Radiation Protection Computer Code
Analysis and Maintenance Program (RAMP)
User's Meeting
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SNAP Overview

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APT

What is SNAP?

- Symbolic Nuclear Analysis Package
  - Suite of Applications
- Standard Graphical User Interface designed to simplify the use of analytical codes.
  - Construct, Maintain and Document Models
  - Run Cases
  - Analyze Results
- Platform Independent, Pure-Java, Plug-in Arch.
  - Can Be Adapted to Any Engineering Code
  - Highly Extensible and Flexible

SNAP is a Suite of Applications

- Primary SNAP Apps:
  - Configuration Tool
  - Model Editor
  - Job Status
  - Calculation Server
- Associated Software
  - AptPlot & Demuxers – Plotting Tools
  - ACAP - Automated Code Assessment Program
  - TSA – Test Suite Analyzer
  - Matlab / Mathcad
  - DAKOTA – Optimization & Uncertainty Quantification

Consistent and Intuitive User Interface

- Common Functionality Across Several Codes
- Minimize Learning Curve for Analysis Codes
- Logical Organization of Model Components and Interconnections
- 2D and 3D Visualization
- Input Checking and Model Validation Tests
- Advanced Model Editing Tools
- Manage Model Documentation
- Easily Submit, and Monitor Calculations
- Automate Analysis of Results

Why Use SNAP?

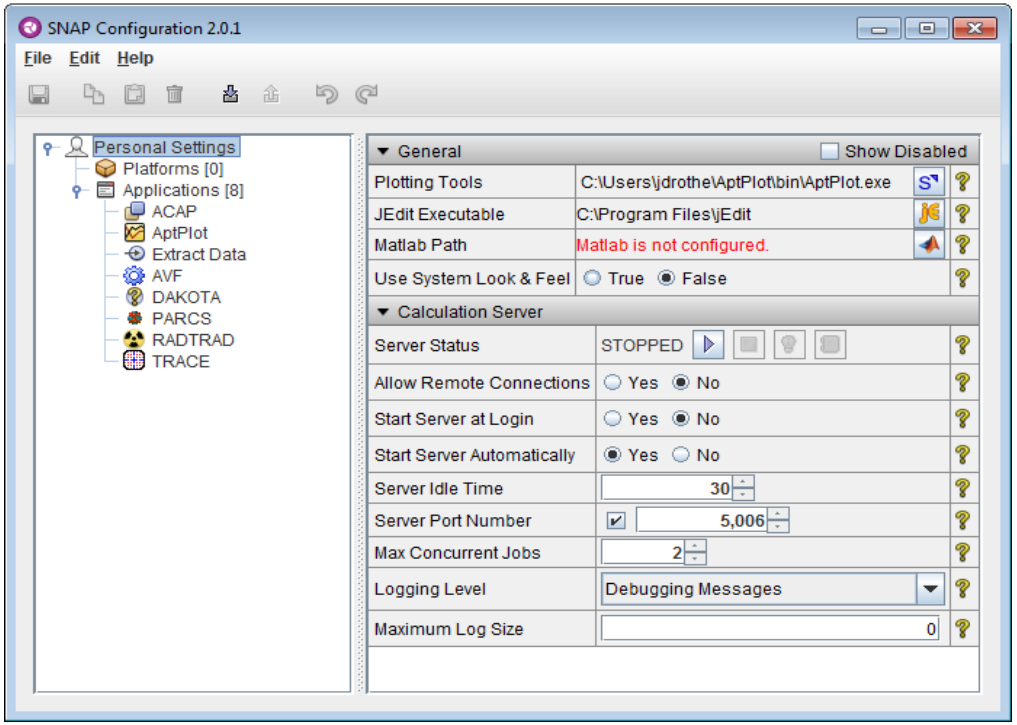
- Greatly reduces time to develop and/or modify analytic code models.
- Permits model developers to graphically annotate and document their input models.
- Simplifies the process of running analytical codes using job automation.
- Provides for quick and easy visualization of code results and/or data.
- Improves Efficiency and Quality!

Advanced SNAP Functionality

- Numerics - Use variables & functions to define input and control execution
- Model Notes - Attach HTML notes to components & individual attributes
- Track Input Ownership & Reviewer
- Model Notebook Generation
- Master Integrator - Split complex models into sub-models.
- Engineering Templates - Provides support for multiple diverse models.
- Kiosk - Create Input templates to constrain execution of predefined engineering templates.
- Uncertainty Quantification Analysis (Dakota)
- Restart Cases
- Component & Group Renodalization
- I/C Import & Management
- Component-to-Component and Model-to-Model Comparisons
- Advanced Job Stream (Under Design)

