Abstract(v2) for the Testcase C1.3a)
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1 Code description

The PADGE code implements higher order discontinuous Galerkin methods on unstructured possibly curved and locally adapted meshes.
Parameter settings for the current test case:

- Discretization/Higher order capability:
  - Lagrange polynomial basis functions of polynomial degrees 0-4.
  - Vijayasundaram flux
  - Characteristic farfield boundary conditions
- Solver/Parallel capability
  - Implicit solver (start with Backward Euler and switch to full Newton)
  - Residual and matrix assembly is parallelized
  - Linear solver: GMRES with ILU preconditioner (parallelized by PETSc)

2 Case summary

- The density residual has been reduced to 10^{-8} relative to the density residual at freestream conditions. Note, that a factor of 10^{-10} could not be achieved as the density residual stagnates at about 3×10^{-10}.
- Computations have been performed on the $C^2A^2S^2E$ cluster (648 compute nodes with 12 cores (two Intel Xeon X5670, 2.9GHz processors). The number of cores used ranged between 1 and 2. TAUBench on one core required 8.223 sec.

3 Meshes

The p4 quad meshes as provided on the HOW webpage

- naca_ref2.gmsh 2240 cells
- naca_ref3.gmsh 8960 cells
- naca_ref4.gmsh 35840 cells
- naca_ref5.gmsh 143360 cells

4 Results

Reference values: $C_d^{\text{ref}} = 4.10732 \times 10^{-6}$, $C_l^{\text{ref}} = 0.28648305875$

