

ExploreAhead Extends the PlanAhead Performance Advantage

By leveraging computing resources, you can achieve improved design results.

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FPGA design sizes and complexity are now in the stratosphere. An increasing number of designers are struggling to meet their design goals in a reasonable amount of time.

Xilinx introduced PlanAhead™ software as a means to combat lengthening design closure times. The PlanAhead hierarchical design and analysis tool helps you quickly comprehend, modify, and improve your designs. Earlier PlanAhead versions (7.1 and earlier) were used to improve performance of the design through floorplanning. The software does encapsulate Xilinx® ISE™ back-end tools to complete the EDIF/NGC-to-bitstream flow. However, earlier versions left the complex job of design closure through place and route options to the user.

With ExploreAhead, you can order multiple implementation runs based on the strategies you defined or on the predefined strategies shipped as factory defaults. These runs can be parallelized to take advantage of multi-core CPU machines.

PlanAhead 8.1 design tools introduce ExploreAhead, which simplifies the tedious task of wading through myriad place and route options to obtain the best achievable QoR for a given floorplan. ExploreAhead also enables an effective use of multi-core CPU machines to speedup the design convergence process.

ExploreAhead is an implementation exploration tool. It manages multiple

predefined strategies. Xilinx has tested these predefined strategies and found them to be some of the most effective techniques to get better performance on designs. These factory-default strategies are prioritized by their effectiveness. Predefined strategies eliminate the need for you to learn new options each time a new version of ISE software is released to achieve the best QoR.

Expert users are encouraged to craft strategies suitable for their designs. User-defined strategies are stored under \$HOME/.hdi/strategies for Unix users and C:\documents and settings\%HOME%\application data\hdi\strategies for Microsoft Windows users. These are simply XML files for teams of users to share. Design groups wanting to create group-wide custom strategies accessible to anyone using PlanAhead software can copy user-defined strategies to the <InstallDir>/strategies directory.

Id	Name	Flow	Status	Progress	Start	Elapsed	Timing Score	Description
1	Run #1	ISE 8	Complete	100%	12/15/05 11:15 AM	00:04:48	425 8.1 Default Settings	
2	Run #2	ISE 8	Complete	100%	12/15/05 11:20 AM	00:06:41	448 PAR -ci med	
3	Run #3	ISE 8	Complete	100%	12/15/05 11:26 AM	00:11:11	12 PAR -ci high	
4	Run #4	ISE 8	Running MAP...	20%	12/15/05 11:28 AM	00:01:47	Map -timing -ci high	
5	Run #5	ISE 8	Queued...	0%			Map -logic-opt on -retiming on -register_duplication on	

Figure 1 – Multiple implementation runs with varying strategies

implementation runs of your design through the NGDBuild, map, and place and route steps. ExploreAhead allows you to create, save, and share place and route options as “recipes” or “strategies.” With ExploreAhead, you can order multiple implementation runs based on the strategies you defined or on the predefined strategies shipped as factory defaults. These runs can be parallelized to take advantage of multi-core CPU machines.

ExploreAhead manages reports and statistics on the runs, allowing you to pick the best implementation for your design. Figure 1 shows an illustration of ExploreAhead.

Strategy

A “strategy” is defined as a set of place and route options. This is a recipe that you can use to implement a single place and route run. Strategies are defined by ISE release and encapsulate command-line options for each of the implementation tools: NGDBuild, map, and place and route.

Using strategies is a very powerful concept that makes ad hoc management of your place and route options a seamless task. ExploreAhead ships with a set of

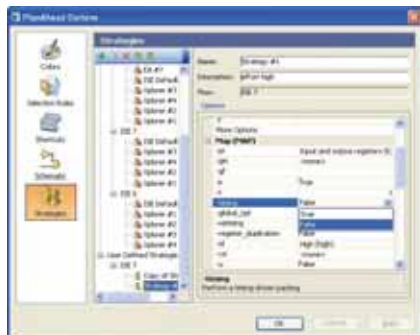


Figure 2 – Strategies editor



Figure 3 – Run ExploreAhead and Launch Runs dialog boxes

ExploreAhead also introduces an easy-to-use strategies editor for you to create your own favorite strategy. Figure 2 shows the strategies editor.

Run

ExploreAhead introduces the concept of a “run” object. Once launched, the run will work through the back-end tools to implement the design. Each run is associated with a set of place and route options or a defined strategy. ExploreAhead gives you the capability to launch multiple implementation runs simultaneously.

Launching an ExploreAhead run is a two-step process. The first step involves queuing up the run with different strategies. The second step will actually launch the place and route tools on each of the runs. The two dialog boxes in Figure 3 show the two steps.

