SNAP Overview

Presented by

Jesse Phillips

jphill@sandia.gov

Sandia National Laboratories

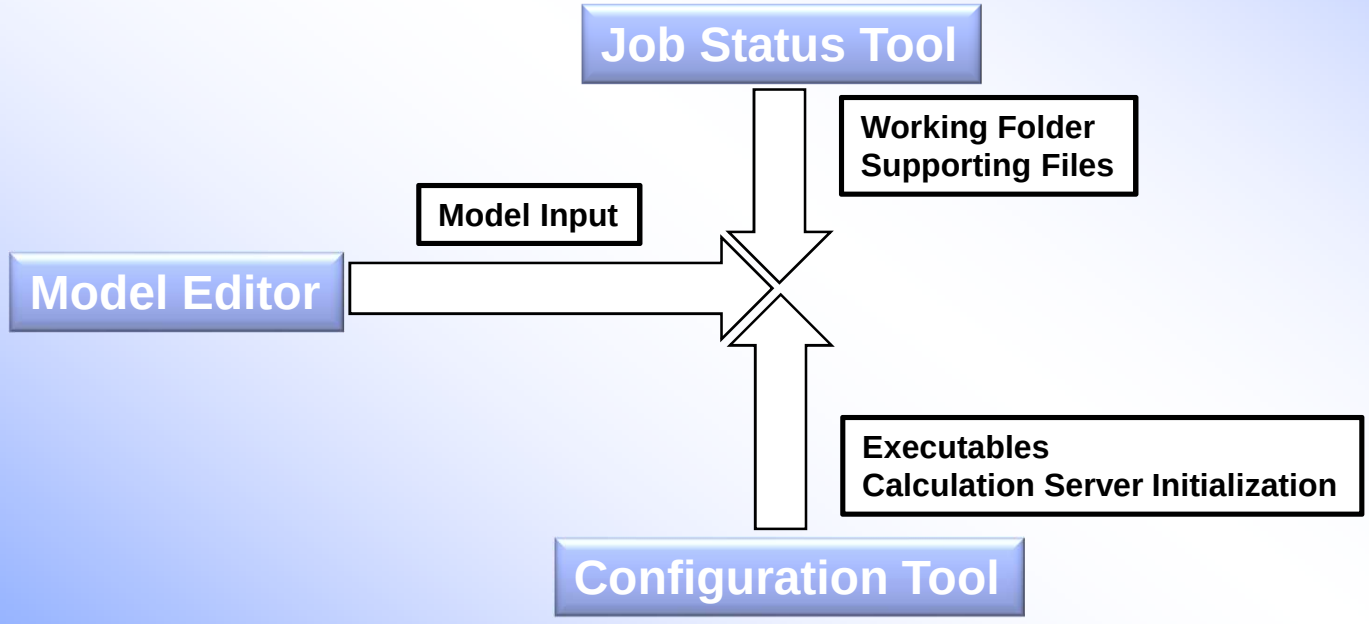
Objective of Presentation

- **Introduce SNAP**
  - **A breakdown of the Model Editor Graphical User Interface (GUI)**
  - **Discuss the various tools (Job Status, Configuration Tool)**
  - **General discussion of functionality regarding MELCOR**
- **Demonstrate user input workflow**
  - **MELGEN and MELCOR**
    - **General “Packages” are maintained**
    - **General User Guide information is accessible**
- **Demonstrate job submittal**
- **SNAP is a very feature rich suite**
  - **Therefore we’ll focus on using it solely to create MELCOR input and perform calculations**

