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OpenMP implementation to Ramses

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Classic RAMSES code is purely written with MPI and not optimized for large simulations that use more than thousands of cores. We try to overcome this issue by adding OpenMP feature to RAMSES, implementing hybrid parallelism that takes advantage of both distributed and shared memory models. With the latest developed OpenMP version, we ran a small cosmological test simulation and it showed a satisfactory level of additional scalability. Although we focused on preserving the RAMSES calculation routines as it is, the exact reproduction of the classical version is not possible for the following reasons. (i): Random number generator that is embedded in RAMSES, (ii): propagation of roundoff error in the Fortran arithmetic operations. We plan to run our new cluster simulation in Korean supercomputer Nurion next year, with subgrid physics that is equivalent, but different in some aspect to New Horizon.

Presenter: Mr HAN, San (Yonsei University)

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