Development and applications of the parallel computing middleware for the life science simulations

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In our project, we had to develop new scheme and algorithm to simulate using stencil computation for the blood-flow and the cell-metabolism on K computer. But, to development multi-scale / multi-physics simulation software is highly complex and difficult. We developed new middleware for parallel computing. This middleware which called SPHERE provides parallel software development environment for researchers and engineers to concentrate on their algorithms development. We developed new simulation software for clotting using SPHERE. For simulate clotting, we developed new scheme and algorithm for Fluid Structure Interface problems. This software which called ZZ-EFSI achieved a highly performance using K computer.

Figure 1 SPHERE: parallelization framework library
Figure 2 scalability of ZZ-EFSI on K

Figure 3 Visualized results, Left : the blood-flow simulation , Right : the cell simulation