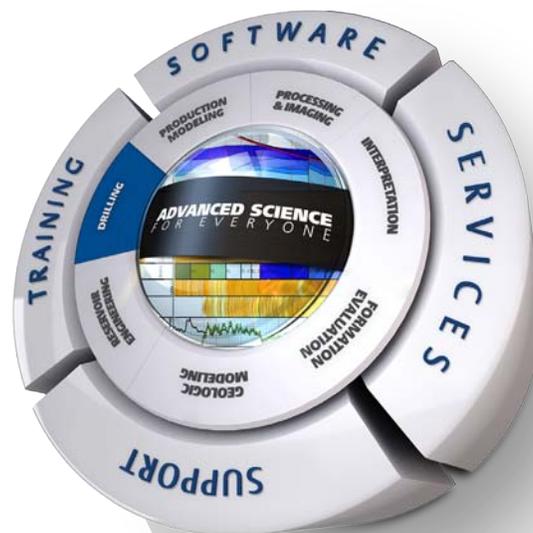


# Geolog™ Geosteer™

## Real-Time Geosteering

Paradigm geosteering software accomplishes what the human mind is incapable of processing. It combines the information from 3D seismic surveys with the data obtained from MWD tools and produces an excellent visual display of the actual well path while drilling. This display allows us to verify that we are in our target zone and clearly indicates when adjustments to inclination are necessary to remain in the target zone. The end result is laterals properly placed in the target zone, which should yield better completions, higher production rates and greater return on investment.

Scott Roth, Staff Geoscientist, Williams E&P



Interactive correlation of modeled logs with real-time responses while drilling allows accurate determination of the wellbore's stratigraphic placement, as well as a detailed update of the structural section along the well path and the determination of whether any trajectory adjustments are required. These trajectory adjustments ensure optimal entry into the reservoir, enable stratigraphic placement to be maintained throughout, and prevent an early exit.

### Optimizing Wellbore Placement in the Reservoir

Paradigm™ OpsLink™ provides operating companies with the ability to make rapid and informed decisions while drilling to maximize productivity and minimize drilling costs. Fast and flexible access to real-time WITSML-based MWD and LWD data provides key information required by asset teams to make these decisions.

### Meeting the Challenge of Horizontal Wells

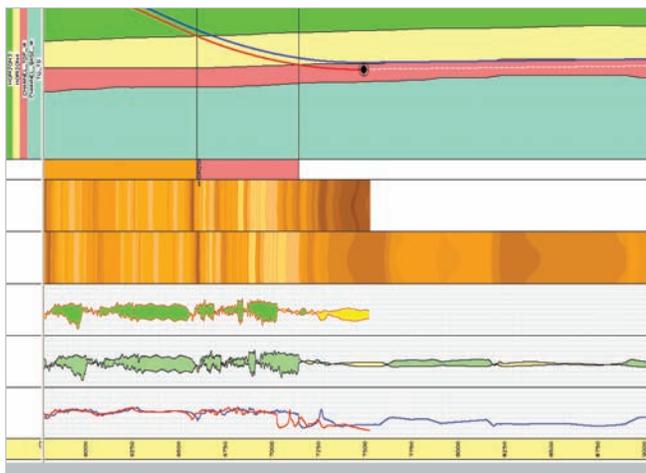
The addition of a geosteering module to the Geolog™ log management, correlation and petrophysics solution provides a powerful interpretation capability that integrates the operator's drilling and geological/geophysical workflows. It provides the geosteering expert with the ability to effectively edit and interpret logs in highly deviated wells, and model the Logging While Drilling (LWD) tool response.

### A Comprehensive and Integrated Solution

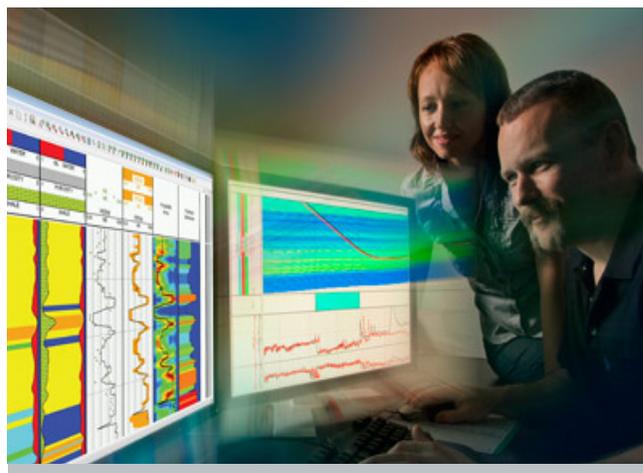
Advanced workflows utilize the tight integration between Paradigm's well planning and 3D visualization/interpretation software solutions, specifically the Sysdrill Designer embedded well planning tool and the VoxelGeo™ volume interpretation application, to provide a powerful log-scale interpretation capability.

