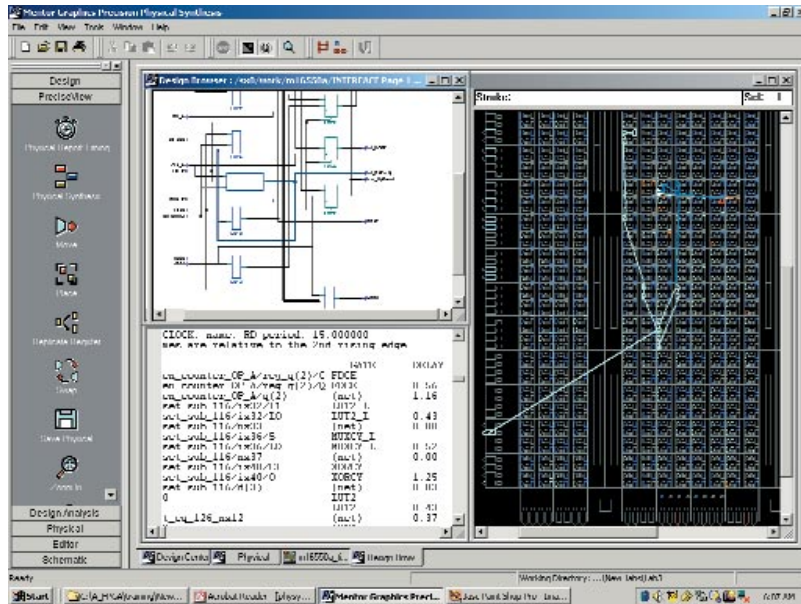# Precision Physical Synthesis

Precision™ Physical Synthesis is the only tool in the industry that combines logical, timing and physical views into a single, intuitive environment, allowing designers to take control of their timing problems.

Major product features:

- Maximize device performance by utilizing physical data

- Reduce device cost by meeting performance goals with a lower speed grade

- Intuitive design environment that includes both RTL and physical synthesis

- Automation with a push button physical synthesis solution

- Controllability if needed with a physical editing environment that includes integrated timing analysis

- Synthesis independent EDIF flow

Redefining FPGA Physical Synthesis

Today's FPGA timing closure challenge is driven by the increased complexity and performance of the latest devices. The gap between the physical and logical worlds presents the biggest challenge to getting the most from an FPGA device. Traditional synthesis algorithms estimate the interconnect based only on the fan-out of the net. This works fine when the gate delay is dominant. However, with the latest devices, interconnect delay is now the dominant factor and accounts for up to 70% of the total delay. If the synthesis algorithms fail to properly account for the interconnect delay, multiple design iterations will result.

Precision Physical takes performance to the next level and gets the most out of the latest devices by using placement rules and delay information to optimize both logic and placement.

Taking control to produce a convergent flow

Precision Physical understands device configurations, delay calculations, available resources, clocking rules and placement/packing rules to properly account for interconnect delay. This knowledge is combined with integrated timing analysis. To converge quickly, Precision Physical uses the output of the P&R system as a starting point, then improves the design's performance.

Precision Physical is fully integrated into Precision RTL or easily integrates with other synthesis tools by accepting EDIF as input. Precision Physical reads the netlist along with the placement locations and delay information from vendor's P&R and then works to achieve timing closure by making netlist and placement changes. Precision Physical offers both an automated approach as well as a physical editing environment if additional performance is needed.

Mentor Graphics®

Precision Physical Synthesis

The automated design flow takes the Vendor's P&R results and automatically improves timing through netlist and placement optimization.

Automated flow

Physical synthesis improves device performance by attacking the problem of inaccurate interconnect delay. Floorplanning gives area constraints and delay estimates that are an improvement over fan-out based models. However, Precision Physical goes beyond delay numbers by knowing what resources are available, the exact location of existing instances and how to legally place any changes. With this detailed knowledge delays can be accurately predicted. Both logic and placement optimization are used to improve timing.

Logical changes such as retiming, replication and re-synthesis are applied. However, to maximize the value of these changes, it is critical that any new elements are assigned to specific legal locations. Then a placement-based delay calculation can accurately estimate the interconnect delay. The objective of placement optimization is to reduce the interconnect delay. This is achieved automatically by moving elements on the critical paths closer together.
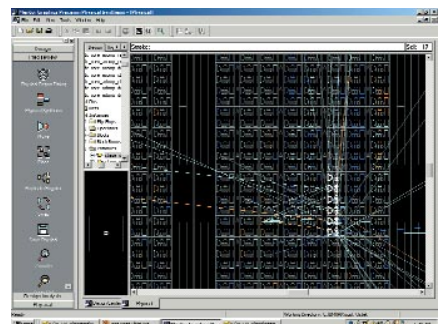
Physical editing environment

There are times when timing is especially challenging and an automated approach does not quite achieve the required performance levels. The PreciseView physical editing environment combines an understanding of placement rules with timing analysis to provide a unique and powerful solution. Designers can mix automation and human guidance or take complete control by moving and swapping individual elements such as LUTS, registers, macros, block rams, etc. This intuitive design environment takes care of the low level details and allows the user to focus on the big picture of timing closure. In addition, the tool uses colors based on node slack to aid the designer in making moves that will improve timing. The ability to cross-select between physical and logical views helps designers to quickly understand how their design is implemented on the physical device and helps find ways to improve timing.

To quickly close on timing, Precision Physical offers a direct connection between the PreciseView physical view and PreciseTime, an interactive, incremental timing analysis.

PreciseTime provides the designer with immediate feedback on any physical edits. Designers no longer have to wait for an iteration through P&R to know if their edits are moving them in the right direction.

In either the automated or interactive flow, the placement of the elements are legal and their locations are specified as input to the vendor's P&R engine. Not only does this reduce the P&R run times, it also provides a convergent flow.

The challenge of achieving timing closure or saving a speed grade varies with each design. Precision Physical offers a flexible set of solutions that include an automated physical synthesis flow and a physical editing environment focused on fixing timing problems that arise during physical design. The key to improving performance with both solutions is the tool's ability to use accurate interconnect delay values to optimize both the netlist and placement.

If extra performance is needed, an intuitive editing environment allows the user to take control. It shows the problems, helps to fix them and verifies the edits — all inside a single tool.

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