GVERSE® Geomodeling

Fully Integrated 3D Interpretation

GVERSE® Geomodeling is a sophisticated integrated solution for subsurface geological/reservoir modeling. Detailed analysis of the reservoir is always crucial prior to field and well planning. With GVERSE Geomodeling, making an informed decision is much easier as this application supports numerous types of data sources for a comprehensive understanding of the petroleum system.

The integrated application combines geological, geophysical, petrophysical, GIS, and engineering data in a single environment, with real-time 3D visualization of the developing geomodel that helps interpret the results from different domains of geosciences and formulate optimized and cost-effective field development solutions.

Surface relationships are modeled in a dynamic real-time environment. The geosurface model can be configured to generate surface conformance relationships, unconformity trimming, channel geometries, subcrop mapping, fault offset and automatic fault polygon generation, as well as gross, net, and net/gross reservoir maps.

Key Benefits
Real-time Integrated Visualization of Results
GVERSE Geomodeling provides an integrated real-time map view, cross section view, and 3D visualization of the developing geomodel. GVERSE Geomodeling integrates petrophysical, geophysical, drilling, and GIS data into the interpretation to observe the real time effect of what-if scenarios on a developing geomodel.
Quick and Easy
As compared to traditional tools, GVERSE Geomodeling allows geoscientists to load, integrate, interpret, and display large datasets with minimum time and effort required.

Flexibility
Features like the ability to Quick Pick surface tops and fault cuts on cross sections and the map view, clip the 3D grid, develop fence diagrams, create modeling regions, and define well group annotations to offer greater flexibility in the interpretation workflow. Docking windows and panels provide the freedom to arrange the workspace as desired. Saving the interpretation configuration of the workspace enables the user to resume the work from where they left off after closing the previous session.

Release Highlights 2019.2
Block Diagrams
Block Diagrams, sometimes called “Gun Sight” displays, are a special type of cross section that displays the penetration points of well bores as they intersect the cross section line-of-section. Block Diagrams show the relationship of the well bores within zones of interest and annotations of either horizontal or absolute distance between the wells and the DSU within the defined zones.

Display Distance between wells in Block Diagram
Identify the exact separation between the wells using Absolute and Horizontal well distance options on the 3D Annotation and Distance toolbar in Cross Section View. To display the desired distances, click Display.
Absolute Well Distance 🕒 or Display Horizontal Well Distance 🖖.

**Display Boundary Distance**

Display the distance between corner wells and the cross section margins in Block Diagram by using the boundary distance option. To display the boundary distance, select **Display Boundary Distance** option from the **3D Annotation and Distance** toolbar in Cross Section View.

**Display Well and Boundary Distances for Specific Formations in Block Diagram**

Display the well and boundary distances for specific formations in a Block Diagram by applying the formations filter. To display the well and boundary distances for selected formations, click **Well Distance Formation Filter** or **Display Boundary Distance** option from the **3D Annotation and Distance** toolbar in Cross Section View and select the desired formations from the drop-down.

**Modeling Regions**

The creation of modeling regions within the extents of the active AOI enables the user to quickly switch between interpretation areas. This feature minimizes the modeling overhead to increase performance without having to switch AOIs with the resulting disruption to the workflow.
Aggregate Surface Color Fills

Better understand the depth relationships between modeled surfaces with aggregate surface color fills. The colors within the selected color palette are distributed across all displayed surfaces to better illustrate surfaces with common depth ranges. To apply a single color palette, select the Surfaces or Faults (main node) from the 3D Data panel and use the Show Aggregate Fill option from the properties panel.

Add/Select Surface and Fault Points on Fence Diagrams

Interwell points can be added and edited on the surfaces displayed on the fence diagrams. Use this feature to match the surface geometry to the depth-converted seismic backdrop for a more complete geomodel.

Apply Custom Display Properties to Wellbores in Block Diagram

Distinguish the overlapping wellbores and efficiently correlate the wells with other objects in the cross section by assigning custom colors and adjusting the symbol size for individual wellbores. To set custom display properties, right-click the desired well and select Display Properties for Selected Well option from the context menu.
**Single Surface Mode**

Perform your interpretations on individual surfaces in Map View with **Single Surface Mode**, through which you can activate and display a single surface in Map View while keeping the other surfaces hidden. To activate the **Single Surface Mode**, right-click any surface from the 2D Data panel and use the **Single Surface Mode** checkbox from the context menu.

**List Wells with Well Name, Number, Operator, and Status**

Identify the wells in a Cross Section with multiple annotation options using a **Well List Text Options** button on the wells tab of the Cross Section View. You can use it to list the wells with **Well Name, Well Number, Operator, and Status**.

**Spline Polygons**

Choose to smooth the polygon edges in the Cross Section View using the Spline Factor option in the **Polygon Properties** dialog box. To apply the **Spline Factor**, right-click a polygon node, select **Display Properties** from the context menu and use the **Spline** check box on the **Polygon Properties** dialog box.

**Apply Depth Interval Using Inclination Angle**

Apply depth interval on the basis of Inclination angle to display only the horizontal part of the well bore in the Cross Section View. To do so, select the **Layout** tab in the **Cross Section Display Preferences** dialog box, or click the **Layout** button on the Cross Section View standard toolbar and select `<Inclination Angle>` as **Top Stratigraphic or Absolute Depth** from the **Vertical Clipping/Depth Interval** group box.

**Add/Remove Multiple Wells from Geomodel**

Select multiple wells in the Wells tab of the GeoSurface Model Properties dialog box and Add/Remove all of them with a single click. To Add/Remove wells, use the check box for the desired well and click **Add Selected Well(s) to Geomodel** or click **Remove Selected Well(s) from Geomodel**.
Well Preview in Cross Section View
Set and display different style, color, and radius for each well using the Well Preview column in the Wells/Logs tab of the Cross Section Display Preferences dialog box.

