JÜLICH Forschungszentrum | JÜLICH SUPERCOMPUTING CENTRE

HIGH-Q CLUB

THE HIGHEST SCALING CODES ON JUQUEEN

- **Promote Exascale with millions of threads**
- **Showcase codes that scale up to 458,752 cores or 1.8 million threads**
- **Diverse membership regarding scientific fields and algorithms**

Stay tuned for the next generation

Aims

To promote the idea of exascale capability computing, we established a showcase of codes that could use the entire 28-rack Blue-Gene/Q system at the Jülich Supercomputing Centre (JSC). We wanted to encourage other developers to invest in tuning and scaling their codes and show that they are capable of using all 458,752 cores, aiming at more than 1 million concurrent threads on JUQUEEN.

High-Q status represents an important milestone in application development towards future HPC systems that envisage even higher core counts.

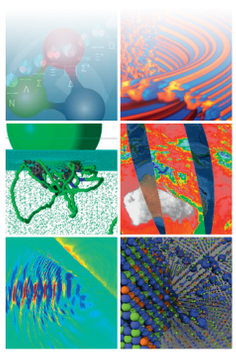
Members

Over time, the High-Q Club has attracted 32 members either via applications from users or solicited during JUQUEEN scaling workshops. Included are codes from fundamental physics, neuroscience, plasma physics, molecular dynamics, and climate and earth science.

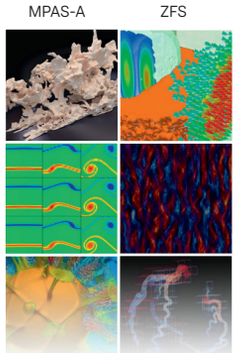
17 codes

11 codes

4 codes



1D-NEGF	MP2C
CIAO	μφ (muPhi)
Code_Saturne	Musubi
CoreNeuron	NEST
dynQCD	OpenTBL
FE2TI	ParFlow+p4est
FEMPAR	pe
Gysela	PEPC
hp-fRG	PMG+PFASST
ICON	PP-Code
IMD	psOpen
JURASSIC	SHOCK
JuSPIC	SLH
KKRnano	Terra-Neo
LAMMPS (DCM)	waLBerla
MPAS-A	ZFS



Observations

The developers range from end-users through computer scientists to the Jülich Simulation Laboratories.

The employed programming languages and models are as diverse as the codes themselves. We see Fortran, C and C++ codes with extensions for GPU support, hybrid parallelisations with pthreads or OpenMP and plain MPI codes. A frequent and vital key ingredient was good parallel I/O, e.g. via SIONlib.

For details see the review article in the international journal Supercomputing Frontiers and Innovations, DOI:10/14529/jsfi180104.

Future

With the decommissioning of JUQUEEN in spring 2018 the High-Q Club no longer accepts new additions. We will shift focus to our new machines and evaluate suitable new goals to continue the idea of the High-Q Club.

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