Deep-Water Salt Interpretation and Visualization Using Dynamic Frameworks to Fill*

Nam Xuan Nguyen[1] and Mary Cole[1]

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[1]Landmark/Halliburton, Houston, TX, USA (nguyenxuan.nam@halliburton.com)

Abstract

This abstract presents a new method to model the salt bodies using Landmark's Dynamic Frameworks to Fill® software technology to define the salt bodies as structural compartments. These compartments are defined using a hybrid resolution model where each input surface can be defined at the optimal level of resolution. This allows the interpreter to preserve full detail in the critical area at the top of the salt body, while representing the remainder of the salt structure at the resolution supported by the seismic data.

Introduction

Salt body interpretation is a critical challenge in deep-water exploration and production. Deep-water basins, especially tertiary basins with mobilized salt, are notoriously difficult environments to explore because of the low quality of seismic data obtained around and below salt. Accurately and effectively interpreting salt bodies has significant impact not only in seismic depth imaging but also in reservoir modelling and well planning. In traditional workflows, salt bodies are typically interpreted as one or more pairs of top salt and base salt single-Z horizons. These horizon pairs are then used as inputs to build the final triangle mesh representation of the salt bodies. The uppermost top salt horizon is critical, as it must be interpreted with the highest level of accuracy to support seismic processing workflows. The remainder of the salt boundaries can be accurately represented at varying resolutions depending on data quality.

Discussion and Summary

Current interpretation tools require that that all inputs be represented at the same resolution. In order to capture the critical top salt surface with the required accuracy, the resultant salt body models are very large (~100 million triangles). These large models can adversely affect performance when incorporated into reservoir and structural modeling workflows. We can build an accurate complex multi-Z salt structure with a smaller quantity of triangles, without losing resolution in the critical top of salt area (Figure 1). This significantly improves performance when this optimum-resolution model is used for velocity and structural modeling (Figure 2).

The Dynamic Frameworks to Fill® system preserves the linkages between the original interpreted horizons, the structural model and the computed compartments. This means that the interpreter can use familiar tools to edit, and reinterpret the original horizons and/or faults and these changes are accurately reflected in the structural model and computed compartments. When the interpretation is updated, the structural model and computed compartments are updated automatically. These compartments can then be used for velocity modeling and incorporated into structural models, where they can be used in volumetric calculations

