Role of Electronic Design Automation in Circuit Design

T. Bhanu Prakash Reddy
Velagapudi Ramakrishna Siddhartha Engineering College, Vijayawada

***Abstract*- As electronics industry is developed, the complexity of the circuits is increased and the growth of integrated circuits is increasing exponentially. The manufacturing process of electronic equipment is also becoming more and more complex. Approach of artificial design and analysis of circuits is unable to meet the general requirements; therefore, computer simulation and analysis of circuits has become very important. On the other hand, with rapid development of computer industry, the computer became a good option for circuit simulation. In order to solve the design and development problems of large scale and very large-scale integrated circuits Electronic Design Automation (EDA) technology came into existence. And the need for Electronic Design Automation is increased. The focus of this paper is to introduce the development and characteristics of EDA technology. It also briefly discusses the general method of electronic design using EDA, the basic process and the trend of development.**

Index terms- Electronic design automation, EDA, integrated circuits, computer aided design, EDA tools, chips.

I. INTRODUCTION

Electronic design automation (EDA) is a term for category of software products and processes that helps to design electronic systems with the aid of computers. These tools are generally used to design circuit boards, processors and other type of complex electronic products. It involves a diverse set of software algorithms and applications that are required for the design of complex next generation semiconductors and electronic products.

II. NEED FOR EDA

Before the advent of EDA integrated circuits were designed by hand. By Moore's law, the number of transistors in an integrated circuit doubles for every two years. This increase in complexity drives the need for automation.

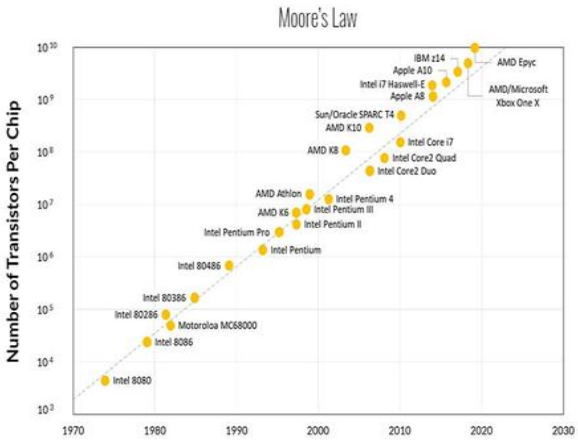

Fig. 1 Moore's law graphical representation

III. ORIGIN OF EDA

The automation of design of electronic systems and circuits has a history of strong innovation. EDA started as a field in 1960s when researchers of some leading labs invented computer aided design (CAD) tools for supporting engineers in analysis and layout of circuits. The early 1970s saw the birth of SPICE (Simulation Program with Integrated Circuit Emphasis), an open source analog electronic circuit simulator, which began as a class project at University of California. At the end of 1990s the need for EDA is further increased due its complexity and scalability issues with over a billion transistors.

IV. EDA TOOLS

Creation of device or instrument involves many stages, from inception of idea to getting final product. Some of the common tools available in the market are:

1. Design Capture Tools
2. Simulation and Verification Tools
3. Layout Tools
4. Synthesis and Optimization Tools

A. DESIGN CAPTURE TOOLS

Design capture tools capture a design and prepares it for simulation. These are the first tools to be used. Design capture is possible with the help of schematic editors. Some of the features of present-day schematic editors are

Extensive component libraries.
Options to create own components.
Automatic detection of errors.
Creation of netlists.

B. SIMULATION AND VERIFICATION TOOLS

Functional verification tools check if the functionality of model of circuit is as specified. These tools are must have tools. There are two major simulation tools – Functional (logic) simulation tools and Timing simulation tools. Functional simulation tools verify the logic design based on design entry. Timing simulators performs timing simulations at multiple stages of design.

C. LAYOUT AND SYNTHESIS TOOLS

Designers transform a logic representation of integrated circuit into physical representation that allows IC to be manufactured. Creating a layout and printing it on board is used be manual procedure but most of the steps in PCB layout creation are automatic now. Synthesis tools translate abstract description of functionalities such as HDL into physical realization (gate level representation). Some synthesis tools generate bitstream for Programmable Logic Devices, while some target the creation of ASIC (Application Specific Integrated Circuit).

V. ADVANTAGES OF EDA

EDA helps designers in handling the high complexity of integrated circuits. It helps designers use latest technology and explore different design approaches. EDA helps product companies achieve more complex chips with lower cost and shorter time. EDA helps the layout designers to place millions of transistors on the IC. It also helps check physical and electrical design rules for all those transistors. EDA programs allows the designers to model the systems performance and estimate its power needs.

VI. INDUSTRIAL EDA

Almost every electronic product from computer chips to satellites, results from designers using EDA tools and services. As electronics became even more complex, the EDA industry is more important to global economy. Engineers need to analyze their design and identify and eliminate the problems before manufacturing actual products. EDA helps them do it. Major EDA companies are cadence, synopsys and mentor graphics. Popular EDA tools are Multisim, OrCAD, Xilinx ISE etc.

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