Keynote Address I

“Role of the Semiconductor Industry in the 21st Century
= Human Talent is the heart of the Information Society =”

Hajime Sasaki
Chairman, NEC Corporation, Japan

The impact of the rapidly expanding IT Revolution can be compared to the invention in the 15th century of the Gutenberg printing press. It has often been said that the information age is around the corner, but it is clearly occurring now.

There are three major revolutionary changes that have led to the information society. First is the breakthrough development of semiconductor technology, which began with the invention of the transistor, the base of today’s most complicated semiconductors. Second is the development of the Internet, which has made it possible to distribute information on a worldwide scale. Last is the Mobile revolution, which has truly placed the power of the information revolution in the individual’s pocket. Through Mobile tools and Internet infrastructure, the power of knowledge will be the driving force of social change. This is the heart of the Information Society.

Over the past 50 years, the industrial seed supporting the Information Society has been the semiconductor. The application of this technology has progressed greatly from its birth in the monstrous ENIAC that calculated artillery distance to the present day PC computer that sits on your desktop. Moreover, the role of the semiconductor will continue its importance as the Internet and Mobile trend looks to continue its rapid growth.

However, there are certain challenges in front of the semiconductor industry’s growth path. One is found in the changing competitive landscape as evidenced by the blooming System on a Chip market. From now, IP strategy will be the factor determining success or failure. Scales of economy will not create winning products. It will be the most advanced technology that wins a customer’s order. Furthermore, market forces will efficiently match the right companies with the right IP at the right time.

As we approach the sub 0.1-micrometer design rule era, the main challenge faced is not in the hardware; on the contrary, it is faced in the ability to design chips that maximize the capability of the hardware. Up until now, the main focus of the semiconductor industry was to concentrate on the improvement of manufacturing equipment and the hardware itself. From now, the ability to enhance design efficiency will become just as important.

As the foundation of design is human knowledge, it is important to remember that education is critical to the enhancement and development of design technology. Investing in design equipment will not be the only way to bring about dramatic increases in productivity, as is the case in the hardware side of the business. Investment in developing qualified design engineers will be just as important. However, human knowledge cannot be developed in a day. It requires the combined efforts of industry, government and academia thinking from a strategic perspective to incubate the human talent necessary to ensure continued improvements in the semiconductor industry.
“Market and technology in PC products”

Ming-Jeh Chien

Chairman, First International Computer, Taiwan

The future will see continued PC growth supported by the internet applications.

On one hand, the increasingly complicated applications and huge database demand high performance CPU. Software vendors now have the H/W to develop more processing intensive S/W in area such as MPEG-4, Audio/Video, Voice recognitions, virtual reality and internet gaming. This will certainly need leading technology to meet high speed/low power requirement.

On the other hand, explosive needs to access information through internet demand user-friendly devices such as internet appliances, PDA etc. Internet appliances are user-application oriented products. The success depends more on the marketing strategy than the leading technology. The good example is the cellular phone hand set. In fact, the boundary between phone and PDA is blurry, since PDA is including wireless communication capability.
Keynote Address III

“EDA Must Deliver System-on-Chip Design Solutions”

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System-on-Chip (SOC) design presents formidable challenges, with profound ramifications for the design tools needed. These challenges can be classified into three categories: technology, complexity, and system design.

First, advancing technology involves new materials, smaller feature sizes, and faster clock speeds. In this environment, what were previously parasitics become first-order effects. The first to impact design is the RC-delay (resistance-capacitance) of the wires or interconnect, which has resulted in the problem of timing closure. To obtain timing closure, it is necessary to unify synthesis, placement, and, eventually, routing into one electronic design automation (EDA) solution that can optimize logic and interconnect simultaneously. The next problem is the degradation of signal integrity, which can be caused by capacitive and inductive cross coupling, by IR voltage drop (current-resistance), and by substrate noise injection. The EDA tool solution in this case consists of fast and accurate analysis that can drive avoidance and correction of signal integrity problems primarily in routing, as well as in synthesis and placement. EDA tools must also increasingly address other unwanted side effects, such as electro migration, wire self-heat, hot electron device degradation, process antenna effect, and thermal stress.

The second challenge is complexity. Today, large SoCs consist of tens of millions of transistors, resulting in hundreds of millions of rectangles, with an increase of at least another order of magnitude over the next few years. The only way to address such large designs is through hierarchy (a chip composed of blocks) and the use of pre-designed blocks called “intellectual property” (IP). No SoC today is designed without using at least two levels of hierarchy, as well as IP in the form of memory, processors, etc. As a result, hierarchy support in EDA tools is essential. The trend towards hierarchical chip-level tools, such as extraction, synthesis, timing analysis, etc., is accelerating, adding to the complexity of the EDA tools themselves. Furthermore, a uniform treatment of hierarchy among related tools (or all tools) becomes a necessity.

The third challenge is in system design. As semiconductors become larger parts of electronic systems, all the way to a complete system on a chip, system design increasingly encompasses chip design and vice versa. This phenomenon increases the need for system-level EDA tools that integrate well with the traditional logical and physical tools used for chip design. System design is more domain specific, or vertical, than the more generic, or horizontal, logical and physical design. This difference results in various system-level abstractions, such as DSP, reactive control, protocols, etc., which must be addressed by EDA tools. Reaching for a higher level of abstraction poses even more challenges to the development of such tools.

This presentation poses EDA solutions to these challenges, gives concrete examples, and argues that complete solutions, rather than point tools, will increasingly and justifiably dominate the EDA field.