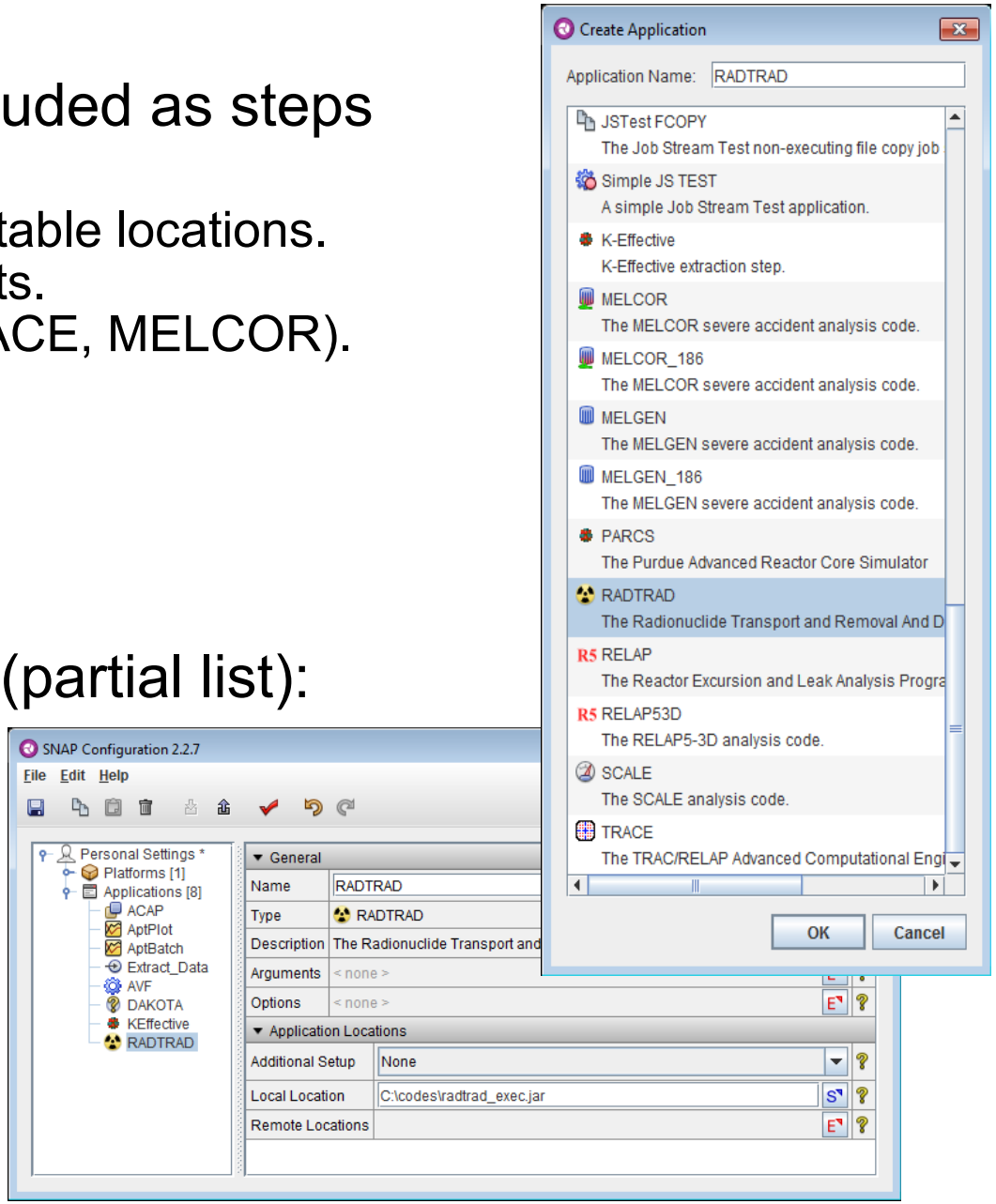
Configuration Tool

- SNAP can be installed under a User's directory or in a System Directory where it can be available to multiple Users.
- Personal Settings are stored in the User's home directory.
- Application paths for jEdit, AptPlot, and Matlab.
- Local Calculation Server Settings
  - Status, Server Port, Logging Level, etc.
- Manages the available set of Platforms & Applications.



Configuration Tool – Applications

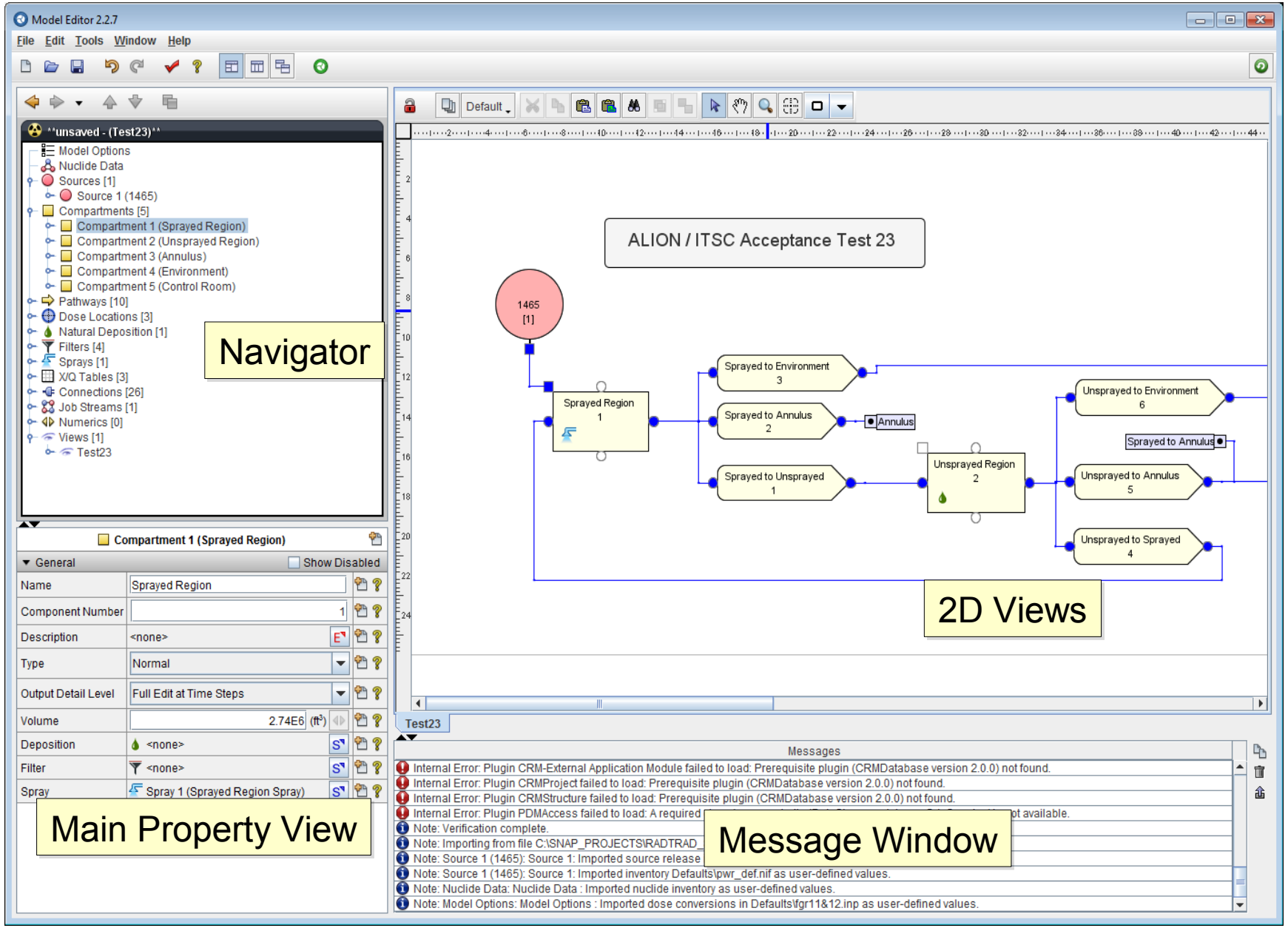
- Applications can be included as steps in a Job Stream.
  - Local and remote executable locations.
  - Command line arguments.
  - Application version (TRACE, MELCOR).
- Built-in support for:
  - ACAP
  - AptPlot
  - DAKOTA Uncertainty
- Supported applications (partial list):
  - COBRA-IE
  - CONTAIN
  - MELCOR
  - PARCS
  - RELAP5 / RELAP5-3D
  - TRACE
  - RADTRAD
  - FRAPCON/FRAPTRAN
  - SCALE



Model Editor

- Primary User Interface
  - Navigator, 2D/3D Views, Property View, Message Window, ASCII Views
- Model Editing and Animation
- Platform Independent Binary save format.
- Allows Editing Multiple Models Simultaneously
- Data Driven Hierarchy
  - Component Data model
  - Displayed in multiple Places
- Built in Engineering Unit Support

