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Set 9 - Diffusion and MPI

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Question 1: Diffusion in 2D with MPI

If we want to spread the heat beyond a single node we need message passing. In this exercise we will parallelize the 2D diffusion equation with MPI.

a) Parallelize your serial 2D diffusion code from Ex 2 with MPI. Use the simple domain decomposition scheme that is described in the lecture notes (i.e. distribute the rows evenly to the MPI processes).

b) Suggest other ways to divide the real-space domain between processes with the aim of minimizing communication overhead.

c) Compare the performance to your previous implementation using shared memory within a single node (up to 24 cores). Use the wall-time needed to propagate the system a fixed number of time-steps as a measure. *hint: remember to synchronize the clock*

d) Make a strong and weak scaling plot up to 48 cores.