

Parallel Reservoir Integrated Simulation Platform For One Million Grid Blocks Case*

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ABSTRACT

This article first provides a brief introduction to the numerical reservoir simulation and a parallel numerical reservoir integrated simulation platform from RDCPS (Research & Development Center for Parallel Software, Institute of Software, Chinese Academy of Sciences), including Pre-Processing, Simulator (for a Three-Dimensional & Three-Phase Black Oil models), Post Processing, seamlessly integrated with parallel computers. We then present key technologies of the simulator, such as the nonlinear and linear solvers, communications among processors, parallel I/O, etc., and corresponding resolvers. Finally, some results with the platform to solve one million grid blocks cases from Chinese oil fields will be given in the article, which can show that the simulator has a very robust portability, high-speed for deadline and good scalability for the tested cases. As application software, our object is always focusing on meeting deadlines from oil industry. Now, for one million grid blocks' case with 20 ~ 30 years production, its elapsed time with 16 processors is less than 12 hours on parallel computers based on Myrinet or QsNet, namely "to submit a case just before off-duty and get its result just before on-duty". A decreasing line of elapsed time appears for a one million grid blocks case. The developing trace of the simulator along with parallel computers can be also inferred.

Keywords: parallel numerical reservoir simulation, fine residual-oil distribution, one million grid blocks problem, integrated simulation platform, parallel computer, deadline, grid computing.

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