



DIGITAL INDUSTRIES SOFTWARE

Vehicle thermal management

Reducing vehicle thermal management costs and time-to-market using multi-level fidelity workflows

Benefits

- Reduce program costs and schedules with decreased physical testing (virtual sign-off)
- Reduce warranty issues with early detection of heat-induced part failure
- Meet engineering demands at every level of the design phase with multi-level fidelity workflows
- Enable engineers to go from CAD to results without having to be a CFD expert

Summary

Simcenter™ Engineering and Consulting services uses Simcenter STAR-CCM+™ software to make vehicle thermal management (VTM) more flexible, accurate and intuitive. Simcenter Engineering and Consulting services and Simcenter STAR-CCM+ are part of Xcelerator, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software.

Over a vehicle's lifetime, it is repeatedly exposed to temperatures up to several hundred degrees Celsius. These high temperatures are especially harsh on critical components under the hood that have limited airflow.

VTM is the practice of evaluating the temperature of parts across the vehicle and mitigating exposure to excessive heat. VTM is critical for every automotive original equipment manufacturer (OEM) and the cost of getting it wrong can be extremely high.

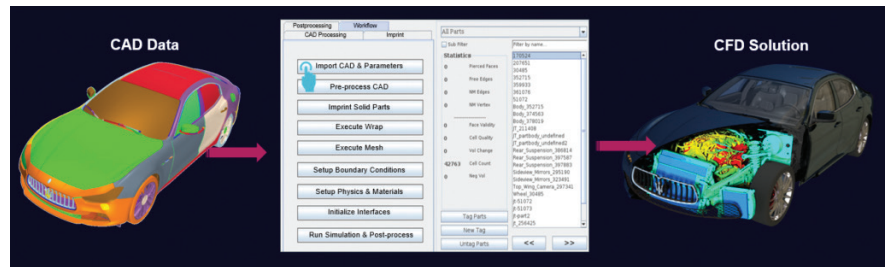
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Benefits *continued*

- Create a customizable and automated experience by selecting fidelity and speed levels
- Allow complex simulations to become more computationally affordable

Simcenter Engineering experts have developed workflows that provide a structured process for engineers to go from computer-aided design (CAD) modeling to physical results without the need to be a computational fluid dynamics (CFD) expert. These workflows allow the user to choose from different levels of fidelity to achieve results within the designated timeframe.



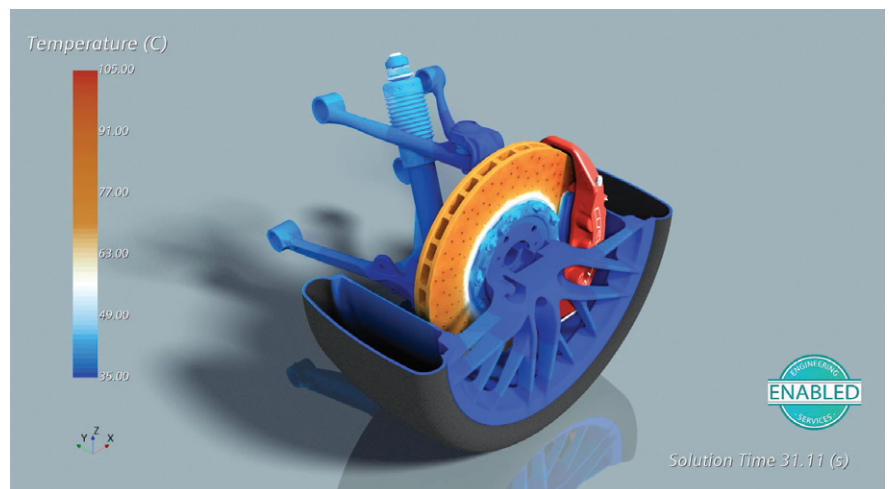
Users can select one of three levels of fidelity:

- Sub-system modeling
- Early digital prototypes
- Digital twin simulations

These options enable engineering teams to simulate various levels of model complexity, ranging from a simple front-end flow to a complex drive cycle analysis, and to increase the complexity as required. They provide an entirely customizable and automated experience to allow users to choose not only which level of fidelity they would like, but also how quickly they would like to get the results.

Sub-system modeling

For engineers who are working in the initial design phase or seeking an idea about overall performance trends, subsystem modeling is an excellent solution. This fully automated solution, tailored for sub-systems such as brakes, allows engineers to model up to 500 solid parts and can provide results in a few days.



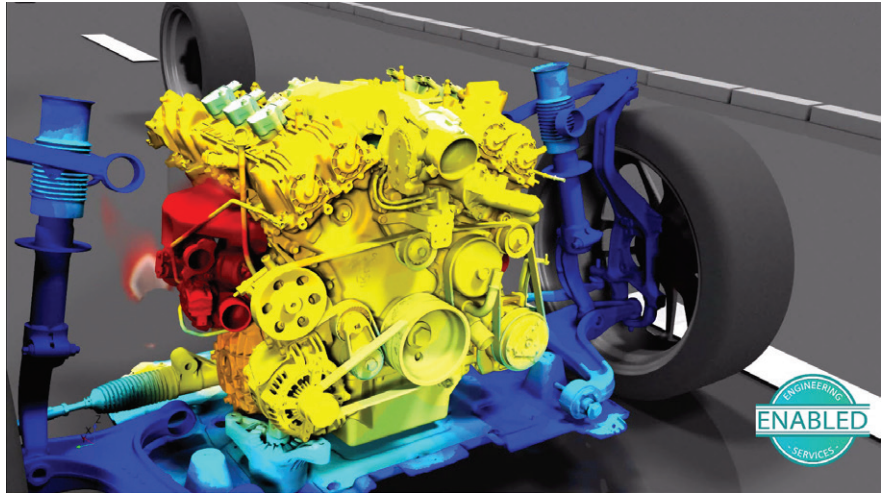
Early digital prototypes

Early digital prototype modeling offers a semi-automated process and a higher level of fidelity. This is well-suited for engineers who are still in the early design phase but looking to examine more parts. This level enables a company to model several thousand parts in a week. Simcenter Engineering and Consulting services recommend this stage when the CAD design is incomplete, or when it is still changing.

Digital twin simulations

This workflow allows for digital prototyping. It enables companies to move from physical testing to a digital verification and validation process. At this level, it is possible to conduct everything from steady-state simulations to complex drive cycles.

Using this level, engineers can easily simulate over 10,000 solid parts using a semi-automated process within four weeks. It offers the highest level of fidelity, capturing all modes of heat transfer from multiple sub-systems. Additionally, it can be used to model all available boundary conditions, making it suitable for later design cycles.



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