Sandia National Laboratories

Simplistic Idea on Information Flow for Job Submittal

- **From a simple user's understanding of information flow**



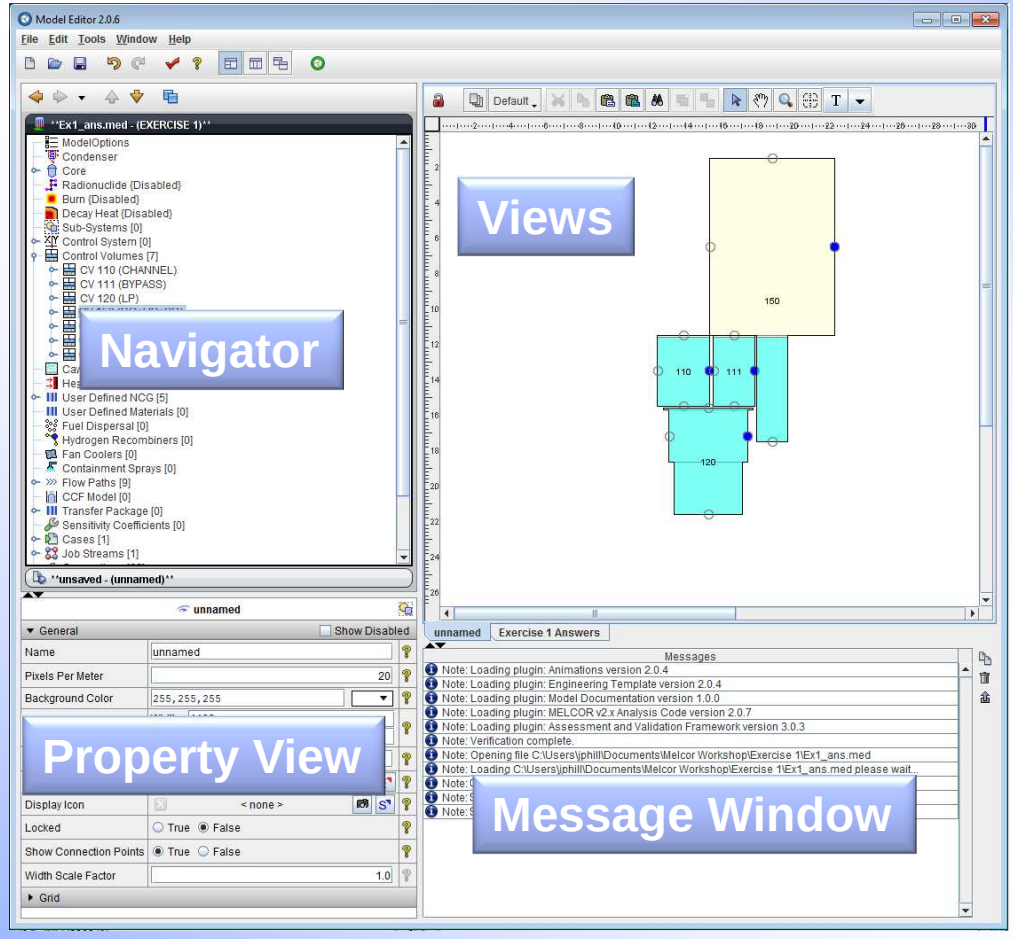
Sandia National Laboratories

SNAP Model Editor

- **Model Editor**
  - Unique plug-ins handle specific model details for a given code (MELCOR, RELAP, etc.)
  - Stores both MELGEN and/or MELCOR user input
  - Can convert older MELGEN/MELCOR 1.86 input to 2.x
  - Submits input processed by executables (i.e. job submittals)
  - Can create an Animation Model for post processing output
- **Model Editor Advanced**
  - User Defined Numerics
  - Engineering Template
  - Automated Validation Framework
  - And more….

Sandia National Laboratories

Model Editor Interface



Sandia National Laboratories

Navigator View

- **Nodal based tree for each package**
  - **Blue node can be clicked to expand the tree** 
  - **Select the MELCOR component to view its properties in the Property view (Components can be selected in either the Navigator or the View port.)**
  - **Packages with different names**
    - **Model/Options == EXEC package**
    - **Control Systems == CF/EDF/TF packages**
  - **Internal Controls**
    - **Cases – Where the MELCOR input is treated**
    - **Job Streams – Identifies MELCOR input files and executables using an information flow map**
    - **Connections – list component dependencies**
    - **Numerics – user defined substitutions to input**
    - **Views – List of views available in the View port**

Sandia National Laboratories

Sub-Systems

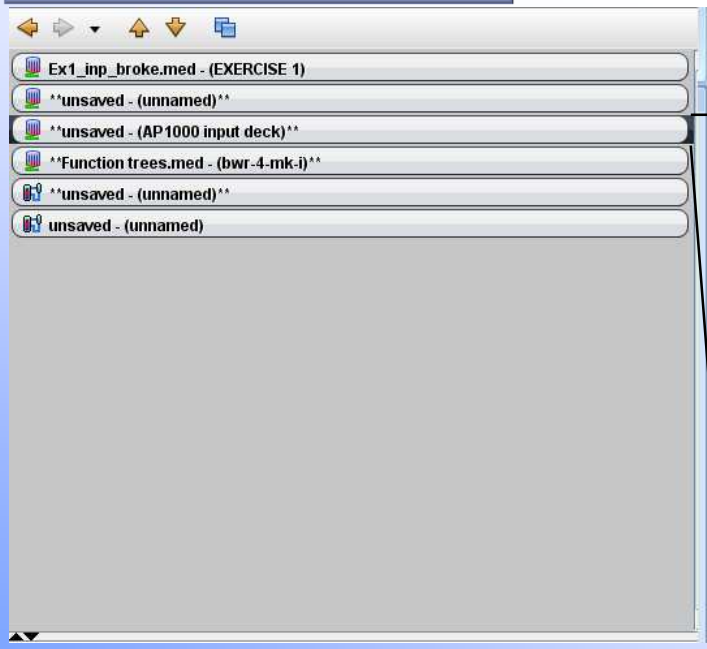
- **Sub-Systems allows user input to be grouped logically into system sets**
  - **Components can be added to a sub-system from the currently available component**
  - **Exporting a text files will maintain sub-systems in independent files (a typical practice for MELCOR file organization where components are stored in unique files)**
    - » **Example**
      - **RHR components may include**
        - **Pumps, reservoir water sources, heat exchangers, etc.**
        - **Their associated flow paths, controls volumes, controlling logic are often kept primarily in one input file for bookkeeping purposes**

