Abstract for the Testcase C2.3a
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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 0-3.
  - Roe flux with entropy fix
  - Characteristic farfield boundary conditions
- Solver/Parallel capability
  - Implicit solver (full Newton or Backward Euler)
  - 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^{-10} relative to the freestream density residual.
- Computations have been performed on old nodes of the $C^2A^2S^2E$ cluster (86 compute nodes with 8 cores (AMD Opteron, 1.9GHz QuadCore processors)). The number of cores used ranged between 1 and 12. TAUBench was between 19.069 and 19.768 sec.

3 Meshes

The q4 meshes as provided on the HOW webpage

- btc0-NLR-E1.v2.m4.msh 768 cells
- btc0-NLR-E2.v2.m4.msh 6,144 cells
- btc0-NLR-E3.v2.m4.msh 49,152 cells
- btc0-NLR-E4.v2.m4.msh 393,216 cells

4 Results

Reference values: $C_d^{\text{ref}} = 4.1402 \cdot 10^{-6}$, and $C_l^{\text{ref}} = 0.0001222976$ (taken from a p=2 solution on the fine mesh with 393 216 elements and 53 084 160 DoFs).

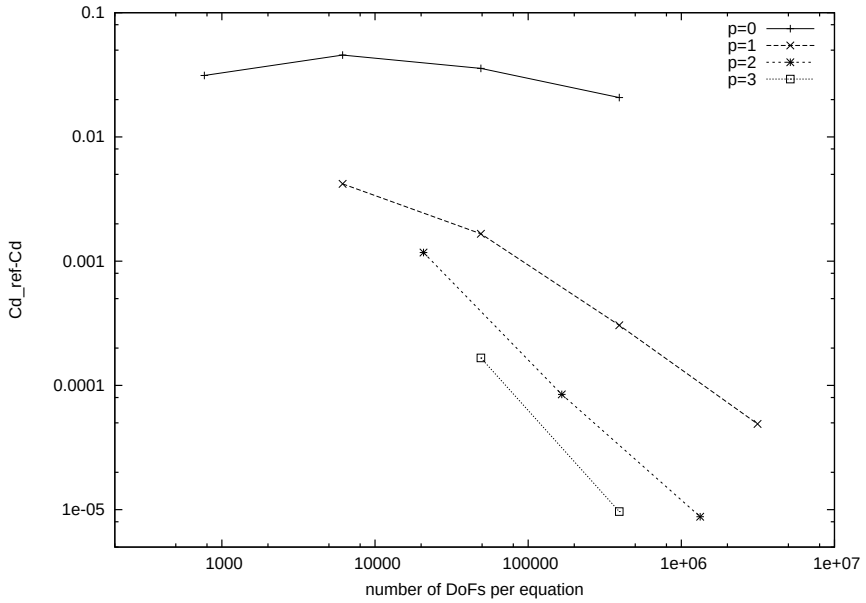

