DUG Insight - seismic interpretation software for 2D, 3D and pre-stack includes:

- Fully integrated 3D canvas for all data
- Fault and horizon interpretation including horizon propagator and fault tessellation
- Mapping and gridding including culture display and geolimages
- Synthetics including AWA synthetics
- Stratigraphic flattening on multiple surfaces
- Cross plotting

Upgrade to Explorationist and you also get:

- Geology including marker picking and geological cross sections
- Stack Attributes - spectral decomposition, incoherence, structurally oriented filtering and a host more attributes
- Velocity model building
- Geobody detection, volume sculpting and transparency
- Stacking of image gathers and mute picking

Additional specific modules:

- Intercept/gradient and AWA stack rotations (EEI equivalent)
- Building synthetic seismic volumes
- DUG Well - Gassmann substitution and AVO modelling
- DUG Rock - rock physics end member trending and stochastic modelling
- Automated multi-horizon picking
- RMO picking for depth imaging
- Petrel and Openworks links
Model building

**FIGURE 1**
Impedance model built on the fly using well log data, interpreted horizons and stratigraphic conformability constraints.

**FIGURE 2**
Real time synthetic modelling while interpreting in DUG Insight. Reflection coefficients are calculated from the model (in Fig 1). Using the convolutional model, a 3D synthetic volume is then created. The synthetic volumes have a number of uses including constraining interpretation and analysis of interference effects.
Synthetics

SYNTHETIC WELL TIES
Synthetic generation and checkshot QC are now integrated within DUG Insight. AVO synthetics for any number of angle stacks can be viewed simultaneously with well log data (three angle stacks are shown above). The correlation co-efficient of the synthetic trace with the data is shown. The display simply toggles between any number of different wells. The time-depth mapping can be updated and edited interactively as can the wavelet parameters (left). Time and spatially varying wavelets are also supported if required. Synthetics can be displayed along the well bore trajectory in any of the DUG Insight section views. The near synthetic wiggle trace in blue is overlain on a near stack arbline (right) - the arbline also follows the trajectory of the deviated well in this case.
AVA stack rotations

AVA Stack Rotations (equivalent to Extended Elastic Impedance) can be calculated within DUG Insight using angle stacks as input. In this example, near and far angle stacks have been used to make a gather volume of stack rotations from -90 to 90 degrees.

**FIGURE 1**
Insight control panel

**FIGURE 2**
The input far stack

**FIGURE 3**
A stack rotation gather at a particular inline and crossline location. The behaviour as a function of rotation angle is shown at the bottom of the gather for the selected TWT.

**FIGURE 4**
A stack rotation of -62 degrees, which in this case highlights a fluid effect in a sand wedge not obvious on the input angle stacks.
Flexible, intuitive, and easy to use

**FIGURE 1**
A very powerful and well regarded propagator is standard within DUG Insight base. It allows multiple seeds or propagation from an existing horizon within a symmetric or asymmetric window. Context-sensitive right mouse button activated menus are available. In this case the options are shown for the horizon.

**FIGURE 2**
Faults can be picked directly in the 3D window, or any cross section window, in the traditional way. Figure 2 shows a fault being interpreted simultaneously in 3D (left), inline view (centre), and map view (right), with the fault polygon displayed on the map. Fault tessellation happens interactively as you pick. Context-sensitive right mouse button activated menus are available. These fault surfaces can then be used to constrain horizon propagation.

**FIGURE 3**
Rock physics guided stratigraphic interpretation. Stratigraphic features (in this case, different channels) can be discerned using interactive polygon selection and highlighting. The polygons are guided by depth-dependent PDFs (ellipses shown on the crossplots) created by stochastic forward modelling.
Spectral decomposition

The data is decomposed into its constituent frequencies using a continuous wavelet transform. The amplitude for each sample is extracted for the defined frequencies.

**FIGURE 1**
Arbitrary line with two frequency gathers, one at a constant time (lower left) and the other at a particular inline/crossline location. A seismic volume is co-rendered with a single frequency along the arbline. The single frequency is also shown in the timeslice. As well as animating through different section views (inlines, crosslines, timeslices and multiple arblines), frequency can also be animated.

