NEST-5g Performance Assessment Summary

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Weak scaling on K computer was examined with up to 663,552 cores (82,944 compute nodes) highlighting a communication efficiency drop for the largest execution configurations which required more time for additional rounds of `MPI_Alltoall` global communication. Simulation performance could be more than 30% faster with a slightly larger event buffer.

Computation efficiency progressively degrades with increasing number of compute nodes, indicating additional processing. Load balance efficiency varied erratically between poor 0.68 and good 0.94. While communication efficiency was still good up to 8192 compute nodes, it deteriorated rapidly for larger configurations, with more MPI collective communication time required for synapse spike data delivery. This arose from additional rounds of communication which were necessary because the predicted size required for the spike event data buffer was insufficient.

NEST is an open-source simulator for large-scale neuronal networks of simple neurons with biophysically plausible density of connections, with development coordinated by the NEST Initiative. Pre-release development version of the fifth generation code written in C++ using MPI (exclusively `MPI_THREAD_SERIALIZED` collective communication) within large OpenMP parallel regions.

A full technical report can be found at
https://pop-coe.eu/sites/default/files/pop_files/pop-ar-nest5g.pdf

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