Figure 1: Error in C_d vs. number of DoFs per equation

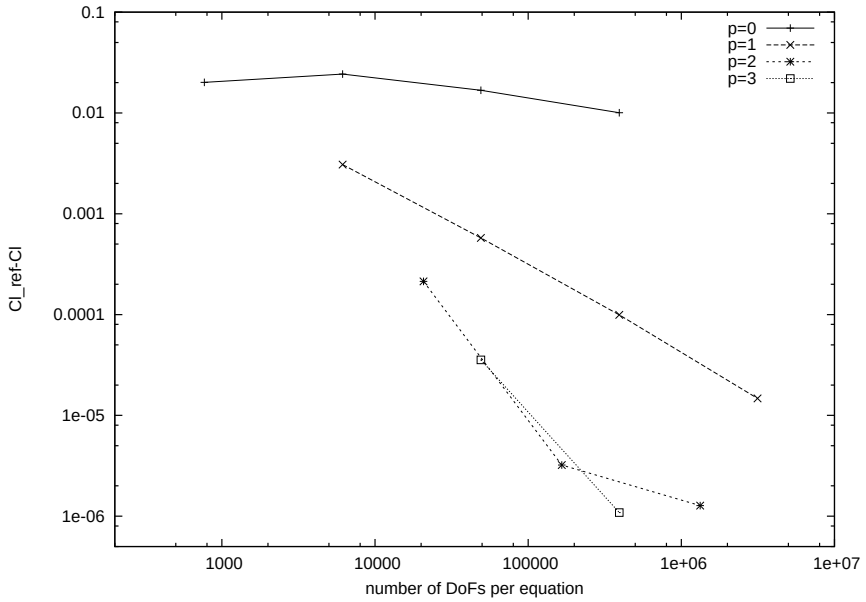

Figure 2: Error in C_l vs. number of DoFs per equation

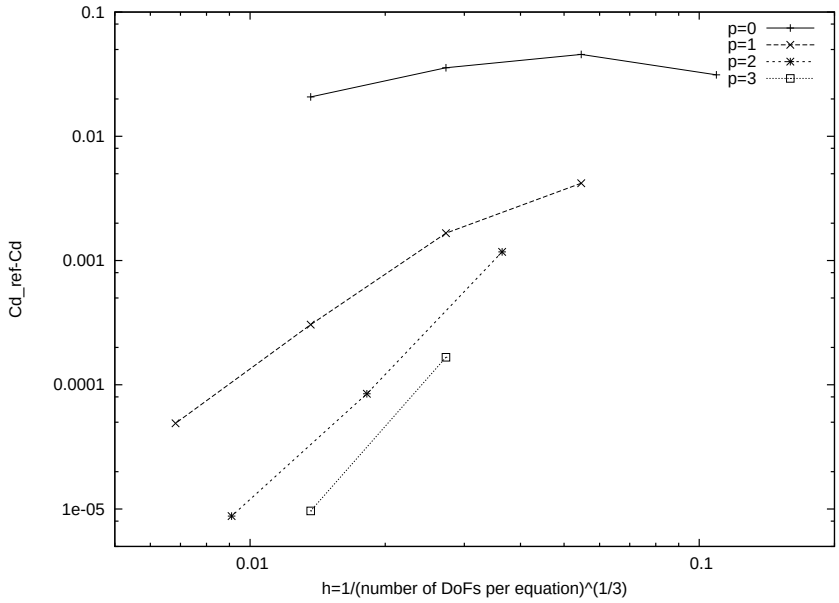

Figure 3: Error in C_d vs. $h = 1/\sqrt[3]{\text{number of DoFs per equation}}$

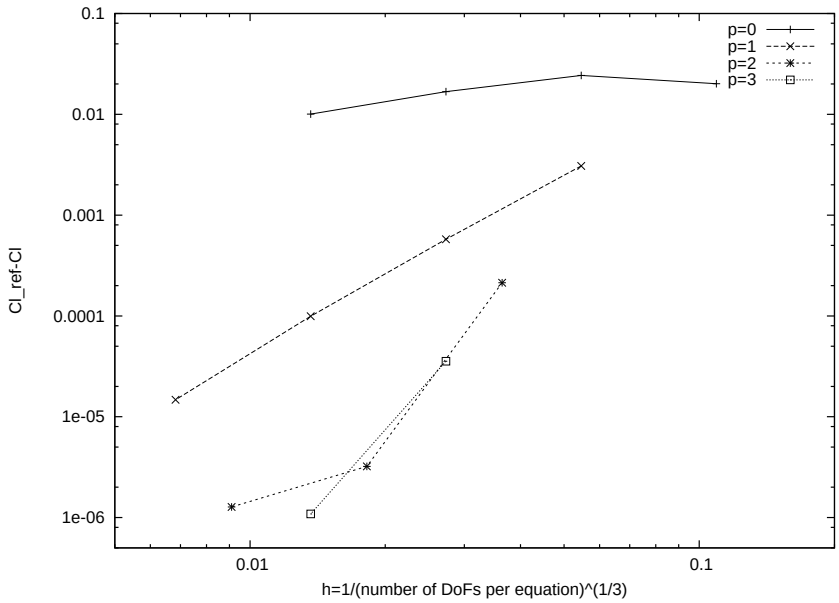

Figure 4: Error in C_l vs. $h = 1/\sqrt[3]{\text{number of DoFs per equation}}$

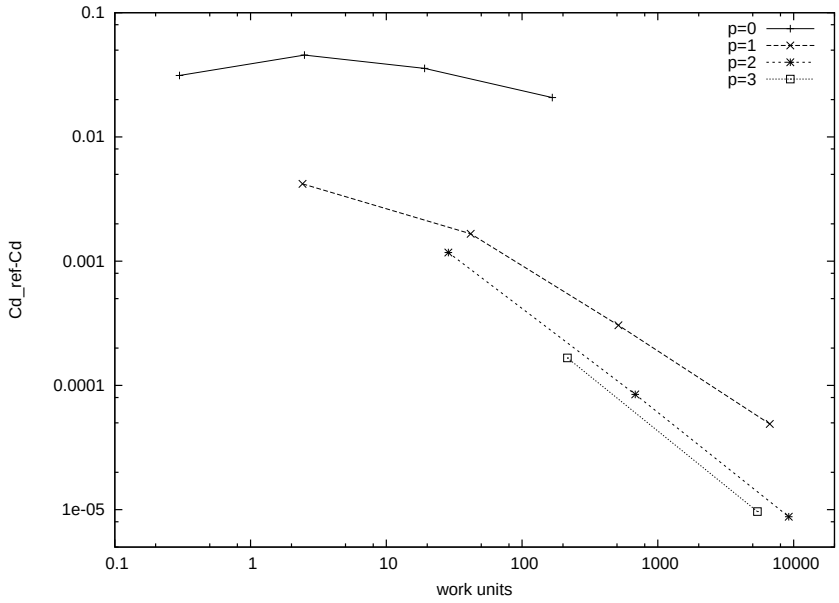

Figure 5: Error in C_d vs. work units

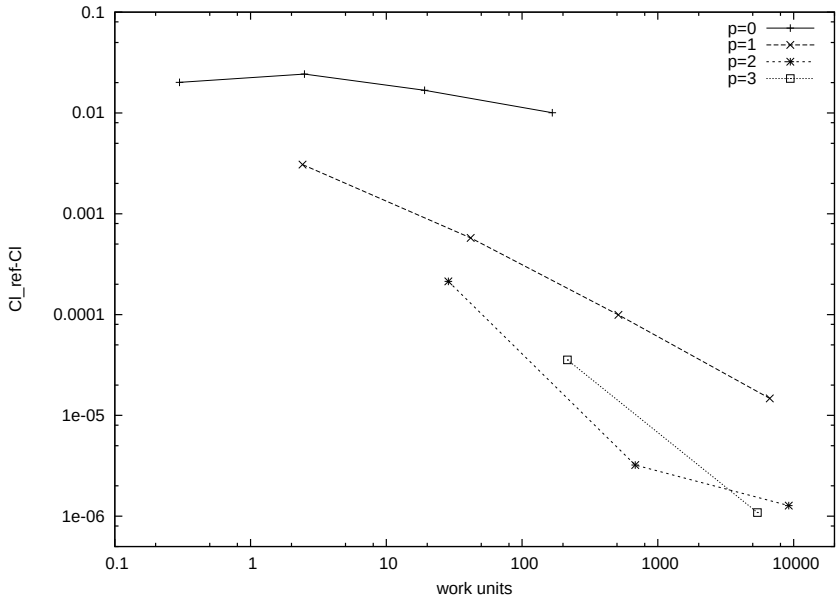

Figure 6: Error in C_l vs. work units