SUMMARY
It is a well known fact that the complexity and number of requirements to support the product development process continuously increase. To meet these needs the development of methods in early phases becomes more and more important.
One area of contribution is the ever-improving simulation techniques. At least equally important is the targeted combination of different simulation tools, spanning over different disciplines (=multidisciplinary) and holds a high potential within the next years. The use of over-all simulation models enables the identification of conflicts within product requirements and consequently optimization potential by transparent interdependencies. In this context the so called “Coupled Simulation” focuses in the controlled interaction between different applications, simulation models and components in a “multidisciplinary over-all-model”
Thus the *Kompetenzzentrum - Das Virtuelle Fahrzeug Forschungsgesellschaft mbH (vif)* has investigated in the optimization of the thermal management for cars by using coupled simulation-models for a complete car in earlier projects. The developed method allows the transient simulation of the warm-up-phase of an engine interacting with the cooling and heating cycle in a very early stage of development and in a suitable time. This method for multidisciplinary simulation has been proofed by coupling 0-dimensional, 1-dimensional and 3-dimensional simulation techniques to an over-all simulation model at the *vif*. Therefore the thermal management can be optimized as a whole by coupling modified versions of each sub-system in a multidisciplinary optimization-loop.
In addition to the adequate modelling of each component with the appropriate software-tool, the controlled data-flow within the network is essential. Input of and output for each sub-system have to be managed. Different versions of the sub-model are linked to different versions of the over-all model; the management of the data includes traceability of earlier version of sub-models used in different over-all models together with its simulation results as well. Finally one control-file manages general boundary conditions of the over-all system and provides them centrally. With the so called *ICoS (Independent Co-Simulation Platform)* an efficient optimization for thermal management has been put into practice.
Now this proofed method will be transferred to the next level: Together with the Canadian project partner *Mecanica Solutions Inc.* an Enterprise Service Bus (ESB) will be designed for the needs of coupled simulation. In the common research project the ESB enables (as a part of a generic collaboration platform) consistent engineering data flow and efficient collaboration processes throughout the entire lifecycle. In this paper the potential of this approach for coupling complex simulation will be presented: Revisions across disciplines, reliable access to CAD data throughout product lifecycle, controlled multidisciplinary simulation across extended enterprises and optimized regarding accessible hard- and software.