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Viewpoint — Supercomputing: The Next Industrial Revolution

Companies that embrace supercomputing can help put U.S. industry back on competitive footing in the modern world economy.

By Stanley Ahalt

Across the country, small and medium-sized companies in automotive, manufacturing and other assembly line industries are suffering tough economic times due to ever increasing global market competition. Sobering headlines tell of layoffs and closed doors as businesses struggle to remain competitive with higher labor overhead, rising production costs and outdated technology.

To reverse this trend and remain viable, companies must take an evolutionary step and start looking to technologies that can enable them to build better products, cut costs of production, quickly analyze and solve assembly line problems and streamline overall efficiency.

Computer modeling and simulations, made possible by high performance computing or supercomputing, were once technologies exclusive to corporate titans with endless R&D budgets. Today they are becoming increasingly scalable to companies of all sizes with a limitless spectrum of uses, much like personal computers have become smaller, sleeker and more affordable to consumers. Where desktop computing was once considered the primary workhorse for initial industrial productivity gains, today's workhorse is high performance computing, using scientific and engineering computing to dramatically increase productivity.

The race is on. Japan has already started implementation of high performance computing within its industries. Chinese companies are also buying up some of the world's fastest supercomputers. In a 2005 report, the National Academies of Sciences has urged Congress to facilitate the deployment of high performance computing in the U.S.

What are the benefits? Supercomputing applications can produce virtual prototypes of parts and products, reducing the time and effort to bring a product to market. Simulation makes choosing between alternative processing methods far easier. Better analysis and documentation of capabilities helps with efficiency. Improved factory and workflow layouts increase productivity. All of these factors can dramatically improve a company's bottom line and increase

its competitive edge in the global marketplace.

Today, the same supercomputing technology used in car crash test analysis is being used to determine whether a plastic bottle of liquid detergent can withstand a five-foot freefall. Aerodynamic analysis used by airline industry is now being applied to solve the problem of stopping Pringles potato chips from flying off of the assembly line. Supercomputing simulations have reduced the amount of money that Goodyear has spent on physical tire prototypes from 40% to 15%. Even golf club manufacturer Ping, a mid-sized company in Phoenix, is using supercomputing to simulate new designs in golf clubs.

Supercomputing can breathe life into small and medium-sized companies whose technologies are prehistoric by today's standards. The National Science Foundation echoes numerous independent studies that have concluded that computer modeling and simulation are the key elements for achieving progress in engineering and science.

Microsoft Corp Chairman Bill Gates has recognized the future potential saying, "We see as a key trend here is that we'll have supercomputers of all sizes, including one that will cost less than \$10,000 and be able to sit at your desk or in your department and be very, very accessible...we need an approach here that scales from the smallest supercomputer that will be inexpensive up to the very largest."

While that day may still be in the distant horizon, efforts are underway to bring high performance computing into small and medium-sized companies today. The Ohio Supercomputer Center has developed the innovative Blue Collar Computing program, which will help small and medium-sized companies gain access to supercomputing technology at a more affordable cost. With improved software development, training, outreach and partnerships, supercomputing can become a reality on a smaller scale for industrial clients.

In a recent national radio address, President Bush pledged to further advance this program by increasing funding for research in new promising areas-particularly supercomputing.

Senator Mike DeWine (R-OH) and Senator Herb Kohl (D-WI) have introduced legislation, the "Blue Collar Computing and Business Assistance Act of 2006," that will authorize up to \$25 million per year for the Commerce Department to create up to five new supercomputer centers across the country. Staff from these centers would help small businesses find areas where supercomputing would help them stay competitive and then link the business with existing supercomputing labs to execute those plans. The centers would also develop software specifically designed to meet the needs of small businesses.

The benefits are clear as Procter & Gamble President and CEO A.G. Lafley noted to Wall Street analysts, "We are significantly expanding capabilities in computational modeling and computer-aided engineering, so we can do an increasing percentage of product and process design through virtual simulation." Brant Barlow, IT Solutions Architect for Nationwide sees similar results, "It just gives you a more accurate reading of where that product or service will be twenty, thirty, forty years down the road."

Perhaps the best assessment is offered by the Washington-based Council on Competitiveness, "the country that out-computes will be the one that out-competes."

During the industrial revolution, visionary companies that adopted bold innovations were able to reduce assembly line time, fix production headaches or simply build a better mousetrap. Companies that embrace the endless possibilities of new technologies and supercomputing can reap these benefits once again and help put U.S. industry back on competitive footing in the modern world economy.

Stanley Ahalt is Executive Director of the Ohio Supercomputer Center (www.osc.edu), a technology initiative of the Ohio Board of Regents that connects high performance computing, a state-of-the-art research network, and a deep pool of expertise dedicated to advancing research in the public and private sectors. He can be reached at ahalt@osc.edu.