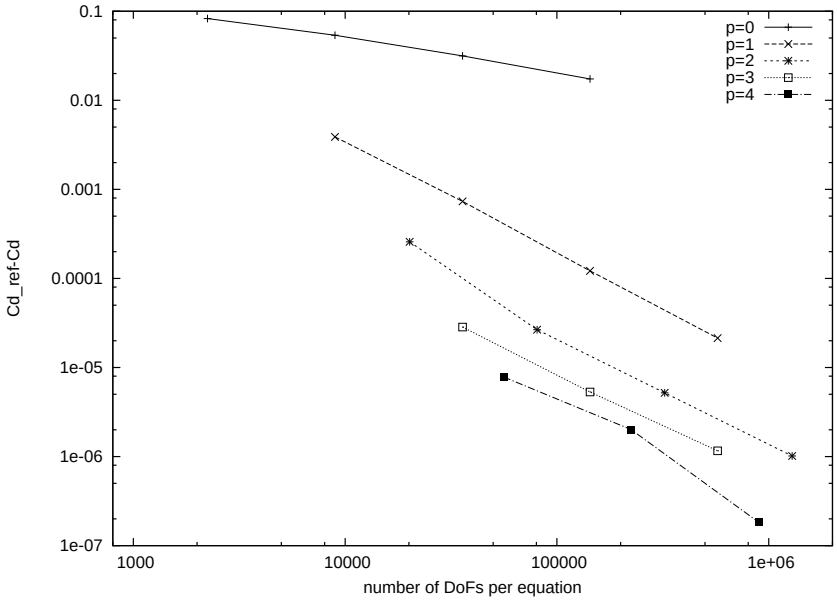

Figure 1: Error in C_d vs. number of DoFs per equation

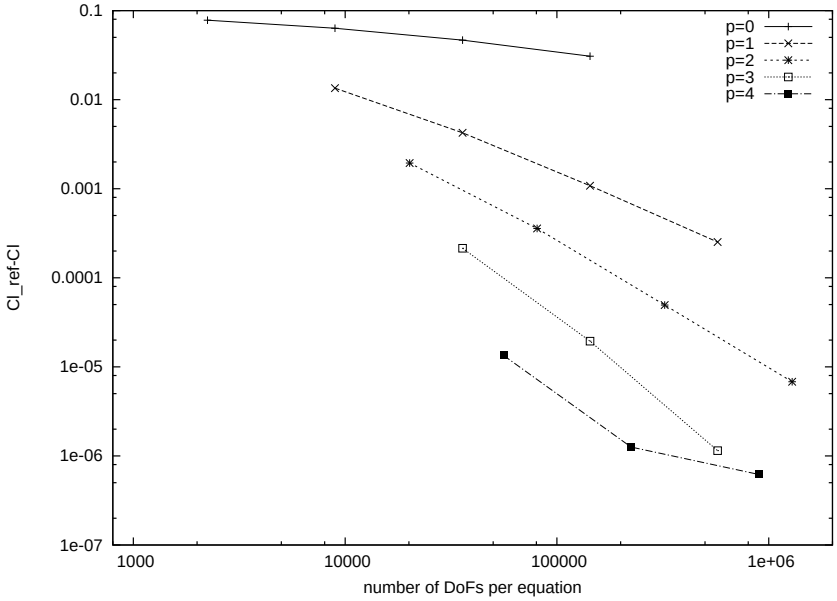

Figure 2: Error in C_l vs. number of DoFs per equation

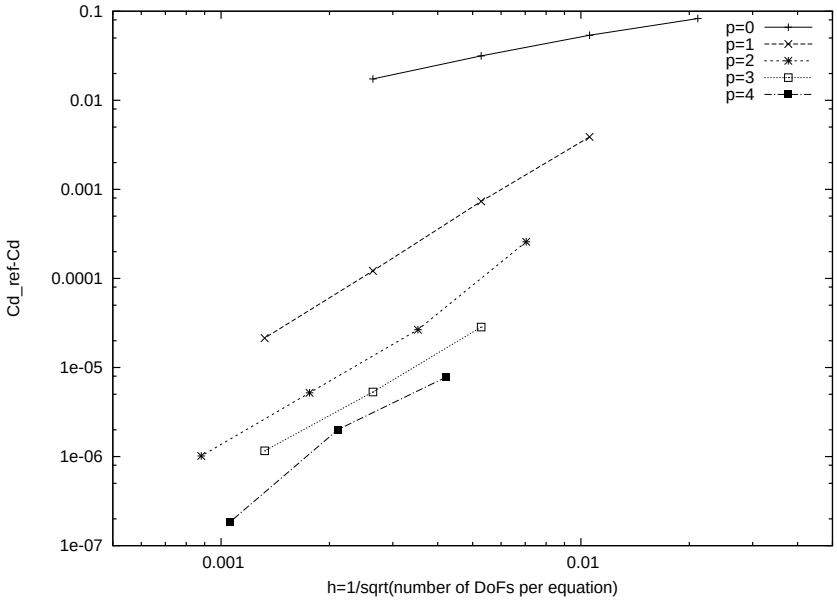

Figure 3: Error in C_d vs. $h = \sqrt{\text{number of DoFs per equation}}$