Sandia National Laboratories

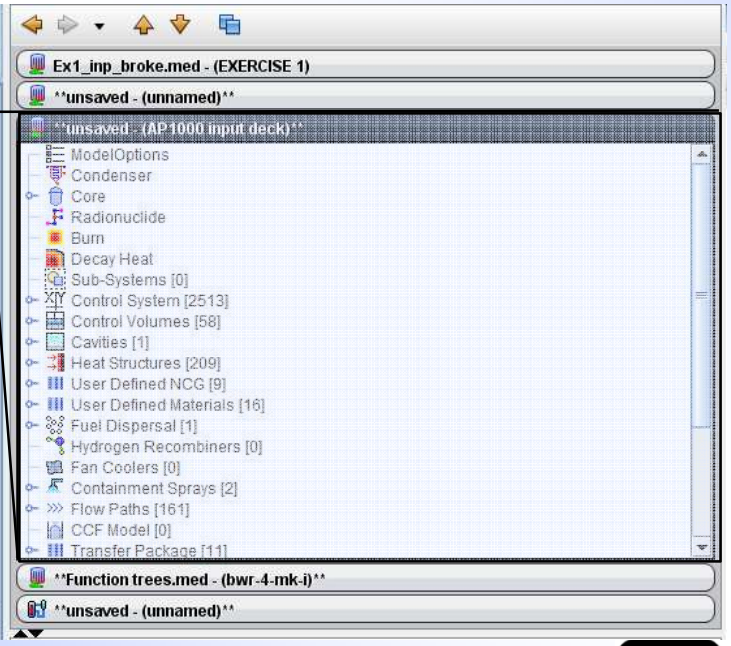
Navigator View

- **Multiple models can be open in one SNAP instance**
  - **Harmonica Display**

Navigator Collapsed



Navigator Expanded



Sandia National Laboratories

Properties and Message View

- **Properties View**
  - Where all user input is accepted
    - » Both MELCOR and/or SNAP components
  - Editable fields
  - Drop down menu
  - Editable window pop-ups
  - Selectable elements
  - Model notes
  - User guidance
- **Message**
  - Where error messages associated with SNAP are placed.
  - MELCOR error messages are still written to the MELCOR files
    - » Message file, diagnostic file, output file, etc.

Sandia National Laboratories

View Port

- **New Views are created in the Navigator tree**
  - **Right click View, select new to create a new view component**
- **View components have several internal drawing methods for various components**
  - **Components can be place in the view by right clicking on the component in the navigator tree and selecting ‘add to view’**
  - **Control Volumes utilize the CV_VAT information (Volume and Altitude Table) when determining the depiction**
  - **Flow paths utilize Connections (see Navigator tree) to determine which Control Volumes to connect. Location of the connecting line is taken from the FL_FT record versus the CV_VAT input**
  - **Core, Control Functions, Database Variables, etc.**

Drawing in the View Port

- **Drawing is very straight forward. Experiment to learn**
  - **Tools available**
    - » **Layers**
      - **Drawn components are assigned to a given layer**
      - **Layers can be made visible or invisible making editing easier**
    - » **Docking**
      - **View can be detached from the view port and moved about the desktop**
        - **Right click the view in the Navigator>Undock View**
    - » **Standard copy/cut/past/zoom/pan controls**
      - **CNT+C / CNT+X / CNT+P / CNT+MouseWheel / MouseWheel(Shift+MouseWheel)**
    - » **Grouping components, found in tool bar**
    - » **Lasso select (left click hold and drag)**

(Continued)

