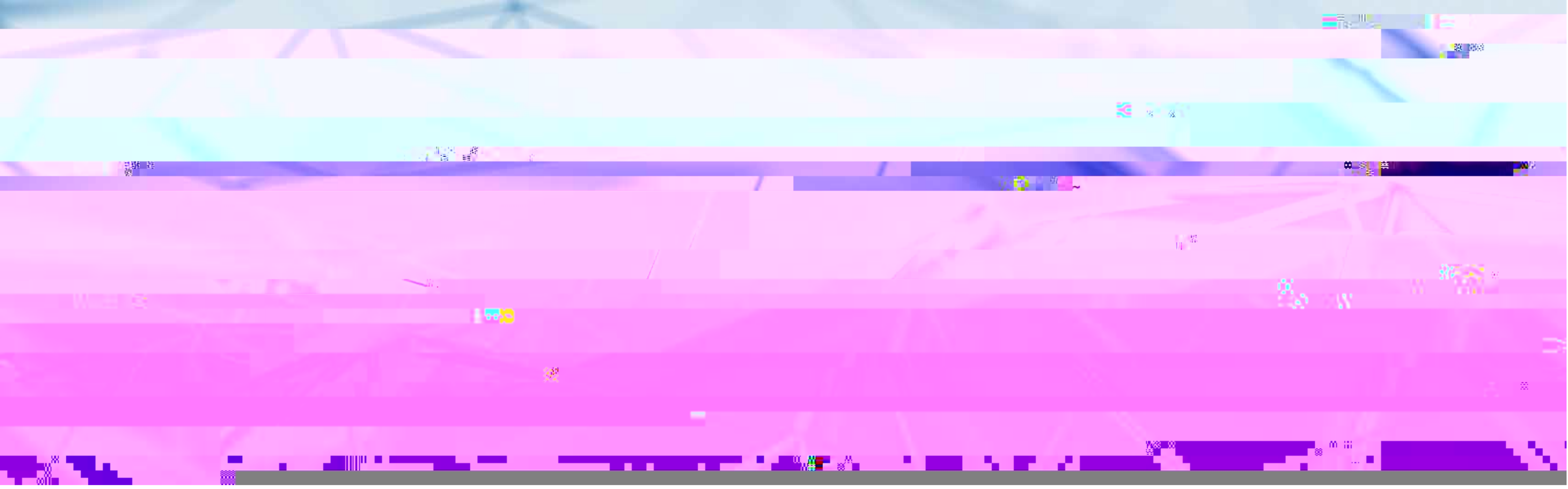

Import Formats

- DICOM (version 3.0 and 2D stacks) including:
  - 4D (time-resolved) DICOM with time step selection
  - Option to store DICOM tags with imported data
- DICOM encapsulated STL surface models
- ACR-NEMA (versions 1 and 2)
- DICONDE

- Plot statistics, export as *.png or *.csv:
  - Volume histogram
  - Area histogram
  - Flatness histogram
  - Elongation histogram
  - Shape factor histogram
  - Sphericity histogram
- Particle visualization:
  - Contact count
  - Voxel count
  - Surface area
  - Boundary contact area
  - Label contact area
  - Volume
  - Max greyscale
  - Mean greyscale
  - Major length
  - Flatness
  - Elongation
  - Shape factor
  - Sphericity
  - Orientation angle to x/y/z axis
  - Orientation to mean
  - Export as *.csv or *.txt files
- Map to mesh:
  - Export (or assign using Simpleware Elite or Apex) particle volume fraction information per mesh cell

Pore Analysis

- Allows pores (either open or closed) to be analyzed from a mask or multi-label mask
- Two types of pore analysis available:
  - Open: for connected pore networks
  - Closed: for pores that are separated from each other
- Statistics for analyzed region or region of interest:
  - Total pores count
  - Total throat count volume
  - Volume fraction
  - Internal pore volume (Mean, SD, Min, Max)
  - Internal pore surface area (Mean, SD, Min, Max)
  - Pore equivalent volume sphere diameter (Mean, SD, Min, Max)
  - Pore flatness (Mean, SD, Min, Max)
  - Pore elongation (Mean, SD, Min, Max)
  - Pore shape factor (Mean, SD, Min, Max)
  - Pore sphericity (Mean, SD, Min, Max)
  - Pore coordination number (Mean, SD, Min, Max)
  - Throat contact count
  - Throat contact area
  - Throat radius (Mean, SD, Min, Max)
  - Throat flatness (Mean, SD, Min, Max)
  - Throat elongation (Mean, SD, Min, Max)
  - Throat eccentricity (Mean, SD, Min, Max)
  - Throat shape factor (Mean, SD, Min, Max)
- Plot statistics, export as *.png or *.csv:
  - Volume histogram
  - Area histogram
  - Flatness histogram
  - Elongation histogram
  - Shape factor histogram
  - Sphericity histogram
- Particle visualization:
  - Contact count
  - Voxel count
  - Surface area
  - Boundary contact area
  - Label contact area
  - Volume
  - Max greyscale
  - Mean greyscale
  - Major length
  - Flatness
  - Elongation
  - Shape factor
  - Sphericity
  - Orientation angle to x/y/z axis
  - Orientation to mean
  - Export as *.csv or *.txt files
- Map to mesh:
  - Export (or assign using Simpleware Elite or Apex) pore volume fraction information per mesh cell

