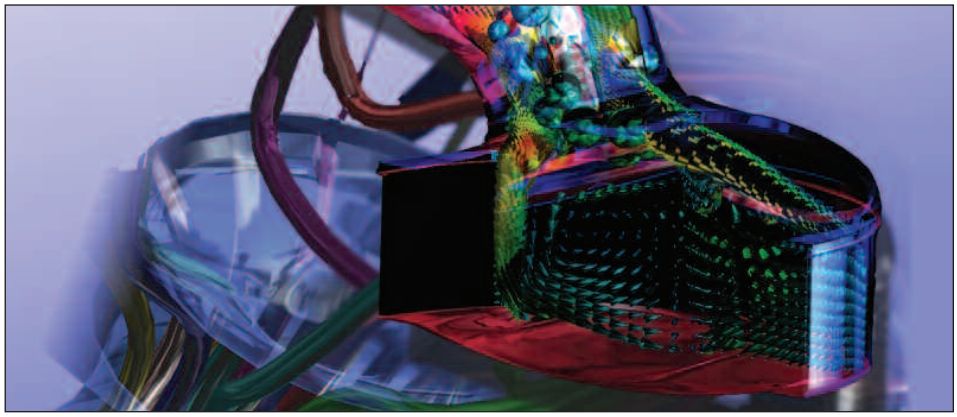
Application Brief

SGI® Visualization Solutions



Silicon Graphics Prism™ Visualization System and AVL Advanced Simulation Technologies FIRE:

Delivering Groundbreaking Computing and Visualization for Engine CFD

Silicon Graphics Prism and AVL Advanced Simulation Technologies FIRE create a world-leading solution for preparing, computing, and analyzing all engine-related computational fluid dynamics (CFD) problems. Together, AVL Advanced Simulation Technologies and Silicon Graphics Prism deliver a scalable compute and visualization solution for pre-processing, high-performance computing, and post-processing of large and complex data engine models on a single shared-memory system platform. You should consider this solution for your organization if:

- You are visualizing large or highly refined models for engine development and spending a significant amount of time decimating your data so that you can work with it and visualize it.
- You spend a lot of time moving data around the network from compute resources to visualization resources.
- You cannot currently visualize your entire engine model and would like this capability.
- You are a high-performance computing (HPC) user and wish to accelerate the interpretation of the large amount of data you generate.
- You are a cluster user who is becoming increasingly aware of the challenges of operating and maintaining a multinode system for large-scale visualization.

A Powerful Team for CAE Compute and Visualization

AVL FIRE and Silicon Graphics Prism help you manage your large data internal combustion (IC) engine CFD pre-processing, analysis, and post-processing more effectively than ever before. Using the highly scalable SGI architecture, the AVL FIRE application provides:

- A robust 3D CFD tool for IC engine development
- User-friendly and workflow-oriented graphical user interface that can be learned quickly, reducing training time
- Extremely high result accuracy

- Fluid-structure coupling and 1D/3D coupling, ensuring consistent results

- Software reliability with in-house validation and more than 15 years CFD software development experience

Delivering Workflow Benefits

AVL FIRE and Silicon Graphics Prism deliver a complete solution for engine engineering, from the pre-processing phase (project management, model preparation and mesh movement) to the solver (fully unstructured technology for arbitrary cell types, true multiphase capabilities, comprehensive set of IC-engine specific spray and combustion models) to the post-processing (multiple cuts, surface values, particle tracing, and animation director).

Workflow benefits of Silicon Graphics Prism and AVL FIRE include the ability to:

- Conduct high-performance analysis and interactive visualization on the same system

- Interactively visualize large or complex data without decomposing it first

- Collaborate interactively with remote users without moving data, for example by using Visual Area Networking (VAN)

- Leverage the system as a virtual resource by sharing it simultaneously with a number of users or allocating it to large-scale computation and visualization as needed

- Standardize on a common application for visualization of CAE results

AVL Fire provides validated and field-tested models for:

- Single and multiphase flows
- Air/fuel mixture
- Wall film generation and propagation
- Ignition and combustion
- Pollutant formation
- Flow and kinetics in catalytic converters and particulate filters
- Coolant flows including boiling

In addition, interfaces for direct implicit coupling to 1D thermodynamic cycle simulation and a coupling to popular finite element modeling (FEM) software are designed for best quality for gas exchange and thermal load analysis, respectively.

Incorporation of user-defined physical and chemical models is also possible due to the open structure of the code, which offers access to all flow-determining variables within a comprehensive set of user functions.

The Silicon Graphics Prism shared memory architecture and the AVL parallel implementation provide speed-up factors close to the optimum.

Supporting Applications

AVL FIRE is complemented in the AVL CFD environment by the pre-processor FAME and the post-processor IMPRESS. Interfaces to a number of other pre- and post-processing applications are provided. AVL FIRE offers direct interfaces to AVL BOOST and other commonly used 1D thermodynamic cycle software. A link to AVL HYDSIM offers import of 1D injection system simulation data for processing within the 3D CFD simulation of flows in injectors and the injection of fuel into the combustion chamber.

Configuration Recommendations

Your ideal AVL FIRE and Silicon Graphics Prism configuration will depend on your current model size and requirements. Silicon Graphics Prism systems are highly scalable so that you can increase your system capabilities as your requirements increase. Based on best-of-breed industry-standard components with Linux®, Intel® Itanium® 2, and ATI® FireGL™ graphics, the systems can scale to 16 graphics pipelines and 256 processors.

Upgrading Your SGI® Altix® System

You can upgrade your existing SGI® Altix® 3000 system to include visualization with a Silicon Graphics Prism visualization module with the addition of a NUMAlink™ 4 router.

Silicon Graphics Prism Deskside

The newly introduced Silicon Graphics Prism deskside provides an entry configuration with 1 CPU, 1 GPU, scalable to 2 CPUs and 2 GPUs. One major asset of the Silicon Graphics Prism deskside is its capability to handle very large models using up to 24GB of main memory. For important analysis, Silicon Graphics Prism deskside is an ideal platform to handle large-scale pre- and post- processing activities in conjunction with a central SGI® Altix® high-performance compute system. Silicon Graphics Prism and the Altix are binary compatible. A minimum recommendation for use with AVL FIRE is 2 CPUs, single pipe, 4GB memory, and 80GB disk.

Power System

The optimal Silicon Graphics Prism Power configuration for local work is an 8 CPU single pipe system with 24GB memory and 200GB disk.

Extreme System

The ideal large configuration with AVL FIRE is a 32 CPU, single pipe system with 32GB memory and 500GB disk. This system can be leveraged as a shared resource, simultaneously supporting multiple individuals, groups of people working together, and the HPC requirements of an entire organization.

For more information:
See Silicon Graphics Prism at *www.sgi.com/products/visualization/prism.*

See AVL FIRE at *www.avl.com.*

Corporate Office
1500 Crittenden Lane
Mountain View, CA 94043
(650) 960-1980
www.sgi.com

North America +1 800.800.7441
Latin America +55 11.5509.1455
Europe +44 118.912.7500
Japan +81 3.5488.1811
Asia Pacific +1 650.933.3000

3819 [06.2005]

J14942