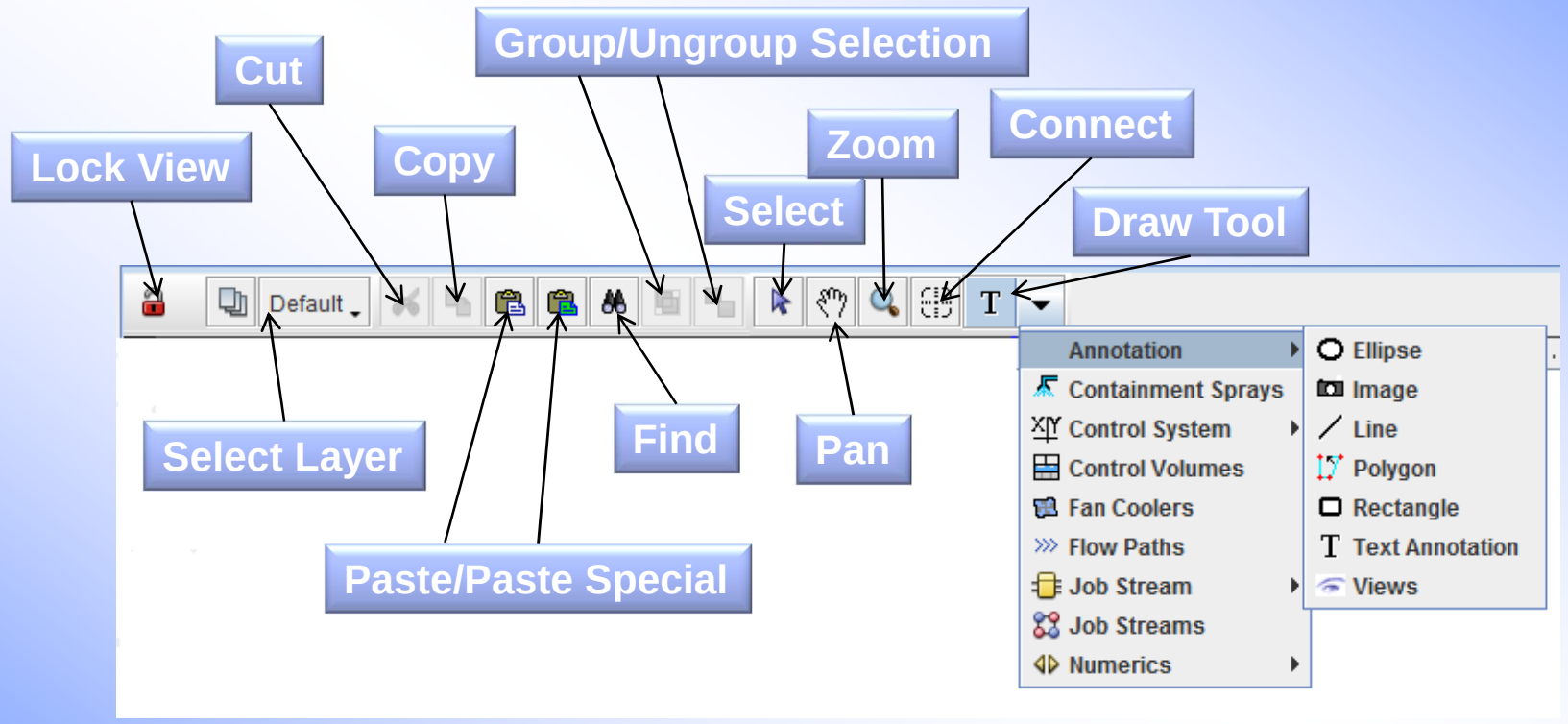
Sandia National Laboratories

Drawing in the View Port

- Tools available (continued)
  - » Connection Tool
    - Components (Control Volumes, Flow Paths, and a few others can be initialized in the view port, likewise connections can be created between such components with the connection tool)
  - » Drawing Tools
    - Annotate
      - Add text, lines, shapes, etc.
    - MELCOR components
      - Sprays, Control Volumes, Flow Paths, etc.
    - Job Stream information flow maps
- Toolbar

Sandia National Laboratories

View Port Toolbar



Sandia National Laboratories

View Port Notes

- **Interactive elements can only be selected from the View Port if the view is locked**
  - **This is to prevent accidental interactions while editing the view components**
- **If the screen is locked you cannot edit any of the components**
- **Individual layers can be locked to prevent editing certain components**
- **Connections can only be made in the View Port for the following**
  - **Flowpaths to Control Volumes, Sprays to Control Volumes, and Fan Coolers to Control Volumes**

Sandia National Laboratories

Example: Import MELGEN File

- **Importing a pre-existing MELCOR model**
  - **File > Import > MELGEN 2X**
    - » **Make sure the Code Version is correct**
    - » **Select the root file**
      - **Note R*I*F or INCLUDE files are read with regard to their hosting file not the main root file. (MELCOR performs these functions with regard to the root file only.)**
        - **Hosting file is the file with the R*I*F or INCLUDE file location**
        - **Root file has the main MELGEN or MELCOR block**
    - » **Name options can be specified by the user**
      - **Preserve existing component names as reasonable (16 character limit and repeated names will have an _# appended to the end of the name)**
      - **Generate with number**
        - **With package prefix i.e. CV###**
        - **Without prefix i.e. #####**

Sandia National Laboratories

Example: Import MELCOR File

- **Within the Navigator Tree**
  - **Add a Case if none exists (right click case select new)**
    - » **This will create a MELCOR Case**
  - **Right Click the newly created MELCOR Case and select Import Case**
  - **Navigate to file location**
    - » **If error Messages are overwhelming**
      - **The “Code Version” didn’t match the file type**
        - **1.86 vs 2.x mismatch**