### Integrated Well Trajectory Analysis and Planning

The Geolog Geosteer module links Geolog with Paradigm's Sysdrill™ drilling engineering solutions, enabling the integration of well planning, positional uncertainty modeling, anti-collision, and projection ahead of the bit. This comprehensive set of information ensures that steering decisions are fast, informed and effective.



▲ Geolog Geosteer modeling capabilities include synthetic image log generation to aid interpretation of real-time data



▲ Geolog Geosteer

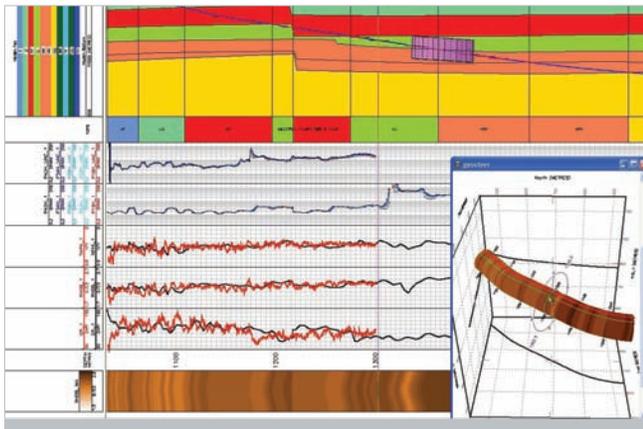
# Geolog Geosteer

## Advanced Modeling

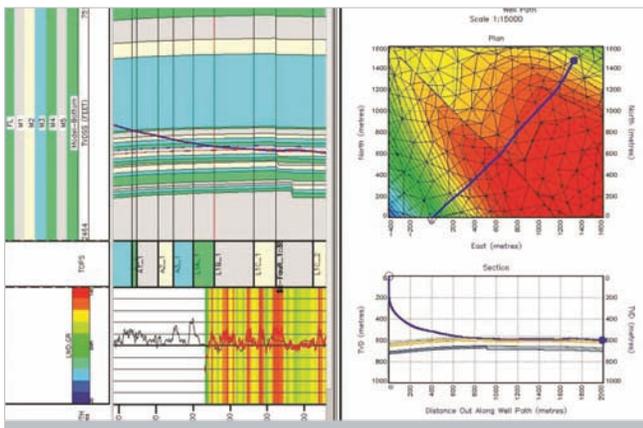
Geolog Geosteer provides the petrophysicist with the ability to model anticipated log responses for high-angle well trajectories based on offset well data from Geolog, and geological structure such as that obtained using the Paradigm SKUA™ product suite. Modeling capabilities include synthetic image log generation, which can be correlated with actual log responses while drilling, for real-time directional corrections or as a post-well analysis.

## Support for WITSML

Full support for the WITSML standard for real-time access to drilling data allows the Geolog Geosteer module to be used at the rigsite or the office, for effective and timely decision-making. Paradigm's OpsLink WITSML receiver enables real-time drilling data from any WITSML server to be stored directly in the Paradigm Epos database. Calculations in Geolog can be set to automatically update data in real time as it is received.



▲ Drilling target and modeled log property image wrapped around the wellbore in 3D



▲ Geosteer workspace display of log data on curtain along wellbore; location of wellpath in plan and section views

## Features

- Ability to rapidly model multiple log properties along the wellbore
- Simultaneous display of multiple property models
- Ability to receive real-time updates via WITSML
- Interactive editing of model by changing well path, bed dip or thickness, or by adding faults
- Properties are remodeled on-the-fly as editing is done

## Interoperability

All Epos™-based applications enable interoperability with third-party data stores, including:

- RESQML 2.0.1
- OpenWorks® R5000.10
- GeoFrame® 2012
- Petrel\* 2017 & 2016
- Recall™ 5.4.2

(\* a mark of Schlumberger)

## System specifications

- Microsoft® Windows® 7, 8.1, 10
- 64-bit Red Hat® Enterprise Linux® 6.8 and subsequent minor releases, and 7.1 and subsequent minor releases

## The Paradigm Advantage

- Geolog Geosteer gives users the independent ability to model, monitor and interactively modify a well as it is drilled.
- Geosteering increases productivity, reduces drilling risk and optimizes wellbore positioning in the reservoir.
- Geosteering is performed in the familiar Geolog user interface, and runs on Windows and Linux platforms.
- Geolog Geosteer offers an effective way of interpreting log data in highly deviated wells.
- Geosteering can be done at rigsite or at the office.
- The Epos interoperability integration framework provides smooth workflows between drilling, petrophysics and geology/geophysics.



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