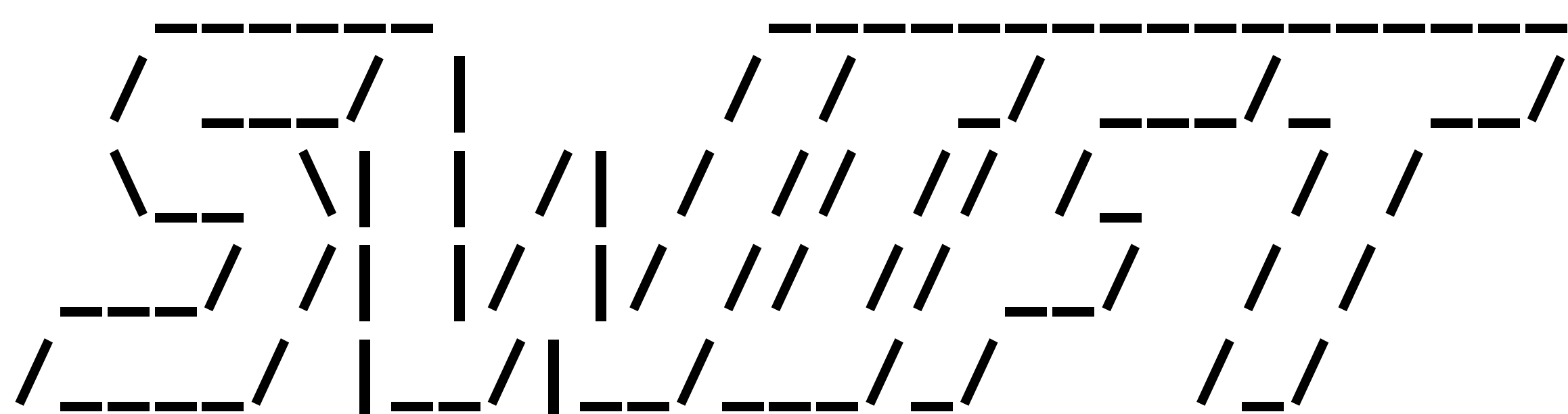


DiRAC



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SPH With Inter-dependent Fine-grained Tasking

The above image shows the extreme dynamic range produced by a cosmological hydrodynamics simulation with using the *EAGLE* galaxy formation model. From the large-scale structure and the cosmic web linking halos together, all the way down to the structure of individual galaxies. We have outlined a few with circles for you to inspect, but feel free to take a look all over the image – there is structure everywhere.

This volume contains 50 million particles. Our next production run, named *EAGLE-XL*, will use around 100 billion smoothed particle hydrodynamics (SPH) particles, in a volume nearly 2000 times as large as the one shown here. This will allow us to see the structure of the Universe with unprecedented detail, and will be the highest resolution simulation of the Universe ever performed.

To run such a large simulation, we need a highly efficient and modern code. The *SWIFT* code (swift.dur.ac.uk) uses explicit vectorisation, task-based parallelism, and asynchronous MPI communication to enable the required parallelism, along with on-the-fly analysis, such that the simulation to be analysed in any reasonable time.