Model Editor User Interface



Component Navigator

Toolbar

Open Models

Current Model

Categories

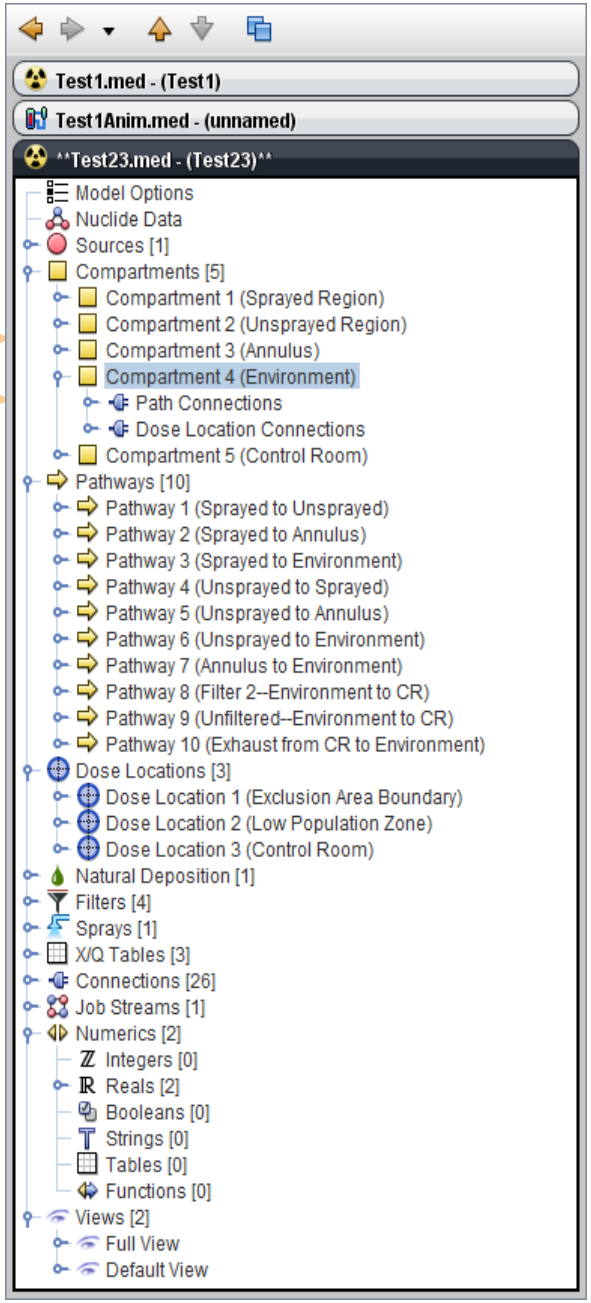
Components

Connections

Job Streams

User Defined Numerics

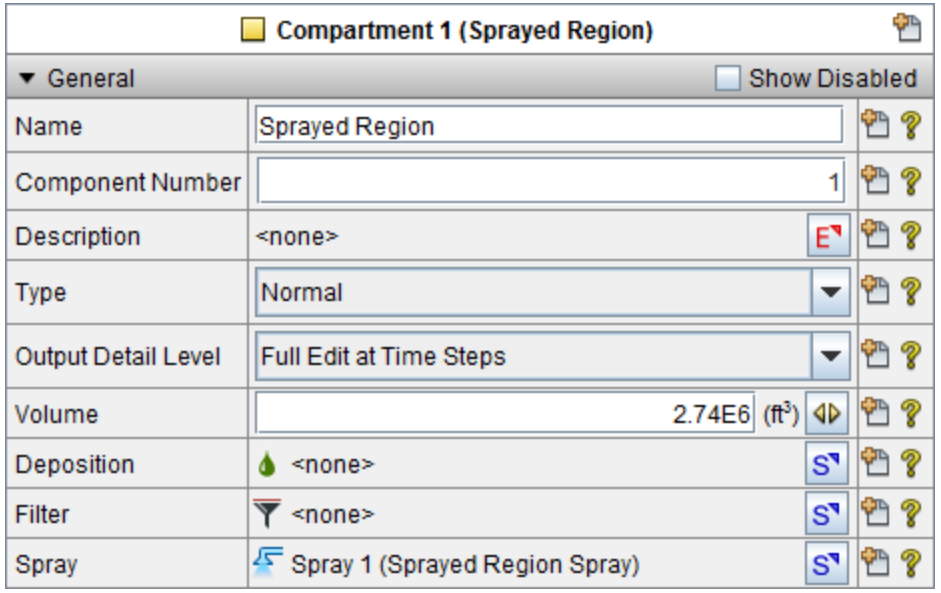
2D Views

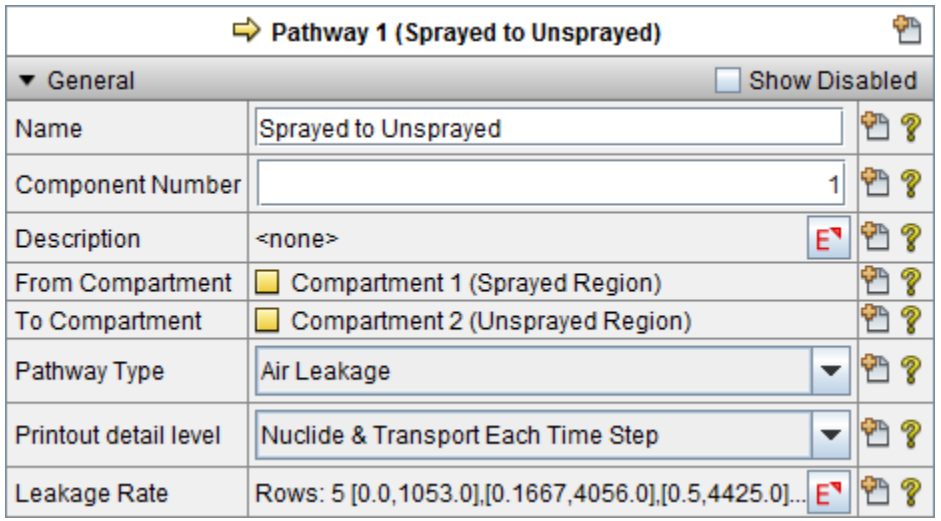


- Multiple Open Models
  - Accordion Layout
- Organizes all Model Components
- Categories and Root Components
- Interconnections
- Copy/Paste
- Add/Remove
- Drag onto 2D View

Property Views

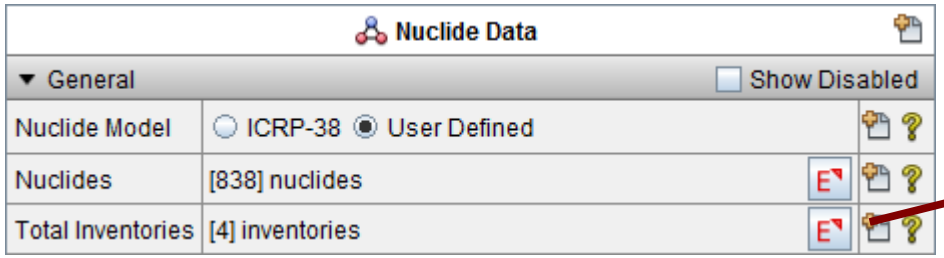
- Main Property View
  - Data Follows Selection in 2D Views or the Navigator
  - Multi-Select Editing
- Component Property View
  - Separate Window
  - Single Component Only
- Custom Editors
- Attribute Documentation
- Pop-up Help

