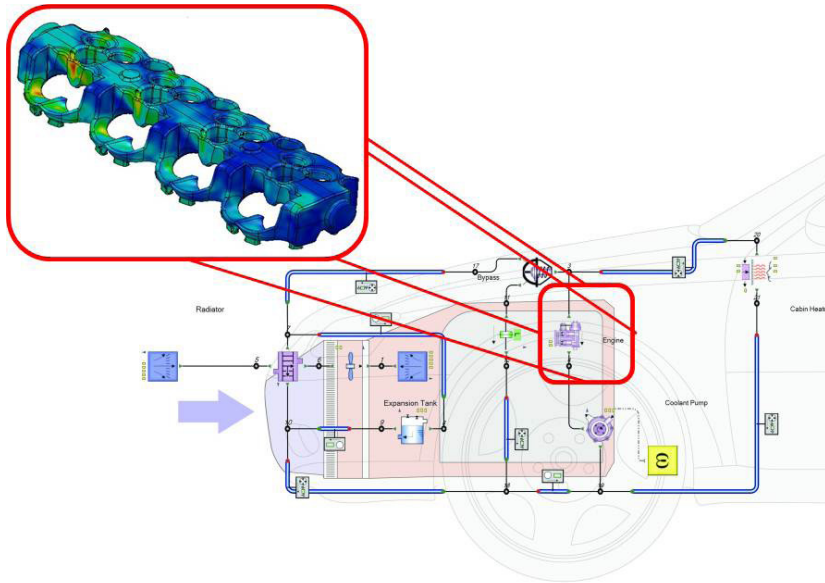


# Combining the Best of Both

## 1D-3D Computational Fluid Dynamics (CFD)

Mechanical Analysis

TECHNOLOGY OVERVIEW



### 1D System CFD

- Simplify complex geometry
- Ability to provide fast answers on fluid dynamics such as flow rates, pressure changes, and temperature fluctuations

### 3D Component CFD

- Model complex geometry
- Ability to provide detailed information on fluid dynamics such as flow regimes, multiple phase changes, and chemical reactions

## NATIVELY COUPLED 1D AND 3D CFD SOFTWARE FOR SYSTEMS ENGINEERS

Over the years, both 1D and 3D CFD software solutions have been used successfully for modeling thermo-fluid systems in the automotive, aviation, oil, gas, power, and energy industries. Both 1D and 3D CFD enable engineers to improve understanding of fluid flow and engineering designs; and in many organizations, both are used to improve product and system design and to ensure performance targets are achieved throughout the operating cycle of interest.

For the first time in the industry, Mentor Graphics is providing a tightly coupled general-purpose 1D-3D CFD simulation software combination. With this combination, engineers can characterize the more complex elements of the sys-

tem with full 3D and easily insert those models into the 1D system-level model for simulation.

FloEFD™ Concurrent CFD can reduce simulation time by as much as 65–75% in comparison to traditional CFD tools. Concurrent CFD enables design engineers to optimize product performance and reliability while reducing physical prototyping and development costs without time or material penalties. And because Flowmaster® offers a fast and reliable solution to 1D flow problems, designers can expect unrivalled savings in both time and process compression.

Mentor Graphics 1D-3D solution provides an opportunity to increase digital prototyping information earlier in the product development

process. This kind of analysis performed upfront accelerates design and development cycles by orders of magnitude and optimizes product design workflows. It increases engineer and designer productivity and minimizes design risk and re-spins. This 1D-3D combination provides the best of both worlds, reducing time to get essential component information to system engineers and improving system-level accuracy with highly complex geometries, thus reducing the design cycle time.

## Mentor Graphics Mechanical Analysis Solutions

### Benefits of 1D-3D CFD

- Delivers higher accuracy results than standalone 1D CFD.
- Operates on standard engineering hardware.
- Works natively in FloEFD and Flowmaster.
- Allows for easy reuse of the characterized component.
- Provides meaningful results faster and allows more “what-if” scenarios to be run.
- Relieves time pressures when a design must be finished quickly.
- Allows better management and problem-solving for complex system designs.
- Brings a more complete solution to the hands of systems engineers.

### Thermal Analysis of Electronic Systems

*FloTHERM* — CFD market leader in the electronics vertical market (IC packages, PCBs, systems).



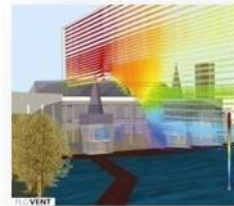
### Hardware for Thermal and Optical Testing

*T3Ster* — Thermal testing of electronic parts and systems.



### Heating and Ventilation in Buildings

*FloVENT* — Optimizes airflow, temperature distribution, and contamination control in and around buildings.



### Concurrent CFD for All Industries

*FloEFD* — A paradigm shift in CFD: fully embedded in the mechanical design environment.



### 1D Thermo-Fluid CFD for Aero, Auto, Process, and Power-Generation Industries

*Flowmaster* — Fast and accurate simulation of fluid mechanics and pipe flow in complex systems



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