Sandia National Laboratories

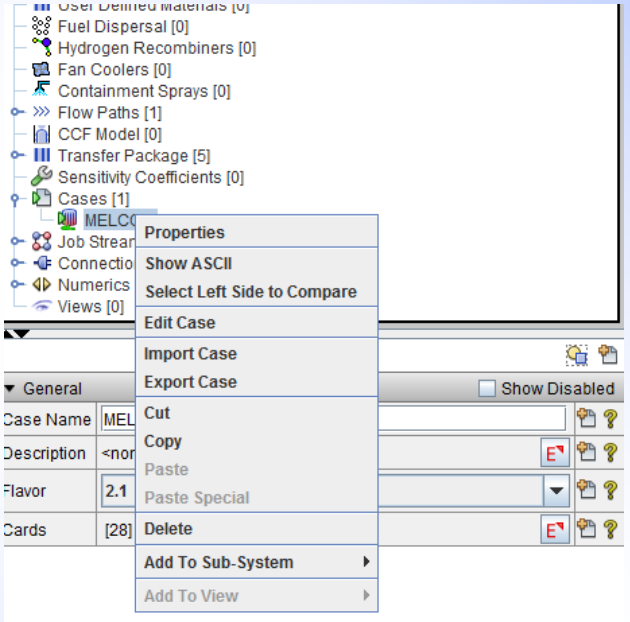
Notes on Importing

- **Review the Message View for import errors**
  - **May require some corrections**
  - **Once again if the error messages are overwhelming**
    - » **1.86 vs 2.x mismatch likely occurred**
- **Import the MELCOR case BEFORE changing the “Code Flavor” i.e. from 1.86 to 2.x or reverse**
  - **SNAP is anticipating like versions**

Sandia National Laboratories

Converting the Models

- **MELGEN Input**
  - **Select Model/Options within the Navigator Tree**
  - **Adjust Code Flavor within the Properties View to the desired input structure**
- **MELCOR Input**
  - **Expand Cases in the Navigator Tree**
  - **Right click the desired MELCOR input within the Navigator Tree**
  - **Select Edit Case**



Sandia National Laboratories

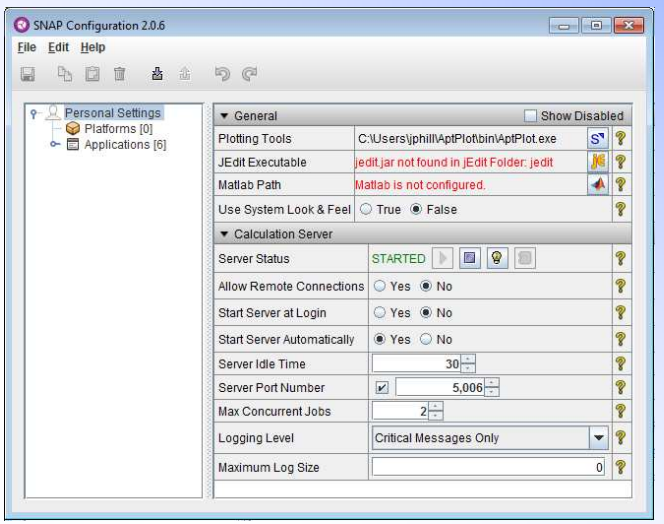
Converting the Models

- **A new Navigator Tree for the MELCOR input will be generated**
- **The functionality is very similar to the MELGEN input Navigator Tree**
  - **Select Model/Options within the Navigator Tree**
  - **Adjust Code Flavor within the Properties View to the desired input structure**
  - **Click the Save Icon near the top of the Navigator Tree (which will close the MELCOR Navigator Tree)**

Sandia National Laboratories

Configuration Tool

- **General Use**
  - **Lets SNAP know where the executables are located**
    - » **MELGEN/MELCOR**
    - » **APT Plot (Not necessary but useful for Post Processing)**
  - **Initiates the Calculation Server**
    - » **Calculation Server is where the calculations are performed**
    - » **By default your current machine is assumed to be the calculation server**
      - **Therefore if your machine is the one to perform the calculations you will not need to adjust this setting**



