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Tractability of LES for complex flows[1] SANJEEB BOSE, KAN WANG, CHRIS IVEY, FRANK HAM, Cascade Technologies — To date, the use of large-eddy simulations (LES) has often been restricted due to relatively large computational expense (leading to intractably long wall clock times) and challenges in the generation of suitable grids for complex geometries. Advances in scalable mesh generation, nonlinearly stable numerical methods and wall modeling have substantially reduced the computational cost of performing LES of flows with either complex physics and/or geometries. We will discuss the computational performance and scalability of the flow solver charLES on petascale architectures and the prospects of using LES within engineering design environments where higher simulation throughput is required. The cost and fidelity will be assessed in the context of some benchmark LES, including the prediction of transonic compressor stall (NASA Rotor 37). By leveraging massively parallel petascale computing platforms, it will be shown that such calculations can be completed within hours of wall clock time.

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Sanjeeb Bose
Cascade Technologies

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