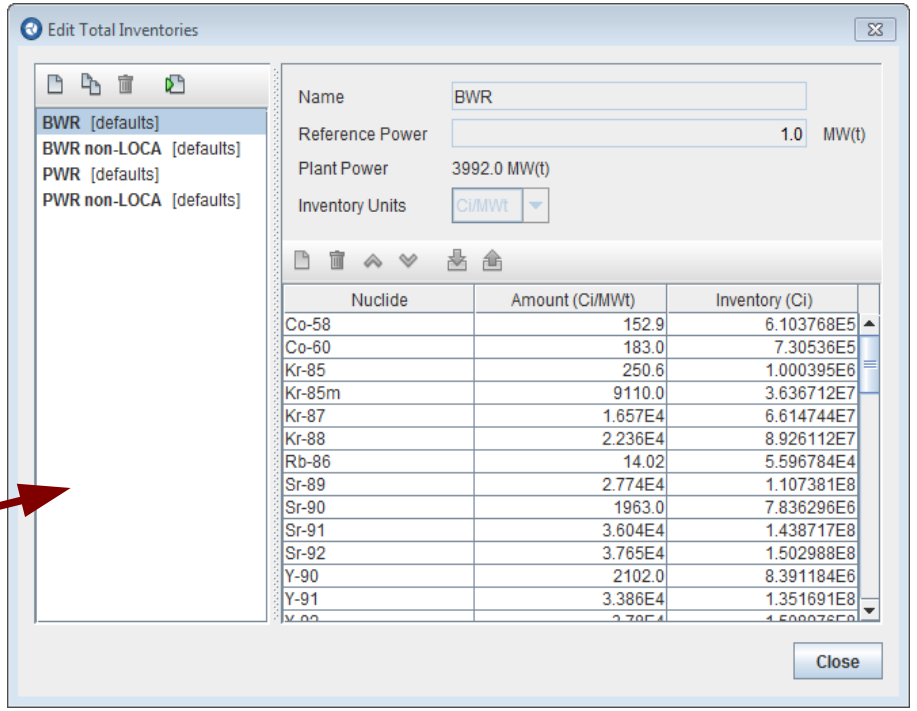




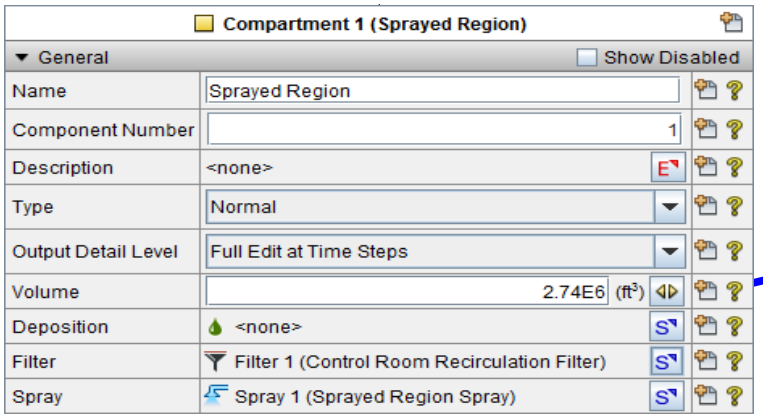
Property Editors and Selectors

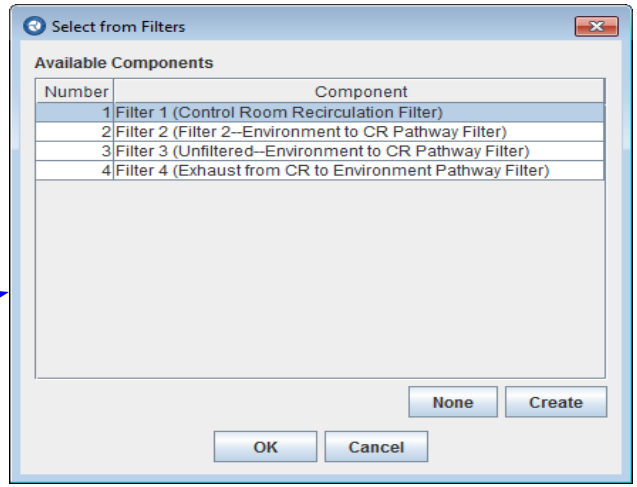
- Property Editors – **E**
  - Detailed custom dialogs
  - Display/edit sets of values





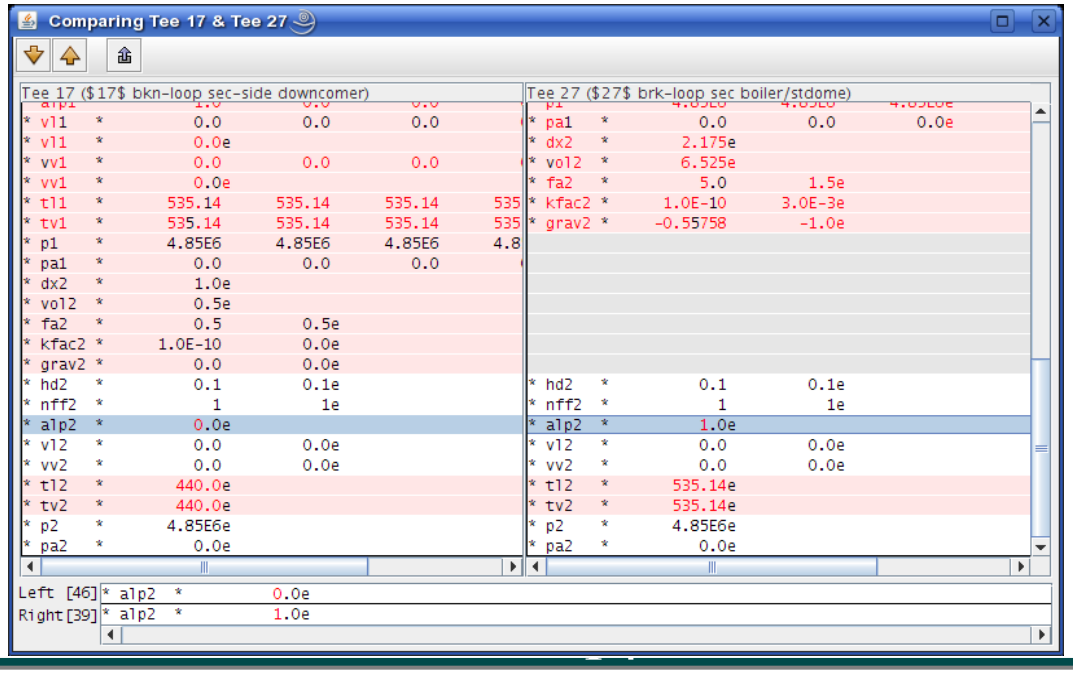
- Component Selectors – **S**
  - Select from the available components
  - Sort by category, number,





