DELIVERING THE BEST OF HIGH TECH

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The electrification of our world continues at a rapid pace. Since the 1960s, Dr. Gordon Moore's prediction that computing performance will double every 12 to 18 months has held true. The conveniences of the modern world — ubiquitous communication through internet-enabled phones, electronic payments and digital streaming — are all due to continuous engineering innovations delivered through cheaper, faster, more-precise electronics.

What a transformation it's been! The first Intel microprocessor, introduced in 1974, contained less than 3,000 transistors whereas the recent microprocessors and GPUs contain more than 10 billion transistors. Similarly, the first working mobile phone prototype, demonstrated in 1973, weighed nearly 2.5 pounds. In comparison, the latest iPhone weighs 4.55 ounces and provides the functionality of a mobile computer. These feats required more than just breakthroughs in electronics. Innovations in materials science, physics and processing technologies, and engineering simulation also deserve credit.

Throughout my engineering career, I've used many simulation tools to design semiconductor devices, embedded systems and software. At first I used schematic capture tools to build circuit boards, but quickly learned that simulating the designs on computers was more efficient and provided more design insight. In a virtuous circle, I used simulation tools running on Compaq computers to help design the next generation of better, faster, cheaper Compaq computers.

Since then, engineering simulation tools have gotten more sophisticated. While early tools enabled engineers to model and simulate individual components, modern tools use real-world physics to solve larger problems, including system integration. Andrew Cresci of NVIDIA captured this succinctly when he said, "We use ANSYS simulation running on current-generation GPUs to design the next generation of GPUs."

The high-tech industry shapes far more than communications and computing. High-tech innovators are actively working with automotive companies to make cars smarter. At the 2016 Consumer Electronics Show, the auto industry stole the spotlight, highlighting autonomous vehicles. Tesla has added more autonomous driving capabilities in its cars and three Mercedes Benz autonomous vehicles are now permitted for public testing in Nevada.

To support all this automation, high- tech companies are investing heavily in processing capabilities. Automation platforms, such as NVIDIA's PX2, are crucial. With 12 inputs for all types of sensors — from video cameras to ultrasonic sensors — and the processing capacity of 120 MacBook Pro computers, the PX2 platform is just one example of complex systems needed for modern electronic automation.

These exciting innovations hide the complexity that design engineers must overcome to meet strict power, performance and cost specifications. The chip designer must ensure that the IC delivers the best performance per watt of energy; the PCB designer must address all signal and power integrity issues; the communication system engineer needs to produce a robust antenna design; and the software engineer needs to guarantee low latency and high reliability. Many of these parameters must be verified by tests conducted across a range of operating conditions, such as temperatures and voltages. And this is just the tip of the iceberg in terms of analyses that engineers perform to deliver affordable and reliable products.

This "best of high tech" issue of *ANSYS Advantage* includes many examples that validate the value of engineering simulation to building better high-tech products. For instance, Chemring Technology improved antenna efficiency by 67 percent and won CES 2013 Design and Engineering award, NXP designed a 75 percent smaller IC for automotive infotainment, Vortis technology improved cell phone battery life by 125 percent, and Alacatel-Lucent built a 10-gigabit-class networking product at a much lower cost.

ANSYS simulation tools play an important part in the smart product journey. From semiconductor design to structural integrity and aerodynamic performance, high-fidelity 3-D simulation enables engineers to converge on the best solutions faster, gain quicker insight into trade-offs, and minimize over-design with ease. Recognizing the complexity of the challenges you face, ANSYS delivers the most advanced simulation solutions to speed your innovations.