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OpenFOAM HPC Challenge - Hardware Track

Comparison of Sapphire Rapids, with and without HBM in cache and flat configurations

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Overview

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Problems run

Compilation

Scaling

Comparison

Meshes

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- Coarse
  65M Cells
  expected to scale up to around 6,500 cores
- Medium
  110M Cells
  expected to scale up to around 11,000 cores
- Fine
  236M Cells
  expected to scale up to around 23,600 cores

Hardware configurations

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- Sapphire Rapids
  Intel Xeon Platinum 8480+
  512 GB of DDR5
  105 MB L3 cache
- Sapphire Rapids with HBM Intel Xeon CPU Max 9480
  128 GB of HBM plus 1TB of DDR5
  112.5 MB L3 cache
  HBM tested in both cache mode and flat mode

Intel compiler and MPI

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```
export WM_COMPILER_TYPE=system
export WM_COMPILER=Icx
export WM_MPLIB=INTELMPI
OpenFOAM/OpenFOAM-v2412/etc/prefs.sh (END)
```

Scaling

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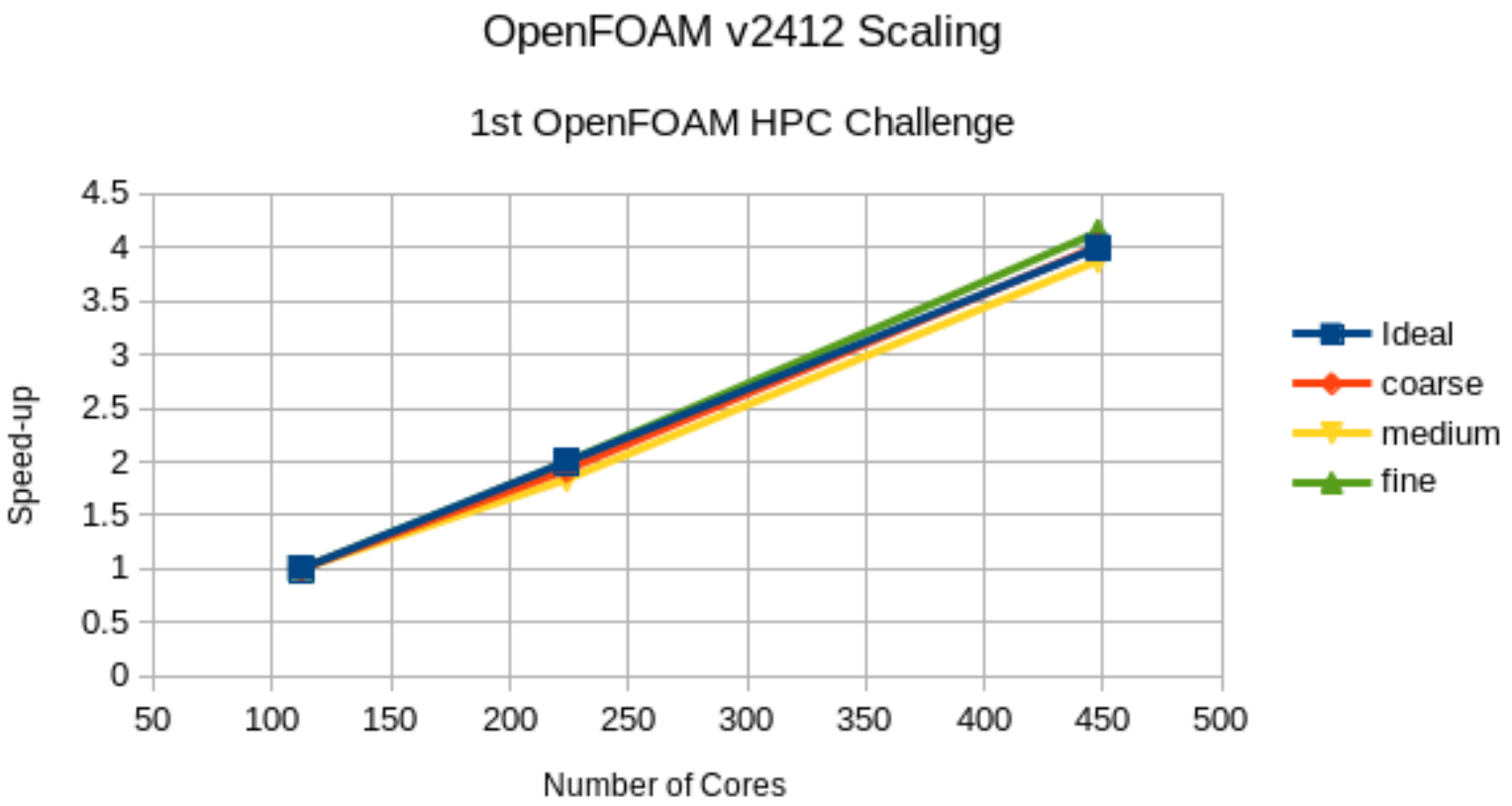

HBM is faster

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Configuration	Solve Time (hours)	Energy (kWh)
DDR5 only	18.51	13.03
HBM cache	10.06	7.11
HBM flat	10.12	7.16

Medium mesh, 112 cores

HBM speed up of 1.84x

Flat mode is faster

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Configuration	Solve Time (hours)	Energy (kWh)
DDR5 only	9.80	6.91
HBM cache	5.42	3.84
HBM flat	5.17	3.67

Coarse mesh, 112 cores

Flat mode speed up of 1.05x

Except for bigger problems

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Configuration	Solve Time (hours)	Energy (kWh)
DDR5 only	>36	>25.2
HBM cache	21.12	15.01
HBM flat	23.87	16.96

Fine mesh, 112 cores

Cache mode speed up of 1.13x

Thank You For Your Attention

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Any Questions?

Reach out: aleksander.dubas@ukaea.uk

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