ECHELON

CASE STUDY // ZUCCHINI





NOVEMBER 15, 2021

CONFIDENTLY RUN CENTURY-LONG GIANT FIELD SIMULATIONS

ECHELON CASE STUDY: ZUCCHINI

ACTIVE CELLS

6.7M

200+

WELLS

95 YEARS OF SIMULATION

Cross-section of the Zucchini field model, colored by porosity.

Reference: A. Vidyasagar, L. Patacchini, P. Panfili, et. al. Full-GPU Reservoir Simulation Delivers on its Promise for Giant Carbonate Fields. Third EAGE WIPIC Workshop: Reservoir Management in Carbonates, Nov 2019



CHALLENGE

Zucchini is a giant Middle-Eastern field with long production history, yet with still a low recovery factors and in the order of 40 more years of production to go. While being black-oil, the model has some complexities including both relative permeability and capillary pressure endpoint scaling, and analytical aquifers. Blocks size is 100x100x2 meters, for a total of 6.7M cells.

The challenge is to run the forecast with a sequential drilling queue for the management of infill wells, in a robust-enough way to allow optimization of the development plan without being impacted by field scheduling instabilities.



SOLUTION

The solution is to use ECHELON 2.0, the first reservoir simulator developed from the ground up to run on Graphics Processing Units (GPUs).

ECHELON can seamlessly run giant reservoir models on a single GPU with exceptional performance, while adhering to the solution of legacy simulators. ECHELON can also scales to multiple GPUs to further accelerate simulations, using domain partition as illustrated in the figure.

Partition of the Zucchini field in 4 domains, generated by ECHELON for the 4-GPU run.

RESULTS





Number of active producers using four different number of GPUs for the simulations, and field oil production rate. The simulation spans both history and forecast periods.

Scalability test for the Zucchini field model, on NVIDIA V100 GPUs. Scalability is close to ideal from 1 to 2 GPUS (At 1.8x), and progressively decreases as more GPUs are added. Using 4 GPUs provides a 2.6x speedup compared to the single GPU case.

23