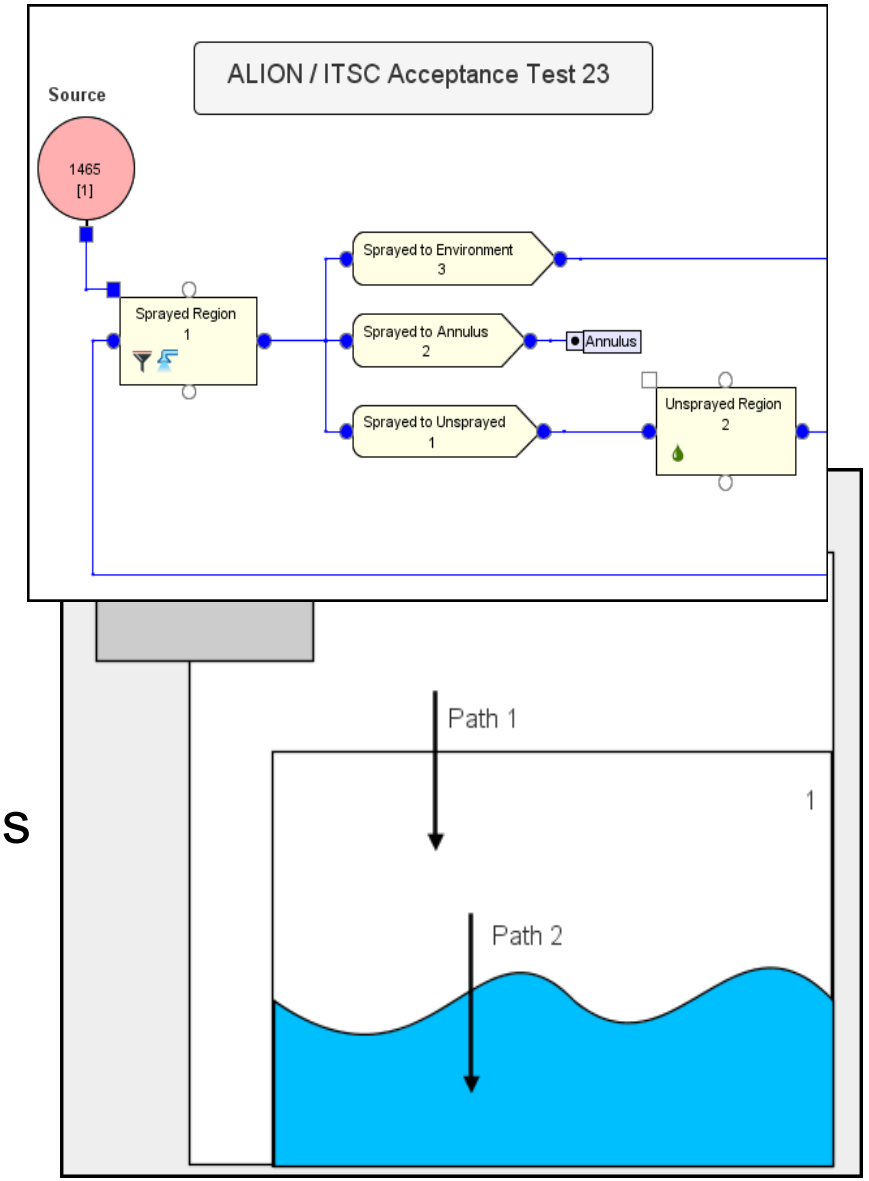
Component Differencing

- Compare the ASCII input of two component selections
- Selection can include anything from a Single Component to Entire Models
- Left Side Implements Component Listener Interface
  - Monitor Changes to a component
- Results can be Exported to a File.



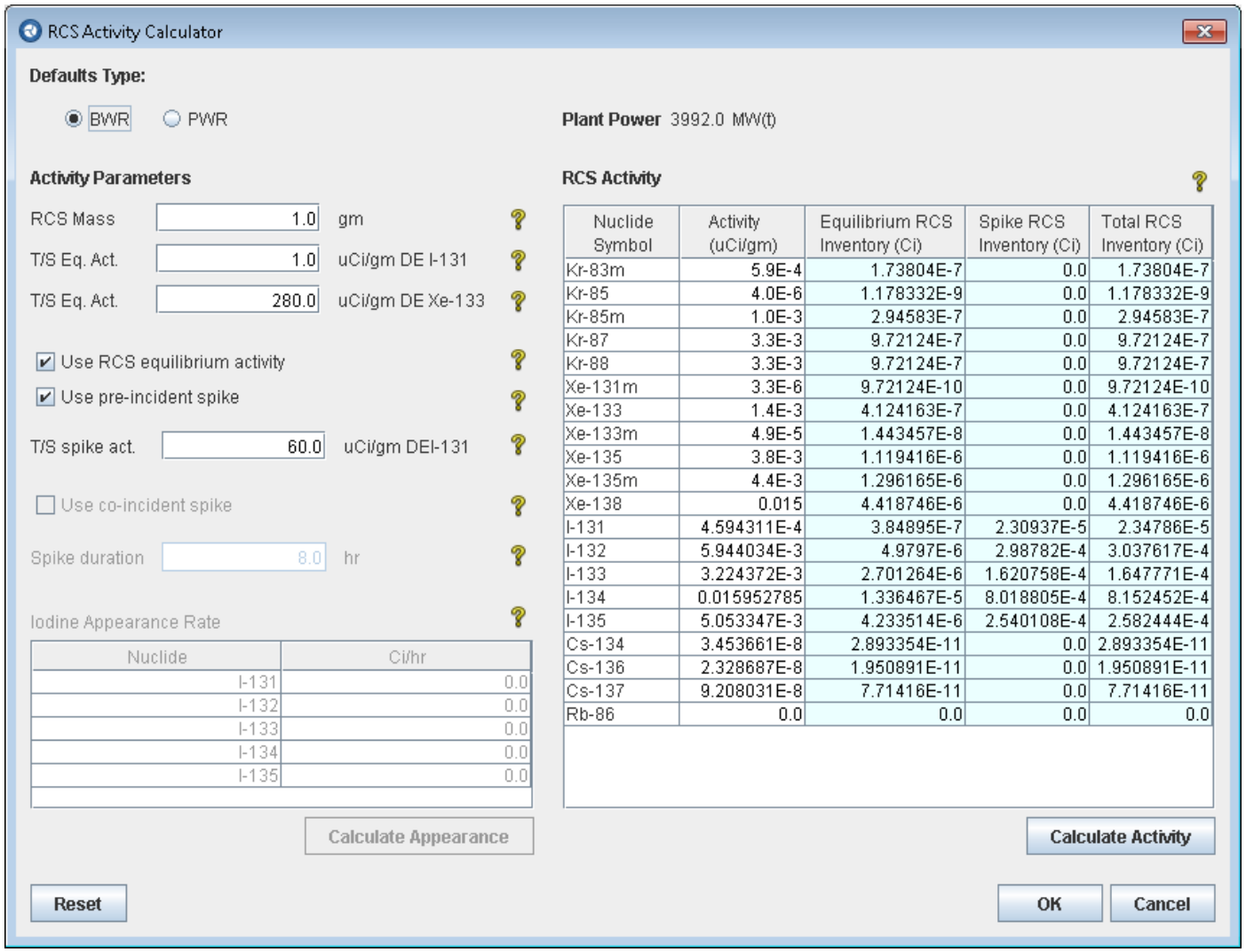
2D Views

- 2D Representation of Components and Interconnections
- Each Component may appear once in each view.
- Add & Remove Components
  - Delete – Remove from model
  - Cut – Remove from the view
- Annotations
  - Labels, Lines, Boxes, etc.
  - Can be associated with model components
- Group/Ungroup to treat a set of items as one.
- Use Layers to control selection and prevent modification.
- Use Embedded Views to hyperlink between views.