**FIGURE 2**
Second arbitrary line tracking a deeper channel.
Well display and co-rendering functionality

**FIGURE 1**
Arbitrary line with timeslice. A seismic volume is co-rendered with an interval velocity model. Vertical and deviated wells are showing P-velocity log data utilising the same colourbar. All data is displayed in depth.

**FIGURE 2**
Groups or ensembles of data can be made. This would be valuable, for example, for showing iterations of model building during a depth imaging project. Each iteration would contain the image gathers, stack and velocity field. DUG Insight can then toggle between the groups of data rather than having to toggle between all of the individual volumes.
Residual moveout for depth imaging, model building, amplitude analysis and flattening

**Figure 1**
Map of residual moveout from image gathers based on an horizon.

**Figure 2**
Residual moveout shown as vectors on the horizon in section view.

**Figure 3**
Residual picks on image gathers with the AVO of a particular event plotted below. The dashed line represents the parabolic pick while the solid line represents the non-parabolic pick. The final line represents the AVO of the selected twt.
Gather interpretation and manipulation

The same propagator that is used on stack data can be used to pick on gathers.

**FIGURE 1**
Gathers showing angle mutes (7 and 35 degrees) calculated from a velocity volume. Mutes can be used to create angle stacks on the fly.

**FIGURE 2**
Residual moveout picks shown on image gathers. The picks have been made within the 35 degree mute. Two picks are evident: a dashed parabolic pick and a solid non-parabolic pick.
Body analysis/interpretation

**FIGURE 1**
Samples within the polygon on the crossplot are drawn as voxels in the 3D view. This is one way of showing bodies in DUG Insight. Volumetric information on the geobody is also calculated.

**FIGURE 2**
Bodies are formed by applying an amplitude cutoff to the data, in this instance using Vp/Vs. Bodies can be connected by faces, vertices, or edges, and bodies smaller than a given volume are automatically discarded. Top and bottom surfaces are fitted to the bodies.

**FIGURE 3**
A third way of viewing bodies is by manipulation of transparency during volume visualisation.
Interpretation

**FIGURE 1**
Lathe view well logs in the 3D view.

**FIGURE 2**
DUG Insight can automatically produce as many horizons as you like. It will propagate from multiple auto seeds, creating horizons from the patches it picks. It is then simple to discard the horizons which are not required.

**FIGURE 3**
Crossplot window (right) showing PDFs from rock physics modelling as well as highlighted points from user-defined polygons on the section view (left).
Interpretation

Both propagation and fault tessellation are available across multiple 2D surveys and between 2D and 3D.
Ability to interpret in, and interactively toggle between, time, depth and stratigraphically flattened space

**FIGURE 1**
Timeslice, sections and horizons in time.

**FIGURE 2**
Slice, sections and horizon toggled to depth.

**FIGURE 3**
Stratigraphically flattened volume showing slice and sections. Horizons are now flat by design. 3D view shows the incorporation of an unconformity.
Geological interpretation

**FIGURE 1**
Well correlation plots are available within DUG Insight. Markers are interactively correlated between all wells, honouring user-defined stratigraphic constraints. Each well can have multiple tracks for well log display. The display can be optionally flattened to a chosen marker (in this example the light purple marker across the centre has been used). Display properties of the resultant layers can also be defined by the user.

**FIGURE 2**
Well markers can also be picked and edited interactively in all views. Well markers are summarised in a spreadsheet-style table.
Images, geotiffs and mis-tie analysis

**FIGURE 1**
Geotiffs and other images can be loaded and interactively positioned onto specific section or slice views. Images can be viewed and interpreted in all views, including 3D.

**FIGURE 2**
DUG Insight includes tools to quickly correct mis-ties of phase, amplitude, and time/depth. Use the intuitive manual editor to drag lines into alignment interactively, or use cross-correlation to automatically find the best matches. DUG Insight simplifies the task by letting you focus on relative adjustments, then solves for the smallest total change.