DecisionSpace® Geosciences: An Eclipse-Based Visualization Application

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The Challenge

- Oil and gas harder to find and expensive to produce
- Drilling deeper, longer wells at greater expense
- “We find oil in new places with old ideas, and in old places with new ideas…”

Wyth Farm Dataset used with permission of BP and BP Wyth Farm partners
Landmark Solutions

Portfolio of Prospects
Exploration Ranking

Portfolio of Discoveries
Delineation Appraisal Planning

Portfolio of Production
Operations Optimization

Pipeline of Potential Investments

DecisionSpace® Geosciences

DecisionSpace Information Management and Platform

Prospecting/Exploration
• Where to explore?
• Which prospects to investigate?
• Where to invest?
• What are the fluid volumes?

Development
• Which discoveries to develop?
• What are the reserves?
• How can I develop most efficiently?

Production
• Real-time execution and control
• Asset model-driven performance
• Automatic optimization of production activities
Outline

- Visualization
  - Data Types
  - Views
- Demo
- Architecture
- Questions
Data Types

- Seismic: Prestack and Post-Stack
- Horizons and Grids
- Faults and GeoShells
- Wells and Well Logs
- 3D Grids
Seismic: Prestack and Post-Stack

- 3D and 4D volumes over thousands of square kilometers
- Hundreds of gigabytes to terabytes in size

Horizons and Grids

- 2D grids (height fields) representing underground surface layers
- Tens to hundreds of megabytes per surface
- Multiple surfaces
Faults and GeoShells

- Triangle meshes representing faults or salt formations
- Hundreds of millions of triangles
Wells and Well Logs

- Polyline trajectory
- Logs: measurements along well
- Lightweight trajectories; logs finely sampled and can be tens of megabytes
- Tens of logs per well
- Thousands of wells
3D Grids

- Structured grids
  - Hexahedral meshes with implicit layering
  - Discontinuities
- Unstructured grids
  - No implicit layering
  - Tetrahedral
- Hundreds of millions to several billion cells per model
- Multiple-property cells
- Gigabytes
Views/Editors

- 1D View
- 2D Views
- 3D View
1D View

- 1D measurements along a parametrized distance along borehole
- Multiple 1D views juxtaposed for correlation
2D Views

- Maps
- Sections
3D View

- X and Y usually spatial
- Z could be depth, time, age
Demo
Factors Guiding Architecture

- Data set sizes
- Multiple views on the same data
- Interactivity
  - Navigating within views
  - Changing display parameters
  - Editing: manual or automated
- Leverage all computational power on system: CPUs and GPUs
- Portability
- On-the-fly vs. a priori computation
## Visualization Architecture

### Visualization Framework

<table>
<thead>
<tr>
<th>3D View</th>
<th>2D Views (Map, Section)</th>
<th>1D Views (Well Correlation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulators</td>
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</table>

- **Eventing**
- **Domain/Application Scene Graph**
- **Gesture Recognition**
- **Low Level Scene Graph (3D and 2D)**

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<th>AWT</th>
<th>SWT</th>
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- **Low Level Scene Graph (3D and 2D)**
  - AWT
  - SWT
  - Touch (Native)
  - OpenGL
  - CUDA/OpenCL
  - Java2D
  - Hard Copy
JavaFX

- Interesting
  - 2D and 3D Scene graphs
  - Leverages OpenGL

- Additional features needed
  - Extensibility at the underlying graphics API level:
    custom rendering, access to programmable pipeline
Additional Halliburton/Landmark Information

- Stop by our booth

- Come to our 2nd talk

**Moving a Large Swing-Based Geoscience Application to Eclipse**

1:30pm - Wednesday 3/9/2016

Grand Ballroom C
Discussion and Questions?
THANK YOU