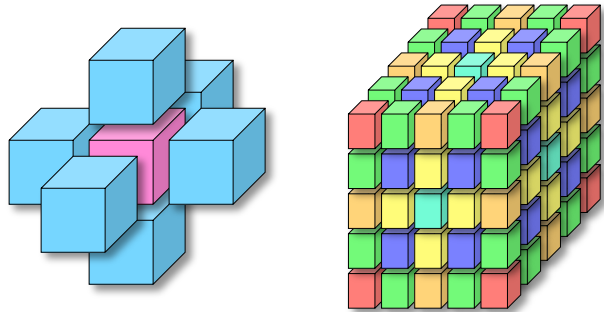# X-TUNE: Autotuning for Exascale

Domain-specific and standard compiler transformations combined with autotuning achieve high performance and improve programmer productivity.

Motifs

STENCILS & GEOMETRIC MULTIGRID

miniGMG benchmark, proxies the MG solves in BoxLib/Chombo codes (ExACT)

Impact

Solver, 7pt GSRB variable coefficient stencil, & 125pt Jacobi constant coefficient stencil
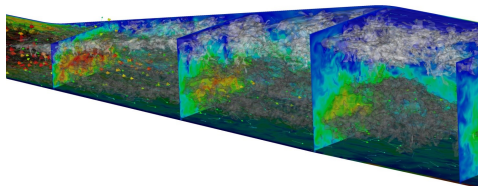
Speedup over reference (CPU): **3x**

Reduction in lines of code: **>10x**

Performance portability: Outperforms manually-tuned code on CPU and GPU

High performance: Near roofline model bound

Scalability: Demonstrated on 1K nodes

TENSOR CONTRACTION & SPECTRAL ELEMENT

Nekbone benchmark, proxies Nek5000 (CESAR)
Other relevant application: NWCHEM

Speedup (GPU) over OpenMP (CPU): **1.5x**

Speedup over tuned OpenACC: **2.9x**

Reduction in lines of code : **>100x**

Fully automated: Mathematical formula to high-performance CUDA

Performance & productivity: Autotuning essential even for OpenACC code

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X-TUNE