Sandia National Laboratories

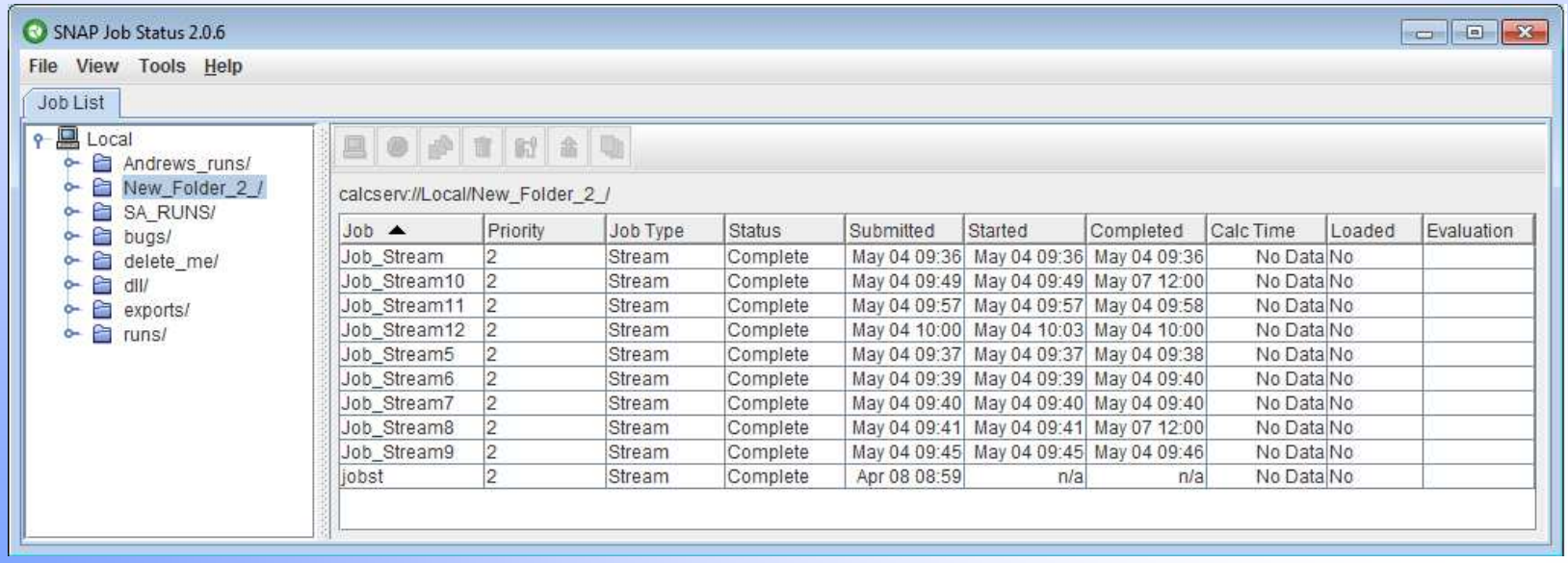
Configuration Tool Setup

- **Personal Setting**
  - **APT Plot location can be specified**
    - **As well as other tools if so desired**
  - **Server Status**
    - **Click the play button, there are several other user actions that can start the Server.**
- **Applications**
  - **Right click Applications > New > MELGEN > location of MELGEN**
  - **MELCOR (same as MELGEN)**
  - **Specify the Server**
    - **If your machine will perform the calculations no further work is necessary**

Sandia National Laboratories

Job Status Tool

- **Job Status Tool**
  - **Keeps track of prior performed jobs**
  - **Only displays the folder list and jobs when the Calculation Server has been started**



Job	Priority	Job Type	Status	Submitted	Started	Completed	Calc Time	Loaded	Evaluation
Job_Stream	2	Stream	Complete	May 04 09:36	May 04 09:36	May 04 09:36	No Data	No	
Job_Stream10	2	Stream	Complete	May 04 09:49	May 04 09:49	May 07 12:00	No Data	No	
Job_Stream11	2	Stream	Complete	May 04 09:57	May 04 09:57	May 04 09:58	No Data	No	
Job_Stream12	2	Stream	Complete	May 04 10:00	May 04 10:03	May 04 10:00	No Data	No	
Job_Stream5	2	Stream	Complete	May 04 09:37	May 04 09:37	May 04 09:38	No Data	No	
Job_Stream6	2	Stream	Complete	May 04 09:39	May 04 09:39	May 04 09:40	No Data	No	
Job_Stream7	2	Stream	Complete	May 04 09:40	May 04 09:40	May 04 09:40	No Data	No	
Job_Stream8	2	Stream	Complete	May 04 09:41	May 04 09:41	May 07 12:00	No Data	No	
Job_Stream9	2	Stream	Complete	May 04 09:45	May 04 09:45	May 04 09:46	No Data	No	
jobst	2	Stream	Complete	Apr 08 08:59	n/a	n/a	No Data	No	

