EDIF 2 0 0 - Conversion Guidelines for Importing Legacy EDIF Files for First-time Users

Introduction

EDA physical layout tools provide stream in and stream out flows for GDSII data. This data is universally understood to be the final standard data format provided for IC fabrication. Unfortunately at the front end of the design cycle, the data is much more subjective. Schematic capture tools and editors vary widely in how data is displayed and used. Furthermore, the netlists they produce can vary even more as there is no single netlist format for the variety of simulation engines available in the industry. The issue of how to migrate schematic and library data form vendor to vendor is of high importance when tools are used interchangeably. When migrating from one vendor platform to another entirely, the issue can be even more daunting. This application note will provide some practical insight on how to get the most out of the EDIF 2 0 0 format using the Gateway Schematic Editor.

Conversion Scenarios

It is important for anyone who plans to migrate schematic library data from any vendor to understand what to expect in terms of what is involved. The EDIF standard provides for much of the schematic information but it is up to the individual EDA vendor to support the standard in its entirety or not. Not all vendors support all parts of the standard in their import and export routines. Even for vendors that support the entire standard, there are still some limitations of the standard that need to be accounted for on a per-vendor basis. The main limitation is that the imported schematic has no netlisting information associated with it for the individual elements. The netlist syntax is only specific to the simulator, and the EDIF standard provides no data for the netlist except for connectivity between elements.
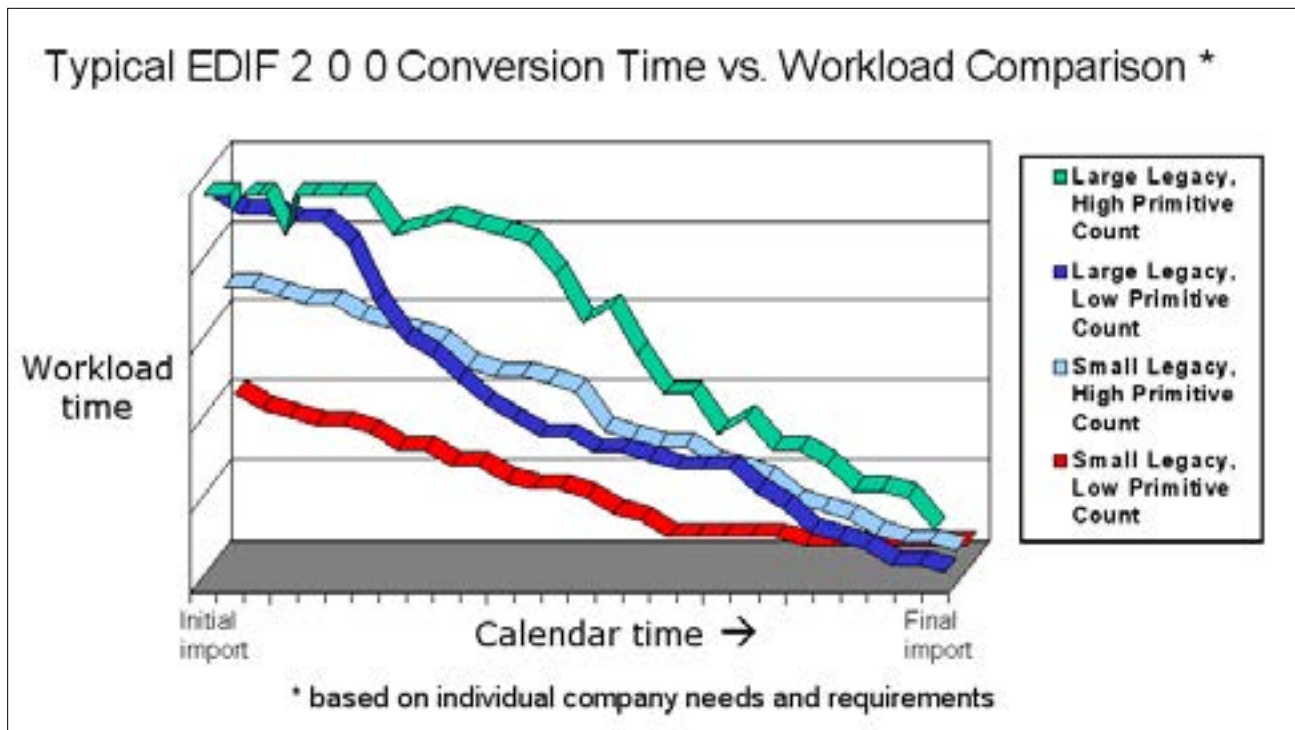

