cadence®

Conformal Smart LEC

Massively parallel architecture and adaptive-proof technology deliver turnaround time improvement

Cadence® Conformal® Smart LEC is the next-generation equivalence checking solution. Offering key technologies of massive parallelism and adaptive proof, Conformal Smart LEC improves runtime by an average of 4X compared to existing solutions with the same compute resources. Designers can now achieve their power, performance, and area (PPA) goals and deliver complex designs within tight market windows.

Overview

With rapidly growing functionality at advanced nodes, design sizes are increasing. In addition, designers need to make aggressive pushes in synthesis optimization to achieve their PPA goals, especially with datapath-intensive designs. These advances in size and complexity in designs are challenging current equivalence-checking proof methods, resulting in long runtimes and inconclusive results. Equivalence checking, as a critical component in tapeout flows, must keep up. Conformal Smart LEC delivers on these challenges with its new "smart" technologies.

As shown in Figure 1, Conformal Smart LEC is a superset of the existing Conformal L and Conformal XL configurations. Conformal L offers core equivalence-checking technology; Conformal XL extends the L capabilities with automated checking of complex datapaths and equivalence checking of the final place-and-route netlist. In addition to capabilities provided by the L and XL configurations, Conformal Smart LEC delivers next-generation equivalence checking with smart instance selection, adaptive proof, and massive parallelization technologies.

Key Features and Benefits

- Adaptive proof strategy can automatically partition design and distribute formal proof across multiple machines and CPUs
- Massively parallel architecture is fully automated and transparent to the user and can scale seamlessly to 100+ CPUs.

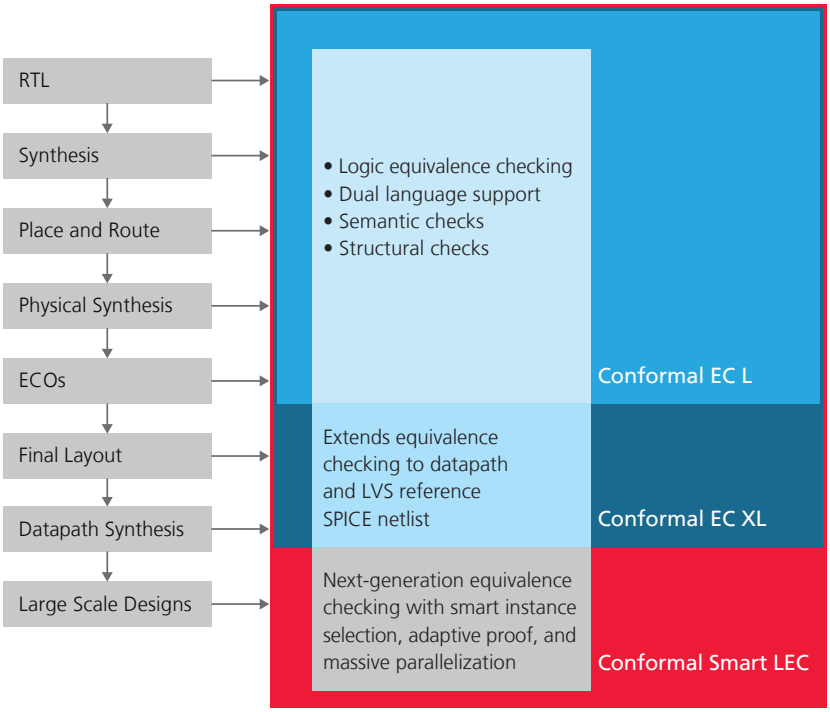

Figure 1: Conformal Smart LEC is a superset of the existing Conformal L and Conformal XL configurations

Smart Instance Selection

Smart instance selection enables higher quality module selection for hierarchical comparison to minimize dynamic flattening and obtain overall better runtime performance. This feature provides the capability to select modules in hierarchical compare for achieving the best quality in runtime and abort resolution.

Adaptive Proof Technology

Conformal Smart LEC has an extensive portfolio of formal solvers that can handle all conceivable design synthesis and implementations. Adaptive proof technology orchestrates the solvers so users do not have to iterate over their verification strategies. With a single command, Conformal Smart LEC analyzes the characteristics of both the golden and revised designs, such as datapath type and logic complexity. Based on the results of the analysis, the command automatically executes the most appropriate strategy to complete the comparison (Figure 2).

The strategy is different for different parts of the design and the result is effectively a fine-grain strategy customization that is very difficult or nearly impossible to replicate manually. With the adaptive proof technology and scalable massive parallelism, designers can potentially achieve runtime improvement of up to 20X.

Massively Parallel Architecture

Conformal Smart LEC is introducing a massively parallel architecture that can utilize multiple hosts and multiple cores to maximize computation results. This capability enables running module comparison in hierarchical equivalency checking runs across multiple CPUs and hosts. In addition, the parallel hierarchical comparison uses smart scheduling to reduce runtime and improve resource efficiency.

For a design with an evenly distributed module complexity, parallelizing the hierarchical comparison can significantly reduce the turnaround time. To achieve parallel efficiency, Conformal Smart LEC uses continuous workers—processes that contain the entire design—to execute the module comparison (Figure 3). Workers can be invoked on the localhost or on remote machines.