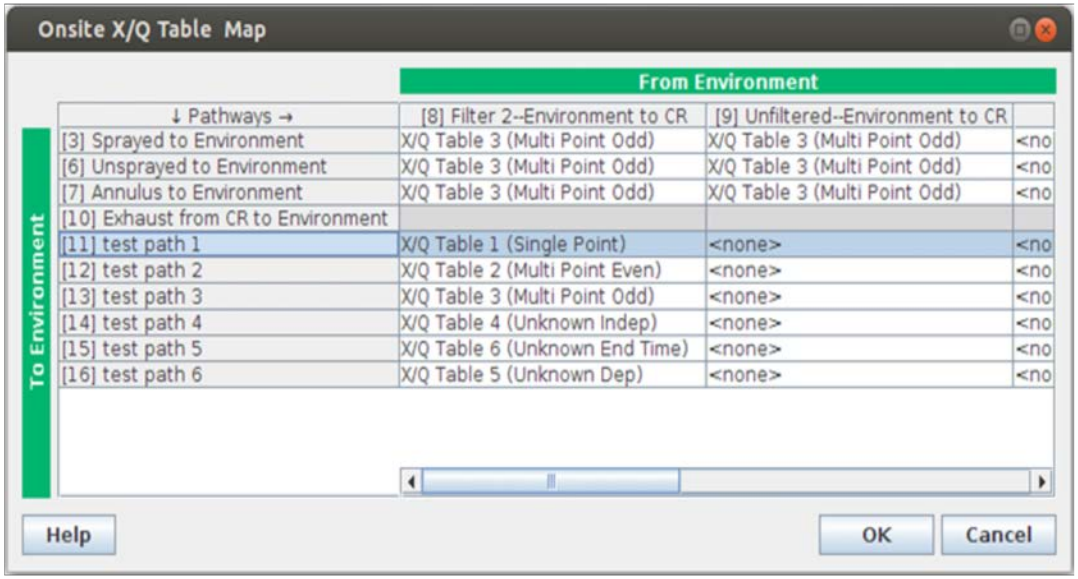


RADTRAD Editors

- RCS Activity Editor
  - Calculates RCS Activity for BWR and PWR scenarios
  - Displays Equilibrium, Spike and Total RCS Inventories

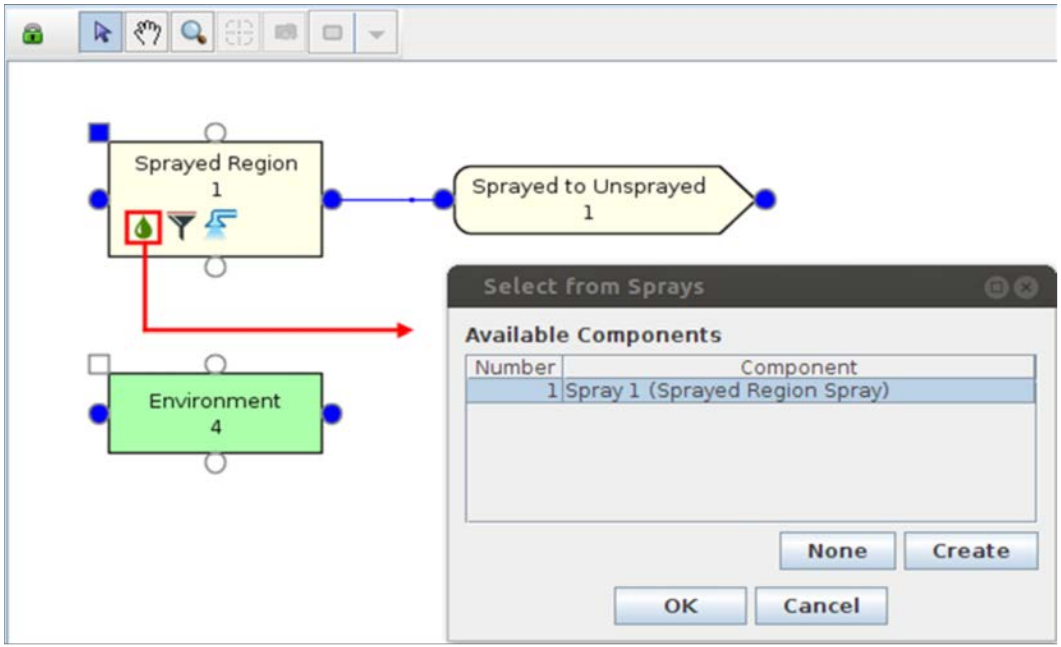


RADTRAD Editors

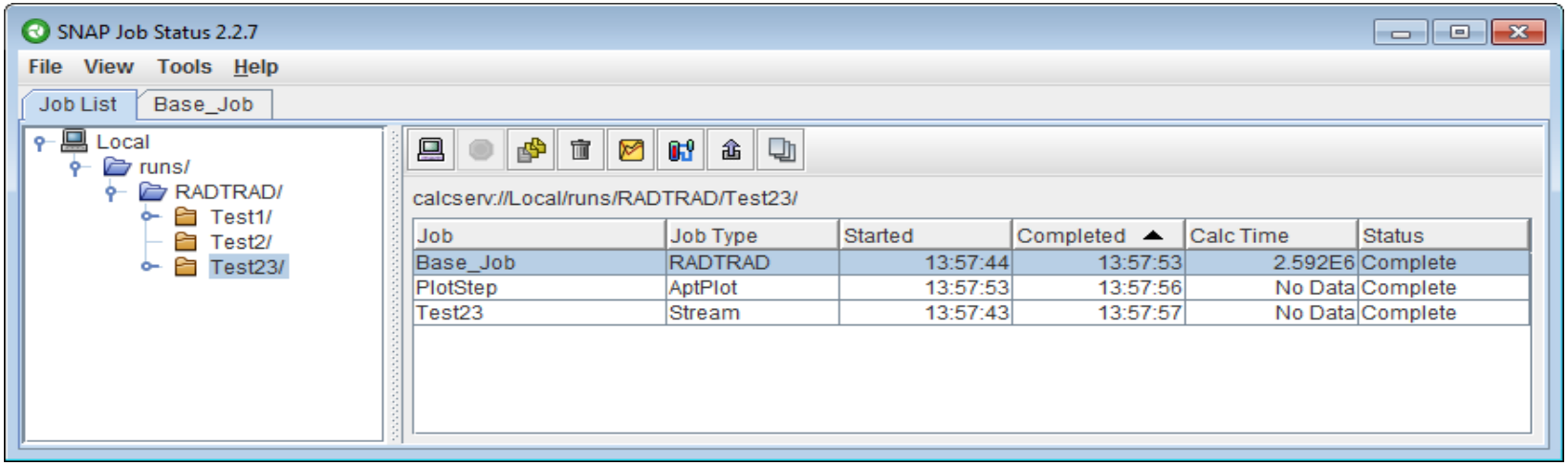


- Onsite X/Q table map
  - Display and Edit X/Q for Pathways To/From the Environment

- Quick Edit Feature on Drawn Compartments & Pathways
  - Create and select filters, depositions and sprays.