Figure 1.

That still does not account for the specific device behavior (design intent) for each instance. This is possibly the most important concept in using EDIF. Although a device imports and looks like a 4-pin transistor, for example, the only one who can verify that it is a primitive device as opposed to a symbol that descends into a subcircuit or uses an attached marcomodel description is someone familiar with the design in its original state. If the design intent of imported elements is unknown or unaccounted for, then the schematics will not be represented properly. To make an analogy, you may layout your design but have someone else do the placing and routing. But you would always take time to consider the placing and routing before taping out. Here, EDIF is the tool that is doing the importing, but you must make sure to guide it with design intent so each cell type is faithfully represented.

Figure 1 shows a graph representing four scenarios representing different legacy design situations. Note that EDIF import and conversion are two drastically different things. Import refers to the importing of the file and Gateway's automatic library and cell generation of what the EDIF file contains. Conversion is the process of turning this imported data into a useful netlist that is able to simulate and represent the circuit as faithfully as possible. Figure 1 is accounting for both import and conversion.

The x-axis of the graph represents calendar time, or time from the beginning to the end of importing and converting a design database from vendor "X" into Gateway. The y-axis represents workload time, or percent of work time spent on conversion. The graph reveals that gradually over time, the time spent importing, converting, and verifying data diminishes at different rates. The rate of decrease is proportional to the size of the legacy data to be imported and converted and also the number of primitive elements in the design database. A primitive device is a device that functions as a true SPICE primitive element versus being represented as a subcircuit or subschematic.

The first time any legacy data is imported to Gateway, all elements must be imported. For future imports, Gateway gives you the option to import everything again, or to bypass any cells it has previously imported. Most users will choose to bypass these cells that are already in the database for these reasons:

1) it saves time

2) if a cell has been imported, chances are time has been spent to convert it for netlisting and you don't want to lose the changes

As each design is imported, more and more legacy is built up inside Gateway. Also, as more designs are imported, there are fewer new cells to import since many designs make reuse of legacy that has already been imported and saved into the Gateway libraries.

It is obvious from Figure 1 that the database that takes the most work to convert over time is one with many libraries/cells and also lots of primitive devices. In this case, the initial workload will be spent on making sure the primitive devices are converted properly. Although there are a finite number of true primitive devices in reality, there can be many variations of a primitive. An example would be a pmos symbol with 4 pins. There is only one pmos primitive in SPICE, which is the "M" element, also known as the Mosfet element. But a user database may contain a single pmos device or dozens of pmos devices if these have been used as specific pmos cells with specific models, attributes, and values associated. A situation like this with a large legacy and many primitives is represented by the green line in Figure 1.

Legacies containing many cells and few primitives are shown by the dark blue line in Figure 1. Examples are many cells using the same pmos and nmos devices. Since these pmos and nmos devices most likely would have been encountered on the first import, you would convert them once and be done. Then, any more designs imported that use them would not need much rework, if any. In contrast to that, the red line in Figure 1 represents a small legacy of designs with few primitives. The curve shows that the primitves are converted with the first few imports and after that the importing and converting becomes almost turnkey with minimal effort.

Conclusion

Familiarity with the original design is critical for success in using the EDIF import tools in bringing a legacy from any vendor into Gateway. Along with the design intent, the size of the legacy and types of cells in the libraries (primitives vs non-primitives) are important factors to consider when sizing the time and effort needed for successful conversion.