Energy Aware Runtime (EAR)

EAR is a system level tool used on SuperMUC-NG for optimisation of energy consumption.

How Does it Work

EAR regularly monitors the runtime behaviour of a job taking instruction throughput, memory access behaviour, and power consumption into account. From this, it derives the best frequency setting according to a configured policy.

For MPI jobs (Intel MPI or OpenMPI), EAR can hook into MPI functions to detect iterative computational phases of an application, allowing it to immediately change frequency when a phase with already known behaviour is entered. In this mode, EAR monitors its own overhead. If that is too high, it switches back to a mode that uses time-based behaviour monitoring. The latter is the default if MPI is not used.

Default EAR Configuration On SuperMUC-NG

By default, the policy of EAR is set to targeting high performance, but reducing frequency as long as performance is acceptable high (this policy is called "MIN_TIME_TO_SOLUTION" in EAR terms).

Switching off EAR

If a user wants to do profiling or benchmark measurements, EAR can make this difficult and unstable. In this case, users can enforce a fixed default frequency by switching EAR off, putting the following line in the job script:

```
#SBATCH --ear=off
```

Further Information

EAR is developed by Lenovo under an Open-Source licence. Please contact LRZ if you are interested in collaboration on energy efficiency of HPC systems.