Sandia National Laboratories

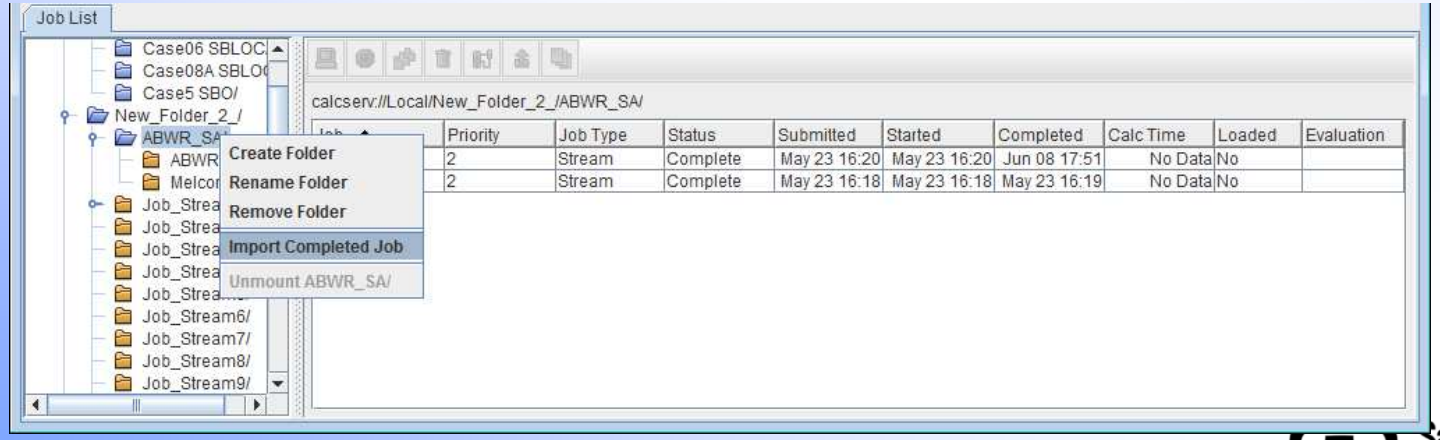
Job Status Tool Setup

- **User will need to create a working folder**
  - **Right click Local > Mount Root Folder**
  - **Specify the working folder**
- **Job Streams can be submitted to any mounted root folder**
  - **The files submitted and produced by MELGEN and MELCOR will be located in \Root Folder\Job Stream Name**
- **From an existing Job**
  - **Files associated with the run can be viewed with the Job Status Tool**
  - **Data can be plotted with APT Plot from the Job Status Tool**
  - **Jobs viewable from the Job Status Tool will be available for post processing with an Animation Model from the Model Editor**

Sandia National Laboratories

Importing a Standalone Job with the Job Status Tool

- The Job must reside in a folder within the working directory of a mounted Root Folder
- Navigate down to the folder where the Job files reside
- Right click the folder>Import Completed Job
- Select the applicable application
- Click Next then input a Job Name if desired
- Click Next then select the location of all desired files



Sandia National Laboratories

Creating a Job Stream

- **Job Stream**
  - **Created within the Model Editor**
  - **Performs MELGEN and/or MELCOR runs**
    - » **Can be either or both**
  - **Submits the input files to the MELGEN/MELCOR executables and specifies the folder where the results will be placed**
  - **Produces a new Job within the Job Status Tool**
  - **Can specify the post processing tool to generate a set of plots**
  - **Has several default Job Streams which can be selected to simplify the setup process**

Sandia National Laboratories

Setting Up a Job Stream

- **Checklist before setting up a Job Stream**
  - **MELGEN/MELCOR executables setup in the Configuration Tool**
  - **Calculation Server started**
  - **Root Folder present in the Job Status Tool where the resulting files will be located**
- **Set-up**
  - **In the Navigator right click Job Streams>New**
  - **Select Basic Stream**
  - **Select calculation type (Two-Step)**
  - **A new View will be created containing an information flow diagram**
    - » **The MELGEN input and MELCOR input will be present**
    - » **A MELGEN and MELCOR executable will be selected from the Configuration Tool automatically**

Sandia National Laboratories

Job Stream

- **Independent files can be specified in the Job Stream**
  - **Restart Files, ASCII Input Files, etc.**
- **Sensitivity cases can be performed**
  - **If a Numeric has been included in the model it can be used to perform various like calculation where the Numeric value is varied**
    - » **Create a new numeric by expanding Numeric tree and right clicking desired Numeric type**
    - » **Create a Numeric Job Stream and edit the Parametric Properties**
    - » **Edit the Parametric Tasks**

Sandia National Laboratories

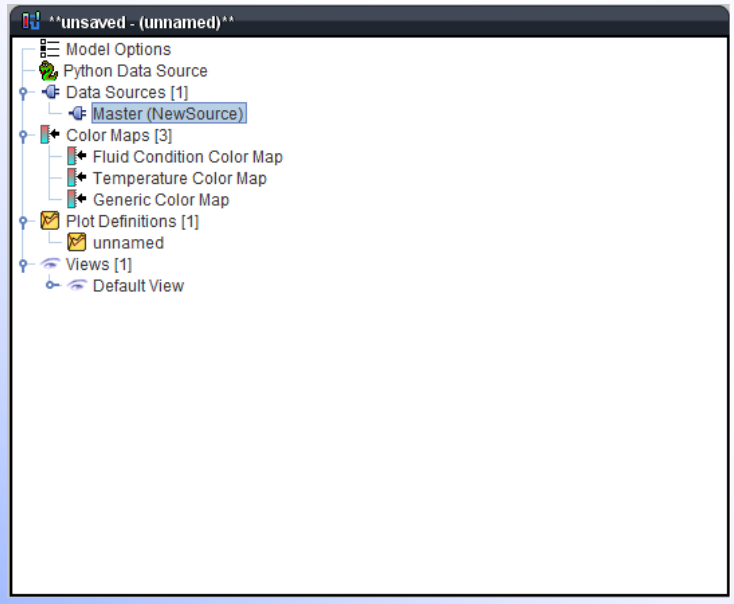
Example: Continuation of Import Example with Job Stream Creation