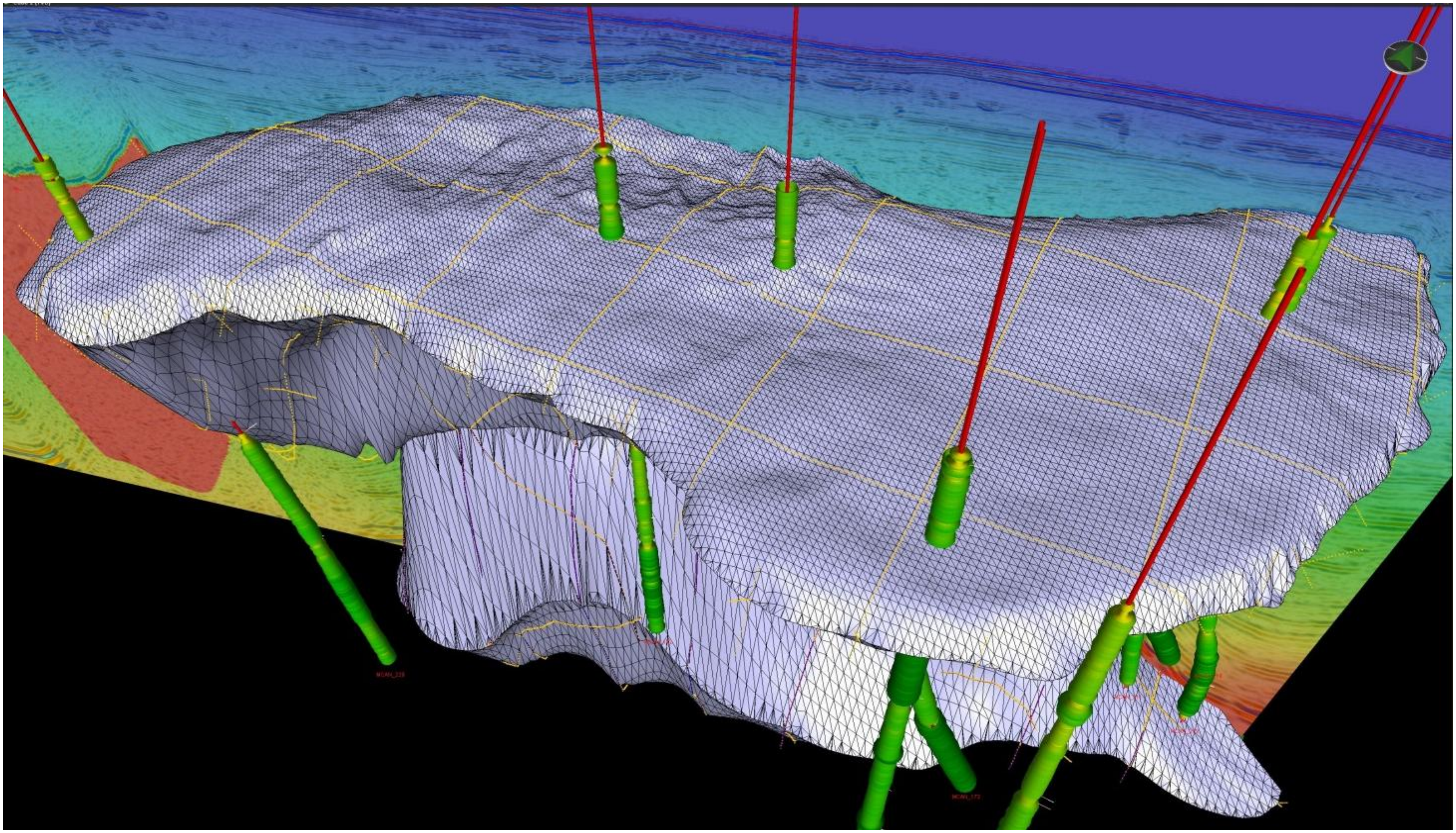

Figure 1. A Multi-Z salt body showing variable resolution where the top salt surface uses four times finer resolution than the other areas.

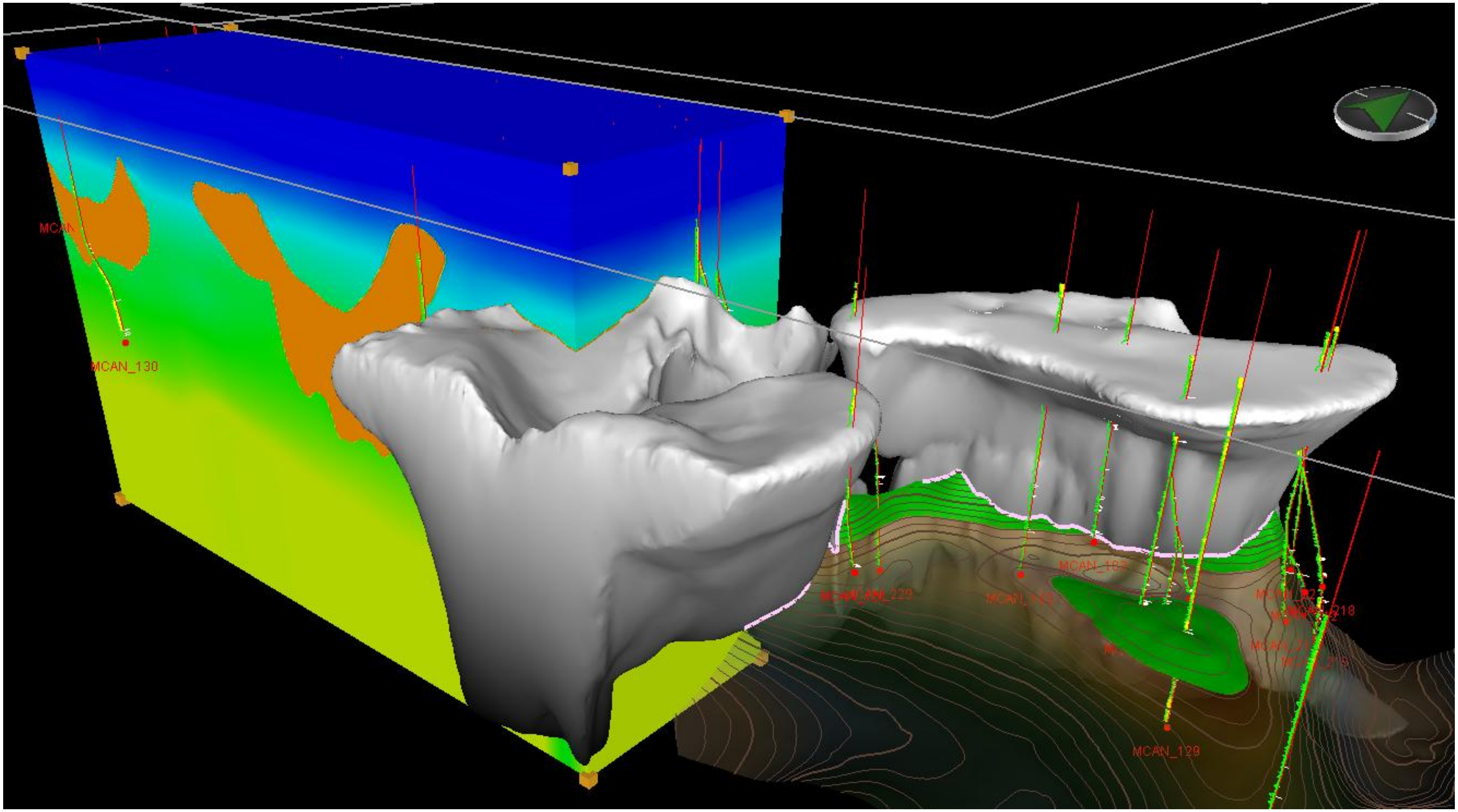

Figure 2. Final reservoir structural framework with incorporation of Multi-Z salt body – the green area indicates the reservoir pay zones. The cube in the background shows the velocity model.