Contribution ID: **36**   Type: **not specified**

Computational efforts to improve the OpenIFS efficiency towards the exascale era

Tuesday, 21 September 2021 09:00 (20 minutes)

The increase in the forecast capability of Numerical Weather Prediction (NWP) is strongly linked to the spatial resolution to solve more complex problems. However, this requires a large demand of computing power and it might generate a massive volume of model output. In this context, the improvement of the computational efficiency of NWP models will be mandatory.

In this work we present our efforts to improve the efficiency of OpenIFS towards exascale computing. Three different efforts are presented, focusing on the efficient I/O management, but also on scalability.

A new I/O scheme was integrated into OpenIFS 43R3 to provide the asynchronous and parallel I/O capabilities of the XIOS server as an alternative to the former sequential I/O scheme. The OpenIFS-XIOS integration contains all the FullPos post-processing features and spectral transformations to have model output in grid-point only representation.

To further improve the OpenIFS-XIOS integration, we also considered using lossy compression filters that may allow reaching high compression ratios and enough compression speed to considerably reduce the I/O time while keeping high accuracy. In particular, we explore the feasibility of using the SZ lossy compressor developed by the Argonne National Laboratory (ANL) to write highly compressed OpenIFS data through XIOS.

The last effort focuses on scalability. In order to anticipate the computational behaviour of OpenIFS for new pre-exascale machines, OpenIFS is therefore benchmarked on a petascale machine (MareNostrum 4) to find potential computational bottlenecks. Our benchmarking consists of large strong scaling tests (tens of thousands of cores, more than the 60% of MareNostrum 4) by running different output configurations.

According to the results, the developments presented contribute to approach OpenIFS to the new upcoming HPC landscape: the XIOS server outperforms the sequential I/O scheme; the lossy compressor is faster than the default lossless one, achieving much higher compression ratios; and benchmarks suggest that OpenIFS scales reasonably well when using the hybrid approach MPI+OpenMP and XIOS.

Primary author: Mr YEPES ARBÓS, Xavier (Barcelona Supercomputing Center)

Co-author: Dr ACOSTA COBOS, Mario (Barcelona Supercomputing Center)

Presenter: Mr YEPES ARBÓS, Xavier (Barcelona Supercomputing Center)

Session Classification: Session 3

Track Classification: 19th Workshop on high performance computing in meteorology