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# A MULTIPHYSIC IMPLEMENTATION FOR CONJUGATE HEAT TRANSFER AND COMPRESSIBLE-LOW MACH COUPLING

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**Key words:** *Multiphysics, Conjugate Heat Transfer, Low-Mach, Compressible.*

A parallel procedure for modeling Conjugate Heat-Transfer and Low Mach-Compressible coupling using The Parallel Location and Exchange library is presented. In both cases exist industrial applications, such is the case of the interaction between the compressor and the combustion chamber into a gas turbine, where the compressor uses the compressible approach while the reacting flow in the combustion chamber can be approached using the Low Mach formulation.

*Conjugate Heat Transfer (CHT).* The coupled solution is computed so that then structure domain receives the heat flux from the fluid domain which in turn receives the interface temperature after it have been calculated by de structure domain. Also we must consider the fact that the physical interaction may be strong in one direction and weak in the other one. While the heat transfer is a diffusion process the fluid is dominated by the convection, the last gives rise to the rate of time between the solid and the fluid can reach $1 \times 10^6$ for a material like the cooper (see Fig. 1-2).

*Low Mach-Compressible coupling (LMC).* The interaction between Low Mach and Compressible Fluids is approached using a characteristic form of the Navier Stokes equations for the interaction at the boundaries of the fluids (see Fig. 2).

*Coupling tool.* The Parallel Location and Exchange library (PLE) is a tool originally developed by *Électricité de France* (EDF) to be used to coupling the Code-Saturne and the Syrthes thermal code. While Code-Saturne carry out the Computational Fluid Dynamic (CFD), the Syrthes is dedicated to solve thermal transient simulations. In order to includes more flexibility to the PLE library we have developed a C++ environmental which extents the capability of PLE to an easy communication between application codes written in C/C++, Fortran or Python.

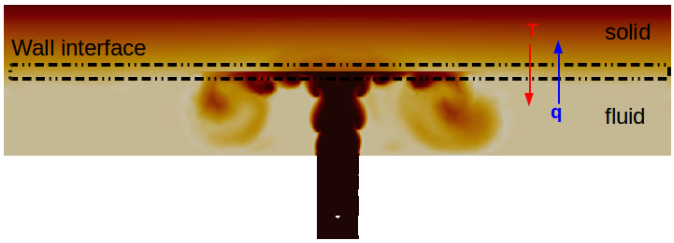


**Figure 1**: Conjugate heat transfer for a impinging wall configuration.

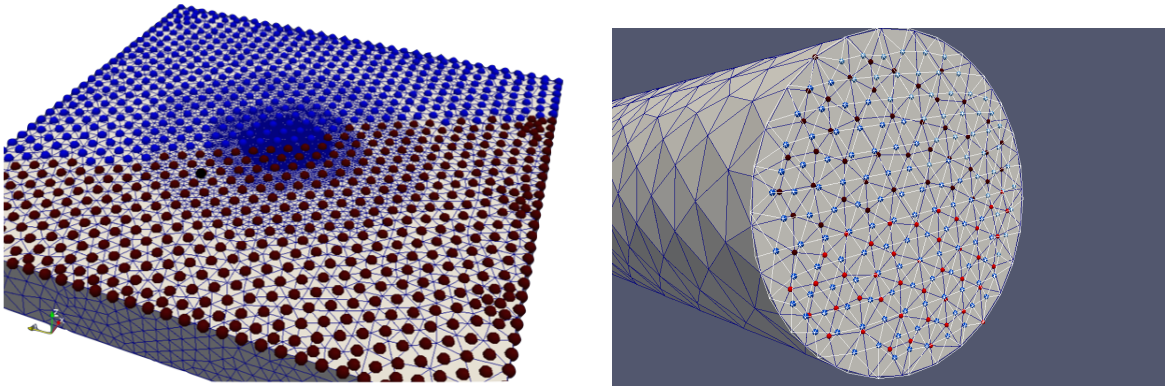

**Figure 2**: Interface between solid and fluid domain for CHT (left) and LMC (right).

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