Toggle On/Off Well and Interwell Points Using Context Menu
Display Well and Interwell points on the Map View using context menus. Right-click any surface on the Map View or the 2D Data Panel and select Display Well Points or Display Interwell Points from the context menu.

Quick Access Toolbar
Customize your toolbar with frequently used commands that are independent of the tabs on the ribbon. The Quick Access Toolbar is located at the top left corner of the application window. Click Customize Quick Access Toolbar button and select More Commands option from the drop-down list to display Customize Toolbar dialog box. Use this dialog box to set your preferences.

Clipping Box Enhancements
Display the extents of the clipping box in 3D View highlighting the boundary in a bold blue color. To display the clipping box, click Show Clipping Box option from the Clipping Options Toolbar in 3D View.

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Key Features

Integration
Observe the multi-disciplinary relationships in your geomodel with tightly integrated and synchronous Map, Cross Section and 3D views. GVERSE Geomodeling is designed for the geoscientists who work on integrated data sets that include geological, petrophysical, geophysical, drilling, and GIS data. It includes an integrated map, cross section, and 3D view of the geomodel which enables you to work in 2D or 3D views simultaneously. Use the GeoSurface Model tool to efficiently source and generate surfaces and faults and model complex geometries such as unconformities, channels, and subcrop maps, conformance relationships among surfaces, and fault offset and automatic fault polygon generation on all the views of GVERSE Geomodeling.

Integration with GVERSE Petrophysics
Considering the importance of petrophysics in understanding the reservoir, the application facilitates the representation of petrophysical properties (i.e. porosity, saturation and geomechanics etc.) based on GVERSE Petrophysics models. These petrophysical modeling results can be displayed on the fence diagrams as curves to better understand the character of the reservoir or on presentation templates on the cross section view.

Integration with GVERSE Geophysics
Incorporate your seismic interpretation into your geomodel with dynamically depth converted horizons, faults, and seismic backdrops on cross sections and fence diagrams. Update the velocity model with interpreted interwell points from your smartSTRAT geosteered well for the most up-to-date depth conversion possible.

Block Diagrams
GVERSE Geomodeling allows you to create block diagrams or gun sight sections that show intersection point of horizontal wellbore with the line of section as it drills through the target formations. In block diagrams, the line of section is laid perpendicular to the wellbore path and in the cross section view they show penetration point of the horizontal wellbore drilling inside the target horizon. This helps the drillers in planning inside the drilling section unit as distances between wells can be shown in the block diagram. Absolute and horizontal distances between wells drilling inside the same target can be determined very easily in a block diagram. Likewise, Drilling Section Unit (DSU) boundary distances between corner wells and section boundary can also be
determined in block diagram. Additionally, you can add formation thickness, distance filtering on the basis of formations and wellbore custom properties to get the complete picture of drilling wells and their placement inside the respective target formations.

Fence Diagrams
Facilitate a better understanding of the reservoir by creating fence diagrams of the open cross sections. This feature assists in analyzing and representing lithostratigraphic relationships, pinchouts and truncations of units, unconformities, structural and stratigraphic traps within the reservoir.

Co-blending
Validate the reservoir behavior by co-blending seismic attributes against interpolated curve properties, lateral lithofacies variation, and related structural geometries on cross sections and fence diagrams.

Interpolation
Advance your understanding of the reservoir by analyzing different geological sections and identify lithofacies, stratigraphic sequences, and depositional trends from the logs. GVERSE Geomodeling interpolation helps you understand the interplay between lithofacies and depositional or structural trends.

Clipping Planes
In a complex geomodel, clipping can play a significant role in examining the relationships among surfaces and faults. Using GVERSE Geomodeling clipping tool, you can easily clip planes vertically or horizontally to keep a specific portion of the scene’s geometry in focus and analyze the trajectory of wells as they are drilled through geomodel surfaces.
Completion and Perforation Postings
Display **Completions** stages and **Perforation clusters** along the wellbore path in **3D View** to identify the productive zones of the targeted formations.

**Requirements**

The following sections list the system requirements for the GVERSE Geomodeling.

**Software**

The software that must be installed on the system running the application are as follows:

- GeoGraphix 2019.2
- LMKR License Management Tool 2019.2 for GVERSE® Geomodeling license.
- Microsoft DirectX End-User Runtime (June 2010)
- Adobe Reader for selected help files (optional)

**Operating System**

To run the application, you need one of the following operating systems installed on your system:

- Windows® 7 Professional x64
- Windows® 7 Enterprise x64
- Windows® 7 Ultimate x64
- Windows® 10 Professional x64
- Windows® 10 Enterprise x64
- Windows® 7 Enterprise x64

**Note:** It is recommend to use the latest Microsoft® service packs and security patches. Geomodeling specifically requires Windows platform update KB2670838 installed on the machine, in case the operating system is Windows 7.

**Hardware**

- System: 8 GB (16+ GB recommended)
- Graphics Card: 2 GB (4 GB recommended)
- DirectX 11 capable hardware

**Note:** We recommend using the latest video drivers and Microsoft updates for your system.

**Licenses**

The following licenses are required to run the application:

- GeoGraphix license version 2019.2
- GVERSE® Geomodeling license version 2019.2

The GVERSE® Geomodeling license is required to enable Model 3D View and Contours on Map view. Also note that FrameBuilder™ is part of the GVERSE® Geomodeling license.

**Note:** Refer to the LMKR Customer Support Portal (http://support.lmkr.com/) for up-to-date information on the requirements.