	○	-	-	-	-	-	○
Open Access	schematic	○	○	-	○	-	-	○	-	-	○
Open Access	layout	○	○	○	○	○	-	-	○	○	○
Open Access	abstract	○	○	○	○	○	-	-	○	○	○
Open Access	symbol	○	○	-	○	-	-	-	-	-	○
Milky Way	CEL	○	○	○	○	○	-	-	○	○	○
Milky Way	FRAM	○	○	○	○	○	-	-	○	○	○
Verilog	none	○	○	-	-	-	○	○	-	-	○
Liberty	none	○	○	-	-	-	○	○	-	-	○
TLF	none	○	○	-	-	-	○	○	-	-	○
LEF	none	○	○	-	-	○	-	-	○	○	○
GDSII	none	○	○	○	-	○	-	-	○	○	○
SPICE	none	○	○	-	-	-	-	○	-	-	○
Custom	none	○	○	○	○	○	○	○	○	○	○