Computers in engineering

Visualizing improved aviation safety

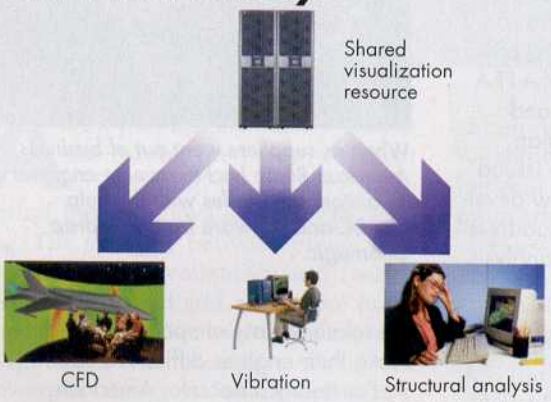
Henry Ford's single greatest contribution to industry was the moving assembly line, which took the Industrial Revolution to the next level of innovation. The assembly line allowed individual workers to stay in one place and work on multiple vehicles that passed by them. Ford realized that increasing efficiency was the key to escalating production, allowing him to surpass his competitors while keeping his costs substantially lower.

Manufacturing has come a long way since 1903, but industry continues to adopt new technologies to increase operational efficiencies. Visual Area Networking (VAN) is one such technology.

From two different perspectives, VAN is the assembly line of the 21st century. From an engineer's perspective, it delivers the efficiency benefits of an assembly line by allowing creators and consumers of manufacturing information to remain in their offices and visually interact with data, applications, and colleagues located at another site—increasing efficiency by eliminating travel, and shortening design cycles with distributed design reviews, and therefore shorter delivery times.

From an IT perspective, VAN delivers assembly line benefits by allowing large data sets to remain in a single location while computational and visualization tasks move around them—increasing efficiency by eliminating time-consuming data copying and maximizing resource use.

VAN enables a single set of resources to support multiple organizations. The environment can support the large data visualization needs of multiple groups in the same way that a computer server or supercomputer supports the simulation needs of CFD, structural analysis, and vibration engineers within a company.



Lockheed Martin uses a Visual Area Networking system from SGI to analyze and investigate aviation events.

The technology can also be used to analyze past events to prevent their recurrence. **Lockheed Martin** uses **SGI**'s VAN solutions to analyze aviation events and construct physics-based models of the circumstances leading to them. The company has offices throughout the Fort Worth, TX, metropolitan area, each housing experts in different disciplines, and they are connected via high-speed networks.

When an expert reconstruction of an event is called for, the company convenes virtual teams of scientists and engineers located at different physical facilities to work on different aspects of the investigation. VAN enables a modeler in one facility to show his results to an engineer in another facility or to a senior executive in Washington D.C. without ever having to leave the office. Illustrating that it is much more than video conferencing, Lockheed Martin takes advantage of the multi-user capability to allow remote participants in a meeting to take control of the simulation, change parameters, and visualize the results—reaching conclusions faster and with less expense than ever before.

To maximize the benefit achievable from VAN, manufacturing companies need to have the proper resources in place. It is crucial that a scalable visualization system like the Silicon Graphics Onyx4 UltimateVision be used as the core visualization server.

An Onyx4 system supports up to 64 CPUs and 32 graphics pipes, and these resources can be dynamically allocated to groups and users on a scheduled or on-demand basis. Small groups can start out with small systems and increase capability as problem sizes or the number of users increase—like speeding up an assembly line. Using this technology also allows existing desktop workstations and personal computers to access more powerful servers.

VAN increases the value of large data sets by making them available to many users throughout an organization, and also extends the economic life of desktop systems by eliminating the need to upgrade them to handle the occasional analysis of larger data sets or the use of advanced software capabilities.

This article was written for *Aerospace Engineering* by **Michael Brown**, Visualization Software Product Line Manager for SGI.

Reconstructing custom fan blades

Beyond a physical likeness, the design and mechanical features of a blimp, or airship, are closer to a submarine than an airplane. Such a melding of concepts introduces design elements unlike those in any other aircraft—something **American Blimp** realized firsthand when the manufacturer of its custom fan blades went out of business.

"Airships are strange beasts and are totally different from 'normal' aircraft," said Lance Nordby, Project Engineer at American Blimp. "They have a number of systems on board that have no counterpart in the airplane world."

One distinctive design aspect of American Blimp airships are the fan blades, modeled after Moulton Taylor's Aerocar of the 1950s. The car/airplane incorporated a cooling fan that American Blimp thought suitable for cooling the airship engines. Fan design is particularly important because