Surface Mesh Generation

- Topology and volume preserving smoothing
- Triangle smoothing
- Decimation

- Export formats:
  - AVI
  - Ogg Theora
  - H.264/MPEG-4 AVC
  - Windows Media Video (WMV)
  - PNG sequence
- Variety of export sizes: From 480p to 2160p (4K)

4D Frame Toolbox

- Active frame slider to manually control frame displayed in the 2D slice views and 3D view
- Cine mode for active slice view and 3D view
- Compare frames: compare two 2D slice views to examine differences
- Options to set the time between frames and delete unwanted frames

Working with Surface Data

- Surface to mask tool – conversion of surface objects to image masks by voxelization. Three available methods:
  - Accurate for manifold objects: when converting watertight surface object
  - Accurate for non-manifold objects: when converting non-watertight surface object
  - Robust: Less accurate but failsafe option for poor quality surface objects
- Mask to surface tool: use the current 3D visualization of a mask to create a surface object
- Create shape – generate surface object primitives:
  - Cuboid
  - Cylinder
  - Sphere
  - Cone
  - Tube
- Sweep centerlines: create surface objects from centerlines or centerline networks
- Manipulate surface objects both interactively and by absolute position and orientation:
  - Transform
  - Rotate 4R 7224 Tm0009 12 0Tf1 320 G845E3 TJETQq0.000009 12 0 612 92 reW* nQ EMC /Span <MCID 58/Lang (en-US)>BDC q0500070000912 0 612 92 re
  - Scale: aspect ratio preserving or along specified axis
  - Zero position: move surface object to the image space origin
- Use global, local or user-defined axis for object manipulation
- 2D nudge tool to fine tune position of surface object in 2D views
- Snap registration tool: automatic registration of two surfaces with no additional inputs
- Register datasets tool C58 0 0 35 0 0 0 0 0 0 12 BT /F1 9 Tf 1 9 Tf1 0 0 /Tm0 register surfaces to other surfaces or any other dataset types:
  - Register to datasets in the current project or a foreign project (a separate Simpleware project file)
  - Best fit algorithm to align surface objects together with 3 methods: landmark, automatic, landmark and automatic
  - Landmark: uses picked landmark points on the moving and fixed surface objects
  - Automatic: uses all points on the moving and fixed surface objects
  - Landmark and automatic: uses landmark registration as a L strat^

  - Unlink Design Link surface objects to allow editing parts in Simpleware
- Interactive positioning:
  - Position and orientation: interactively reposition the imported parts
  - Zero position: automatically place imported parts within image volume
  - Assembly transformation matrices automatically reported to the log

Multipart Volumetric Meshing (options available for FE and CFD meshes)

- Mixed hexahedral/tetrahedral or pure tetrahedral element volume meshing
- Element types: linear, straight quadratic or curved quadratic
- Choice of meshing algorithms:
  - FE Grid: image resolution-based mesh
  - FE Free: progressively decimated (or refined) mesh from the image resolution
- Advanced FE Grid options:
  - Smooth or voxel cell (pure hexahedral with unsmoothed boundaries/interfaces) mesh
  - Surface smoothing
  - Mesh quality optimization
  - Mesh adaptation
  - Smooth masks against exterior
- Advanced FE Free options:
  - Coarseness slider to automatically adjust advanced parameters relating to mesh coarseness
  - Per-part meshing settings
  - Meshing mask and surface objects in the same model (without voxelization)
  - Adaptive surface remeshing
  - Characteristic element edge lengths (min/max)
  - Surface elements constraints: surface change rate, number of elements across a layer
  - Volume elements constraints: internal change rate, number of quality optimization cycles
  - Other options: snap to parent surface, snap surface object nodes to boundaries, smooth masks against exterior, refine near slits and cavities
- Additional mesh quality improvement – user-defined minimum and/or target element qualities. Quality metrics include:
  - In-out aspect ratio
  - Tetrahedron volume skew
  - Tetrahedron minimum dihedral angle
  - Jacobian
  - Jacobian and in-out rati000009 12 0 612 92 reW* nBT/F1 9Tf1 0 0 1 160.