- **Performed during the workshop**

Sandia National Laboratories

Post Processing with SNAP

- **Animation Model is a separate model from the MELCOR model**
  - **File>New select Animation model**



Sandia National Laboratories

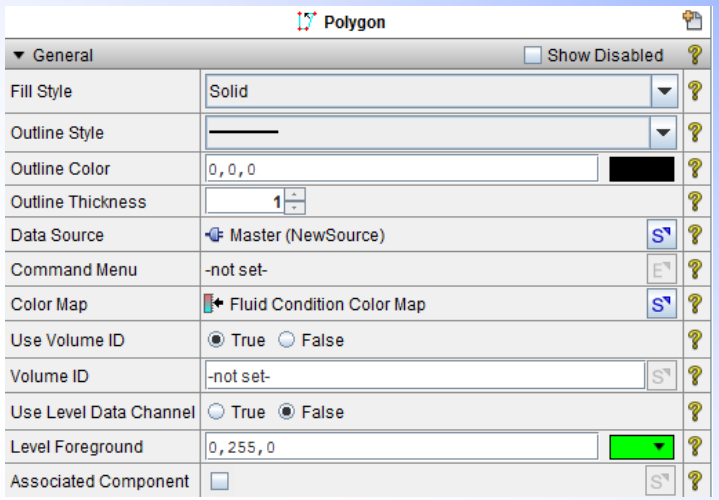
Creating a Basic Animation Model

- **Attaching a plotfile**
  - Two Steps
    - » Click on Master in the Data Source Tree in the Navigator and set the Source Run URL in the Properties to a completed Job
    - » Click the Data Connector Icon 
- **Create a Color Map**
  - Three steps
    - » Right Click Color Maps in the Navigator>New
    - » Right Click the new Generic Color Map>Add To View
    - » Adjust some Properties
      - Set Color Map Type to Generic
      - Specify Dynamic as True
      - Set Channel Name Pattern to MELCOR “CVH-P_%V”
        - Review the MELCOR User’s Guide to see all the available plot channels
        - %V is a place holder for the components Control Volume number (see notes for a detailed description on its use)

Sandia National Laboratories

Creating a Basic Animation Element

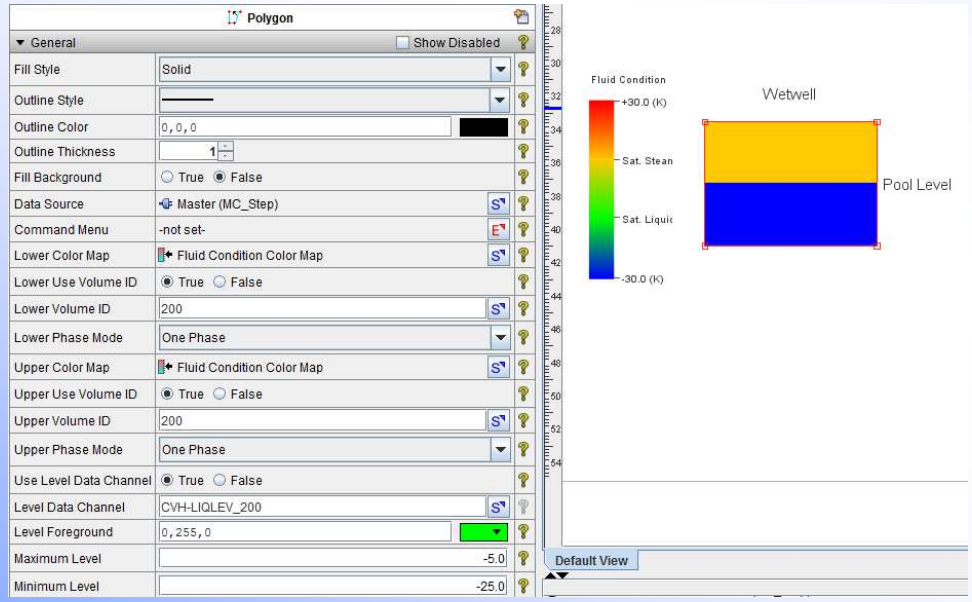
- **Creating a Polygon**
  - **Select Polygon from the Annotation section of the View Port Toolbar (review earlier slides if you can't remember what the Toolbar looks like)**
  - **Start clicking in the View port and the drawing logic will become clear (left click to set a point, right click to remove the last point)**
  - **If you click on top of an old point it will close the polygon and the instance will be complete.**



Sandia National Laboratories

CVH-FL Example Problem: Drawing the Wetwell

- **Set the following**
  - **Color Maps**
  - **Enable Use Level Data / set the Liquid Level Data Channel**
  - **Specify Volume IDs**
  - **Max and Min Levels**
  - **Adjust the Upper Phase Mode to One Phase**



Sandia National Laboratories