Job Status



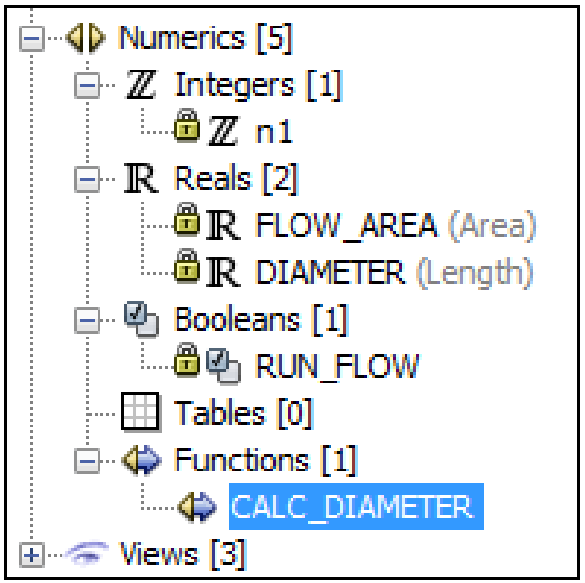
- Display the Status of Submitted Jobs
- Connect to Local or Remote Machines
  - Calculation Server or HPC Clusters
- View ASCII Input and Output Files
- Delete, Plot, and Terminate jobs
- Import Completed Jobs

Calculation Server

- Manages job stream execution.
- Required to Animate results. Interactively or in Replay mode.
- Provides access to files output by a calculation.
- Local server starts & stops automatically as needed.
- Configuration Tool is used to Start/Stop remote servers.

User Defined Numerics

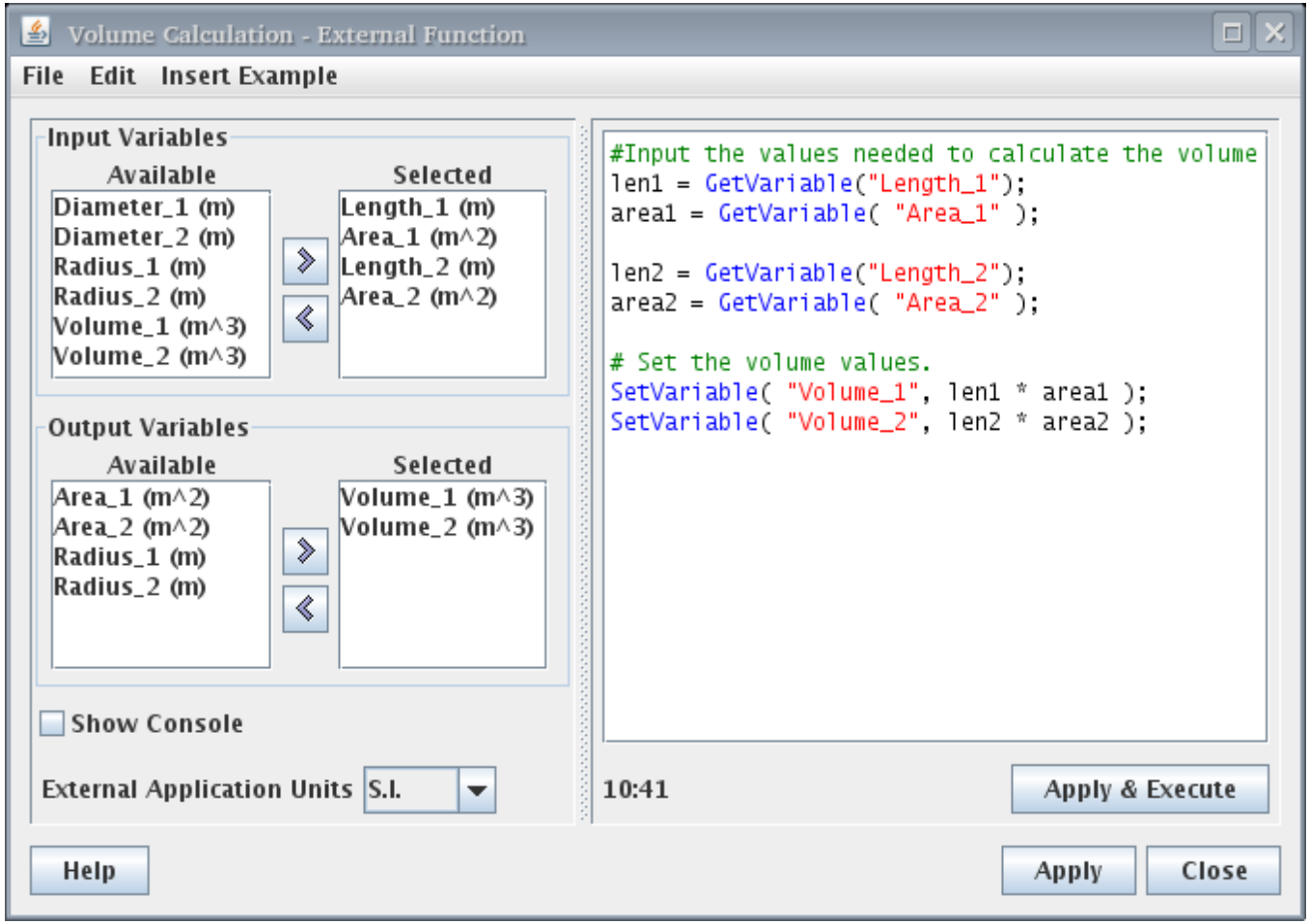
- Variables may be used in place of entering an explicit value for component data.
- Supported Types: Integer, Boolean, Real & Table.
- Python, MATLAB or MathCAD functions can be used to calculate variable values.
- Variables are either Interactive or Calculated.
  - Interactive variable values are entered directly.
  - Calculated variables are assigned values by functions.
- Real variables have engineering units
- (Area, Length, etc.).
- Automatically converts to selected units (SI or British)
- Variables can only be used by a property that has the same units.



User-Defined Functions

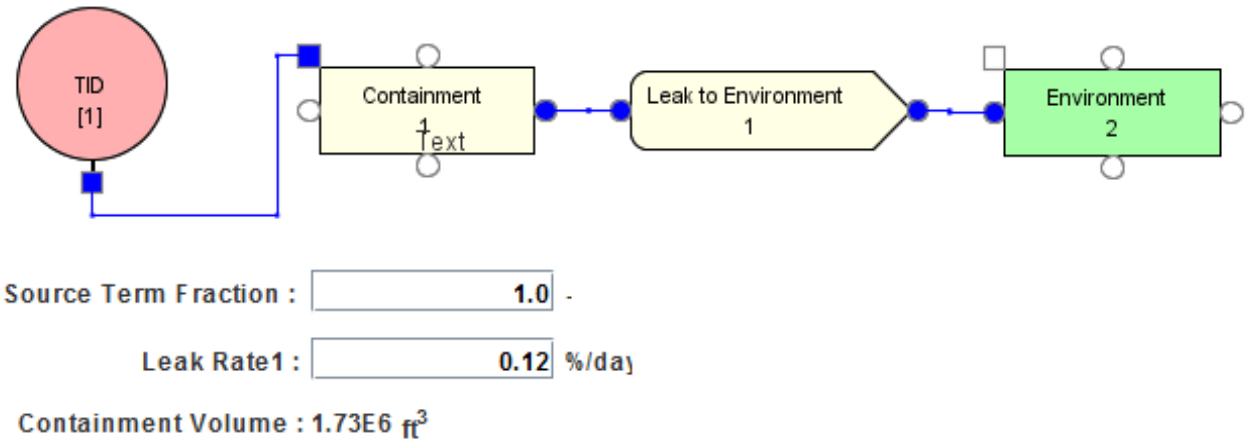
- Matlab, Mathcad, Python
- Operate on SNAP Variables
  - Input: Interactive and Calculated Variables
  - Output: Calculated Variables
- Customizable execution order
- Enabling Booleans can be used to control execution
- Python- function source embedded in the model.
- Matlab/Mathcad- references external .m/.xmcd files

