

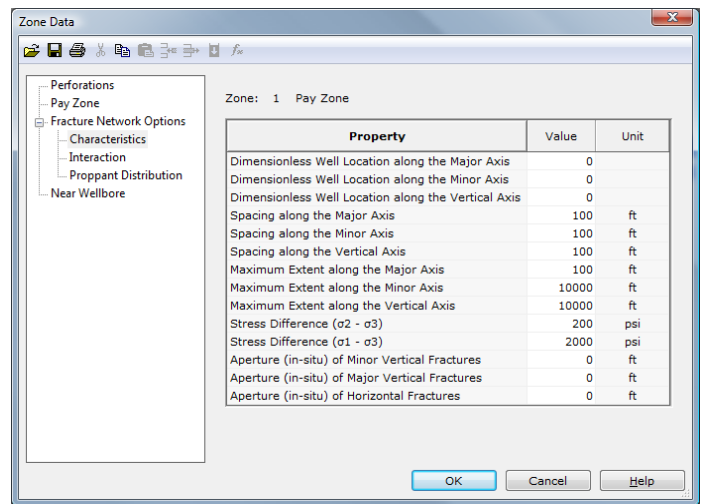
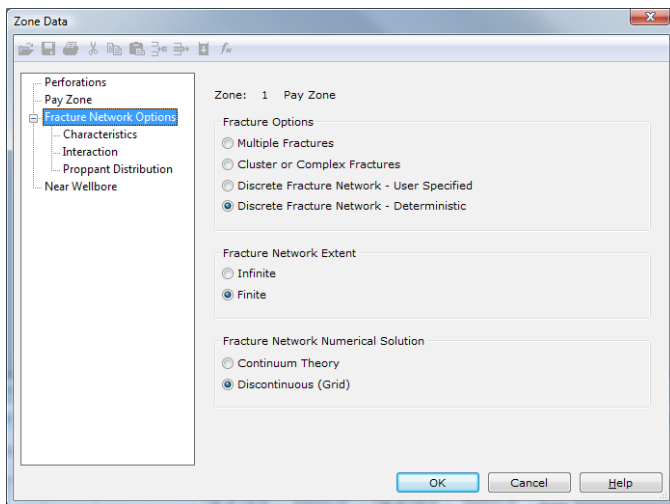


# MSHALE

MShale is a **Discrete Fracture Network (DFN)** simulator for predicting fracture propagation and extent in fractured and naturally fractured reservoirs. The 3D numerical simulator is designed to model multiple, cluster/complex/swarm, and discrete fractures in shale and coal bed methane (CBM) formations.

The multi-dimensional DFN solution is based on a network grid system and has options for *Continuum Theory* and *Discontinuous (Grid)*. The program offers *User Specified* DFN characteristics where the fracture network spacing, aperture, and aspect ratios are input, and *Deterministic* DFN characteristics where the stress differences (i.e.,  $\sigma_2 - \sigma_3$  and  $\sigma_1 - \sigma_3$ ) and network properties are specified. The fracture characteristics, apertures, and propagation in the x, y, and z directions (i.e., the x-z, y-z, and x-y planes) are then numerically calculated.

Fracture interaction can be *User Specified* or calculated *Empirically* based on the created network fractures and spacing. Proppant transport is also unique in that the proppant distribution can be *Uniform*, all in the *Dominant* fracture, or calculated according to a *User Specified* minimum allocation in the dominant x-z fracture plane. Multilayer or limited entry network fracture systems can also be modeled as illustrated on the following screens:



Numerous DFN plots are available to illustrate the stimulated reservoir volume (SRV), specific DFN length, area, and volume ratios, fracture characteristics, etc. Typical 2D and 3D numerical network fracture profile results are shown below:

