

Mask Data Preparation Sidesteps Data Volume Complications

While mask data preparation doesn't affect most front-end IC designers directly, it could cause tapeout delays. To dodge back-end crises, Mentor Graphics Corp., Wilsonville, Ore., has enhanced its Calibre technology to allow direct export of layout data into mask-writer formats.

Mask data preparation has become a major bottleneck. Data volumes are exploding as design rules shrink and resolution enhancement technology (RET) proliferates. If data is handled incorrectly or flattened too early in the process, its volume can balloon.

Mentor's extension of Calibre is based on the tool's hierarchical engine, which preserves design hierarchy well into the mask data-prep stage. It enables users to continue using RET for advanced IC lithography while avoiding the potential pitfalls of data volume and hierarchy management. It also eliminates the need for a standalone fracturing utility and an extra conversion to a closed, proprietary intermediate data format.

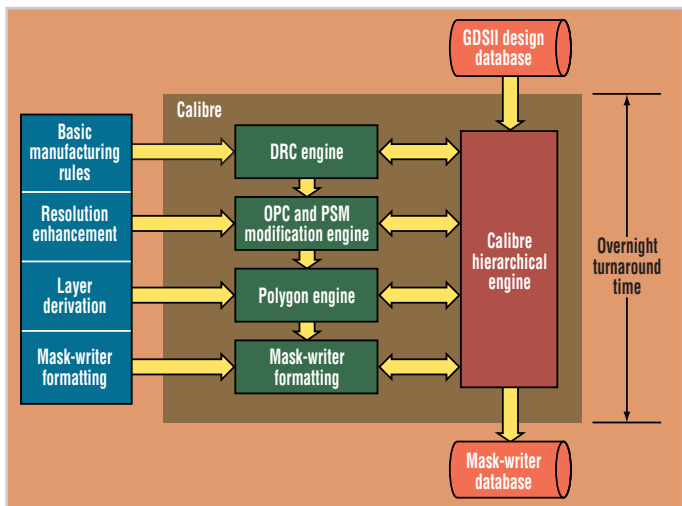
Mask data preparation includes three basic steps: geometry processing, export to mask-writer formats, and frame generation/reticle layout. As designs grow larger and RET is applied more aggressively at geometries of 0.13 μm and below, the first two of these steps are slowed by data volumes.

The export of data to mask-writer formats is the process of converting hierarchical design data in an open, standard hierarchical format to a proprietary format optimized for specific mask-writing equipment. This export step should happen at the last moment, before reticle manufacture, to preserve the efficiency of hierarchical processing.

"Up until now, Calibre has been able to be used through the first three steps of this process: physical verification, resolution enhancement, and layout

preparation," says Joe Sawicki, general manager of Mentor's Calibre Business Unit. "With the new technology, we'll also then be able to take and move that to the mask-writer formatting stage, thus pushing hierarchical processing into that entire process."

Calibre's geometric processing exploits the repetition inherent in IC designs. Rather than processing a cell and duplicating it each time it occurs in a design, Calibre selectively processes the hierarchical design data, using



Calibre's hierarchical engine has been extended to reach into the mask-writer formatting stage of the back-end IC process. (courtesy of Mentor Graphics)

advanced database algorithms. It preserves hierarchy and therefore greatly reduces the amount of data to be processed at export time. It also optimizes the exported data shapes and data volume for fast mask-write times.

By extending Calibre's reach into the mask-writer format stage, the entire tapeout process is mapped into a single run within a single environment. "The hierarchical engine ensures that each of those specific tasks essentially has less work to do," Sawicki says. The result is an overnight turnaround from the final GDSII design database out to the mask-writer format database (*see the figure*).

Intensive mask-writer format export testing at customer sites has been in progress since June. Calibre MDP technology will be made available in the first half of 2002, beginning with the MEBES format.

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