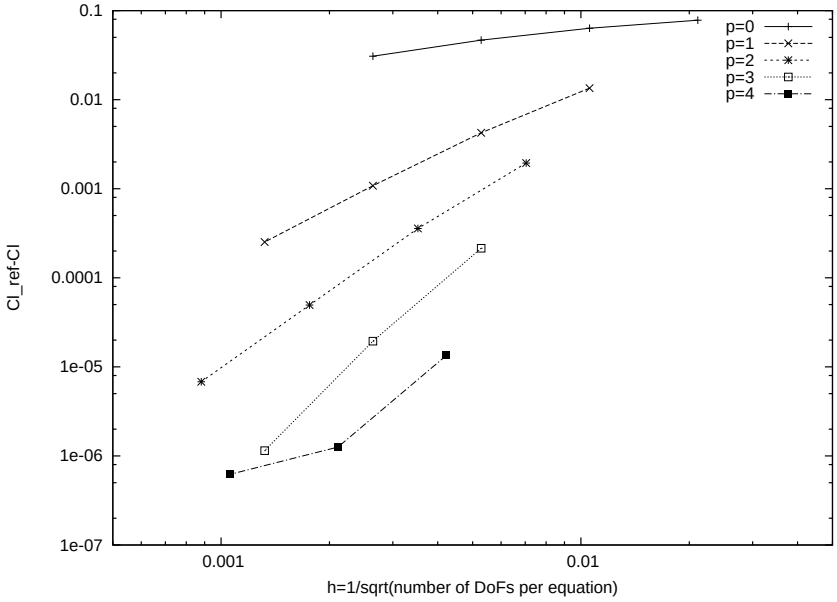

Figure 4: Error in C_l vs. $h = \sqrt{\text{number of DoFs per equation}}$

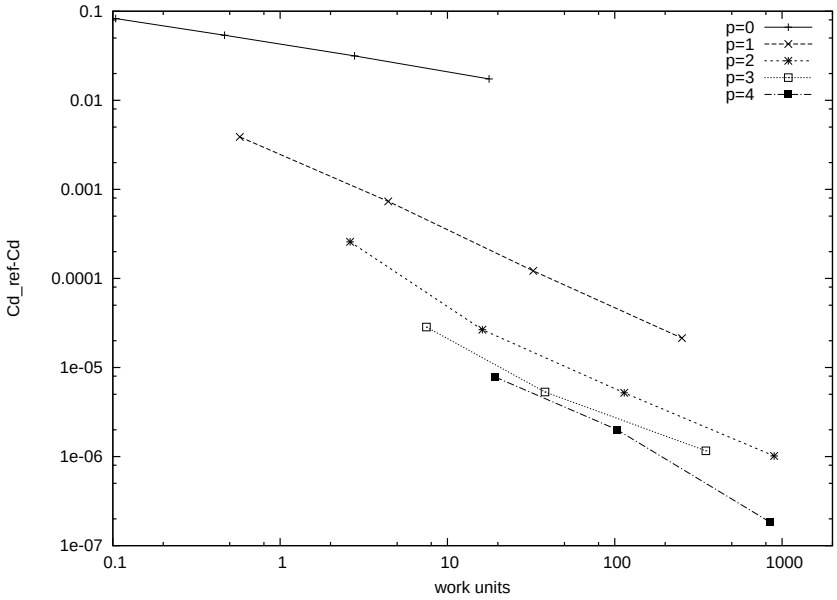

Figure 5: Error in C_d vs. work units

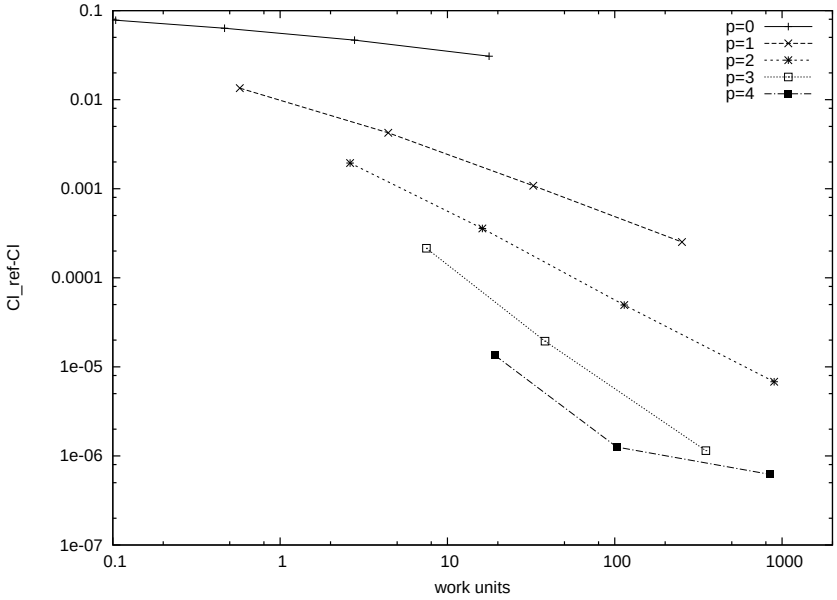

Figure 6: Error in C_l vs. work units