In the run, workers collaborate with each other to compare the modules in parallel. When switching between the different modules, workers quickly set the target module and perform verification without reloading the design data. Workers can use all Conformal Smart LEC multi-threading features—including compare, module datapath analysis (MDP), and abort analysis—thereby achieving massive parallelization.

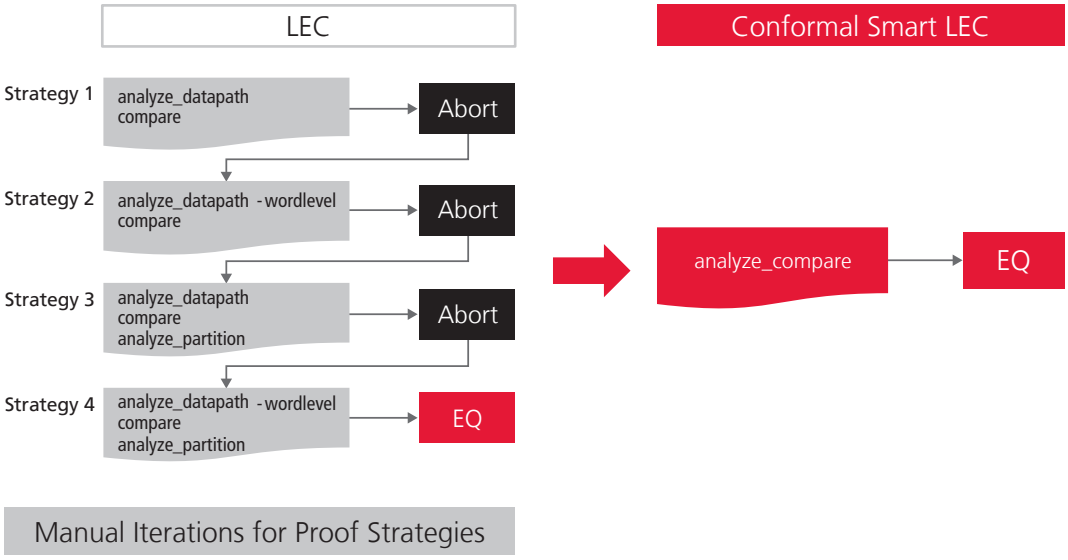

Figure 2: Adaptive-proof technology

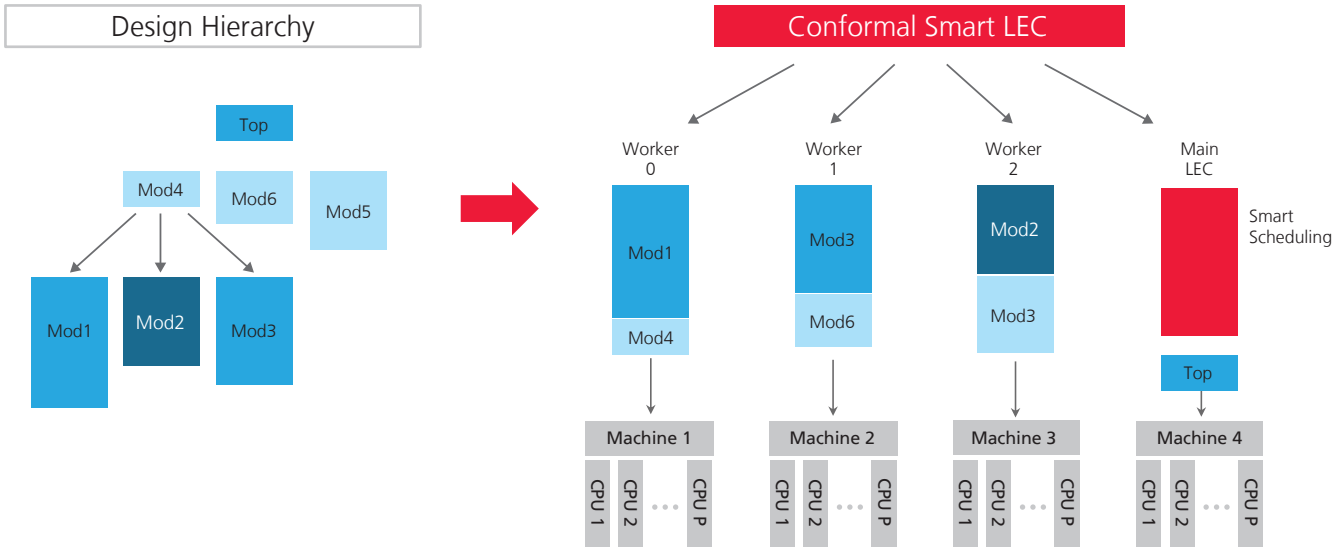

Figure 3: Massive parallelization

Platforms

- Linux (64-bit)
- Sun Solaris (64-bit)
- IBM AIX (64-bit)

Language Support

- Verilog (1995, 2001, 2005)
- SystemVerilog
- VHDL (87, 93)
- SPICE (traditional, LVS)
- EDIF
- Liberty
- Mixed languages

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