Once you have interacted with the “Run ExploreAhead” dialog box and generated the required set of runs, a summary table of runs appears in the PlanAhead console window. Figure 1 displays one such table of runs. Each of the runs is selectable. Selecting a run will display the properties of this run in the PlanAhead properties window. Selecting one or many runs and hitting the launch button will bring up the launch dialog box. Here ExploreAhead will allow you to start multiple place and route runs simultaneously on a multi-core CPU machine. ExploreAhead will push all of the requested place and route runs into a queue

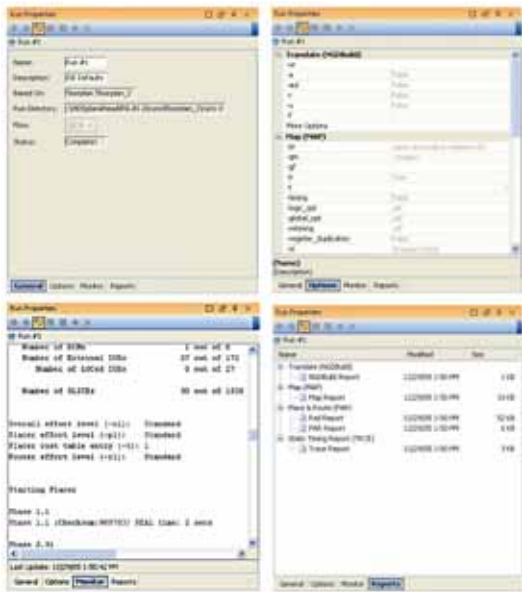


Figure 4 – Selected run properties: general, place and route options, live monitor, reports

and will then launch runs from this queue when CPU resources become available.

Monitor

ExploreAhead has an easy-to-use interface to monitor ongoing runs. The “summary runs” table in the console window helps you quickly browse through the relevant characteristics of a run: the CPU time implications of a strategy, percent completion, timing results, and description of the strategy employed. In addition to the summary results table, there is also a live “run monitor” that displays all console messages gen-



Figure 5 – Import Run dialog box

erated by place and route tools. You can simply select a run and tab over to the monitor tab of the property dialog box to engage the console messages. Figure 4 shows the properties dialog box for a single run.

Reports

The reports tab in the “Run Properties” dialog box shown in Figure 4 lists all of the potential reports that could be produced during an implementation run. These reports are grayed out at the start of the run and become available for browsing as the run proceeds through the various back-end steps. Simply double-click on each of the available reports to add it to the desktop browser.

Results

Once the ExploreAhead runs are complete and you have all of the reports for all of their runs at your disposal, you can then decide to import the results into

PlanAhead software for further investigation. After selecting a run, you can then right-click to import the run, which will also allow you to import placement and timing results into PlanAhead design tools. Figure 5 shows the import run dialog box.

Project

PlanAhead 8.1 software introduces the PlanAhead project repository. The PlanAhead project will save your ExploreAhead run information. ExploreAhead acknowledges that some of the place and route runs can take a significant amount of run time. If you launch a large number of runs, this can also add to your total completion time. As such, PlanAhead software allows you to exit the program, allowing the place and route runs to continue on your machine. You can then launch PlanAhead design tools at a later time; it will re-open the project, re-engage the monitors, and open the summary run tables the report files. This powerful feature allows you to free up a PlanAhead license during place and route runs.

ExploreAhead Design Flow

You can employ floorplanning – a key enabling methodology – within the PlanAhead framework in conjunction with ExploreAhead to get the best-in-class

QoR. You can use ExploreAhead on a floorplanned design or on a single Pblock. You can then piece the design together using a combination of floorplanning, a block-based implementation approach, and incremental design techniques. ExploreAhead, however, makes no assumptions as to the need to floorplan a design. The basic ExploreAhead design flow, shown in Figure 6, requires no floorplanning.

Conclusion

ExploreAhead expands the PlanAhead portfolio to include QoR optimization in the implementation tools. ExploreAhead brings together several key technologies to make PlanAhead design tools an extremely productive environment for interactive design exploration and closure. The combination of multiple what-if floorplans and what-if ExploreAhead runs on each of these floorplans expands the search space of possibilities enormously.

ExploreAhead enables you to search through this large space effectively to pick the most optimal implementation solution for your design. ●●●

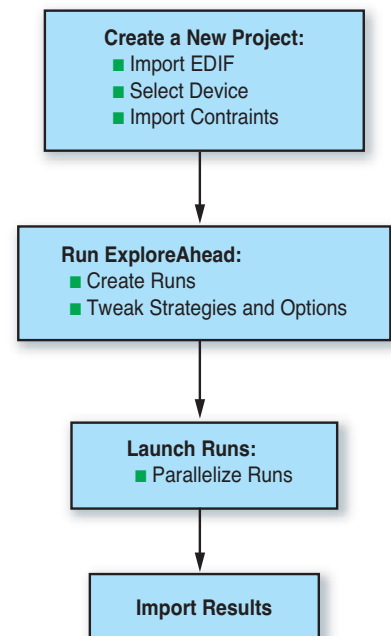


Figure 6 – Basic PlanAhead/ExploreAhead flow diagram