ECHELON

CASE STUDY // SPE1O

ECHELON SOLVES BENCHMARK SPE10 MODEL IN RECORD 18 SECONDS.

"ECHELON IS ONE OF THE MOST DISRUPTIVE TECHNOLOGIES I'VE SEEN IN MY CAREER DOING SIMULATION. IT HAS PROVEN ABILITY TO RAPIDLY RUN VERY LARGE, MULTI-MILLION CELL, FULL-PHYSICS MODELS USING MASSIVE PARALLELISM. FOR IRESERVOIR, THIS HAS LED TO IMPROVED UNDERSTANDING OF COMPLEX SYSTEMS BY ALLOWING FOR BROAD RANGING SENSITIVITY ANALYSIS IN VASTLY REDUCED TIME FRAMES."
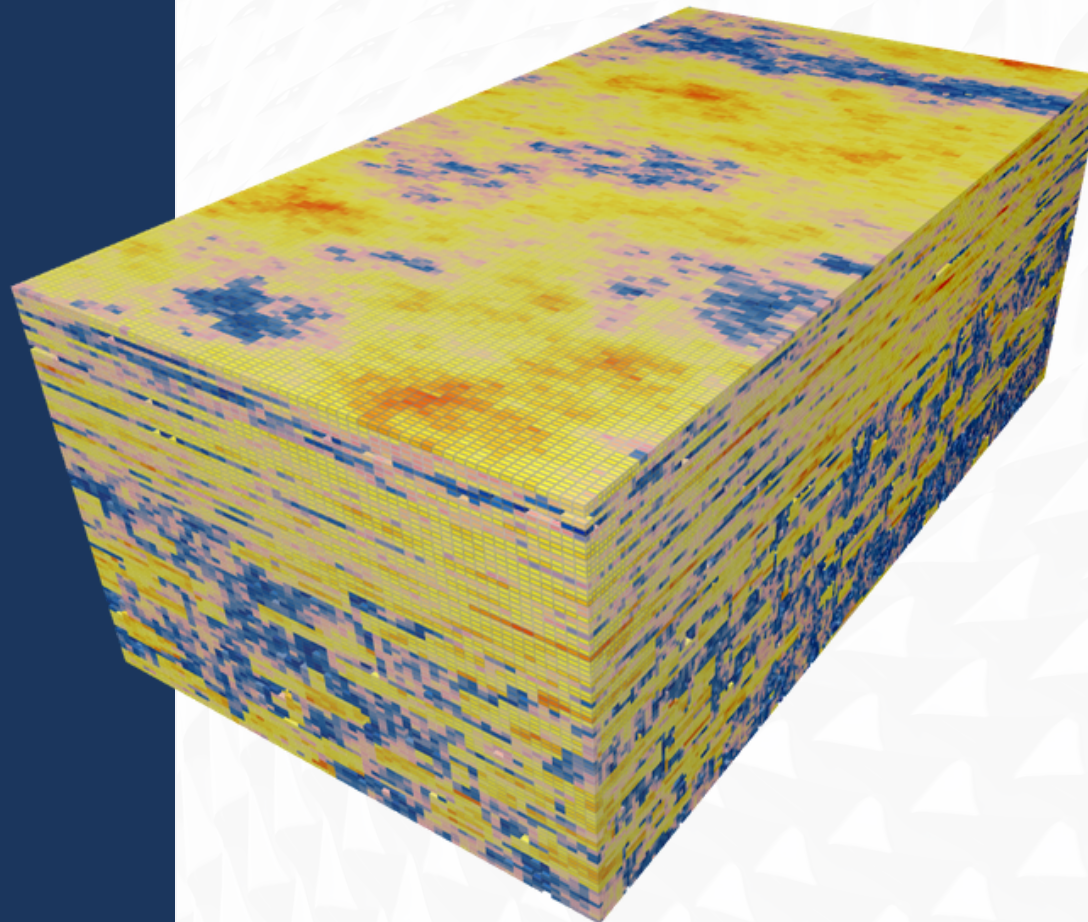
- DR. JIM GILMAN, IRESERVOIR INC.

1.1
MILLION CELLS

100x
FASTER

18
SECONDS

CHALLENGE

The principle goal of the 10th SPE Comparative Solution Project is to compare upgridding approaches on a one million cell model. The model geometry is a regular Cartesian grid with 60 x 220 x 85 (1,122,000) cells. The model is characterized by two formations, the first in the top 35 layers and the second in the bottom 50 layers. Both formations display large permeability variations that range up to 12 orders of magnitude. The reservoir is produced by a five spot pattern with a water drive in the center at a constant constant injection rate of 5,000 stb/d and production wells in each of the four corners, with bottom-hole pressures of 4,000 psi. The simulation produces for 2,000 days assuming incompressible flow.
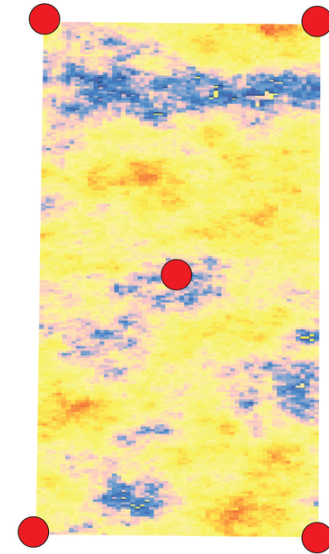
Surface of SPE10 model with well locations marked in red. Water drive in the center with production wells in each of the four corners.
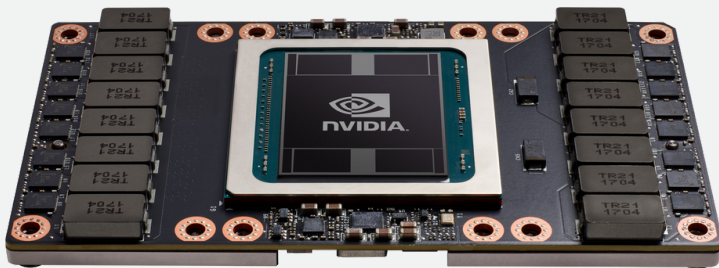

The NVIDIA V100 used by ECHELON to run the full SPE10 model.

SOLUTION

SPE10 is a particular challenge for many simulators because of its strong heterogeneous variations in permeability. A legacy code running on 16 CPU cores takes 72 hours. ECHELON employs an Algebraic Multigrid (AMG) solver, the most modern, scalable algorithmic approach to this problem. ECHELON's AMG solver is implemented in GPU for exceptional speed. Using just 2 NVIDIA V100 GPUs ECHLEON solves the full SPE10 problem in 18 seconds.

RESULTS

ECHELON's performance on the SPE10 benchmark is an example of the extreme capability that the combination of GPU hardware and modern algorithms can offer the discipline of reservoir simulation.
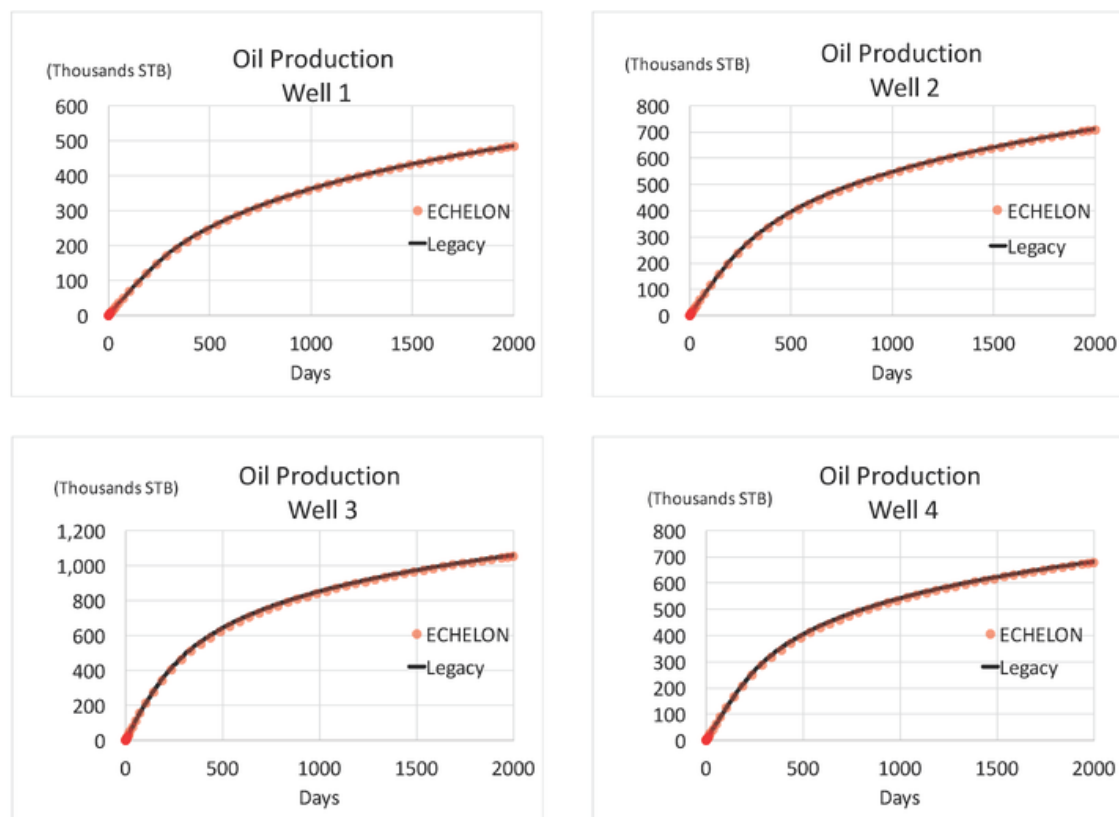
Oil production curves for SPE10 generated by ECHELON and a legacy simulator.

STONE RIDGE
TECHNOLOGY

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