Sample Python Function



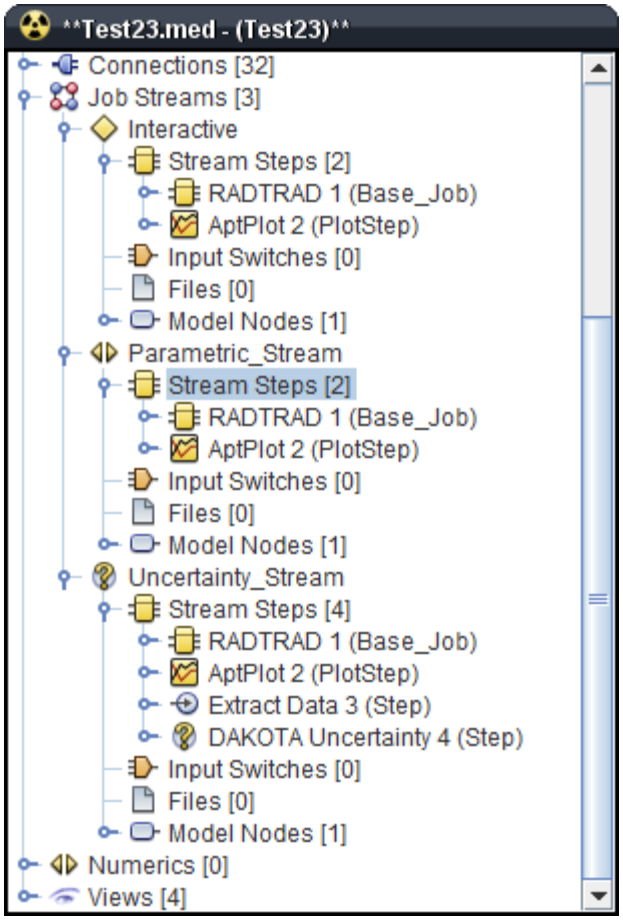
Variables in Views

- Booleans, Integers, Reals
- Drag and drop into a 2D View
- Interactive variables can be set to editable
- Changing a value executes the Functions
- Values updated after function execution
- Can be used to create custom input forms



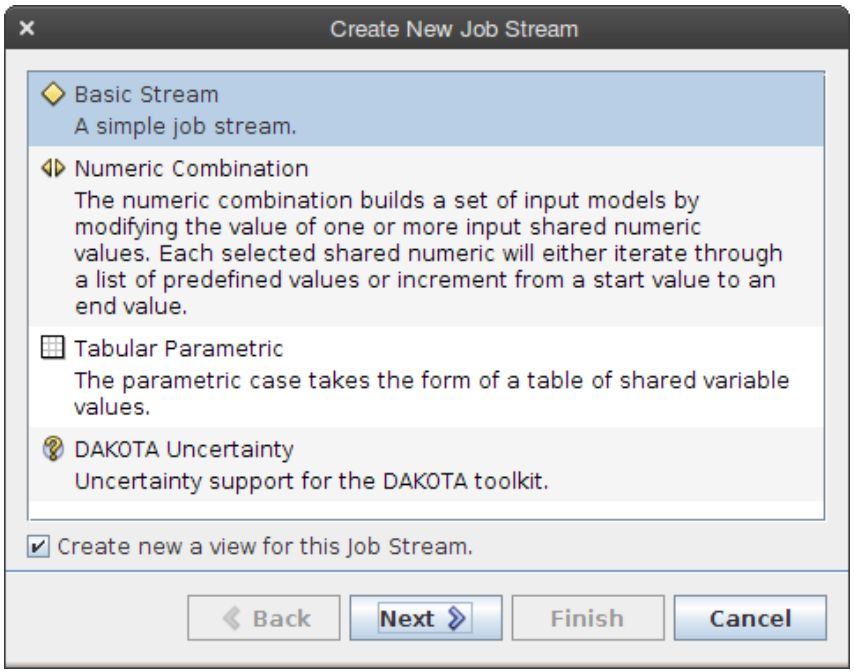
Job Streams

- Job Streams define how a series of interrelated applications should be executed.
- Graphically construct sequences of Job steps.
- A Model can contain any number of Job Streams.
- Parametric Support through Numerics and File connections.
- Parametric Fan-Out and Fan-In.



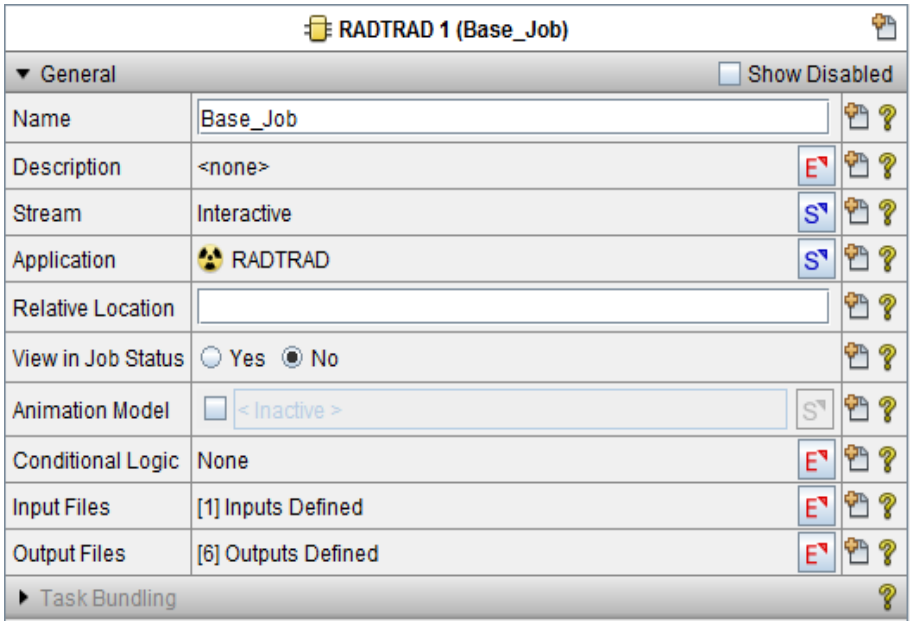
Job Stream Types

- Basic Job Stream
  - Non-Parametric cases
- Numeric Combination
  - Generate a set of parametric cases by specifying one or more interactive variables.
  - A set of values is specified for each variable.
  - Each combination of values corresponds to a parametric case.
- Tabular Parametric
  - Create a table of variables
  - Each row corresponds to a parametric case.
- Dakota Uncertainty



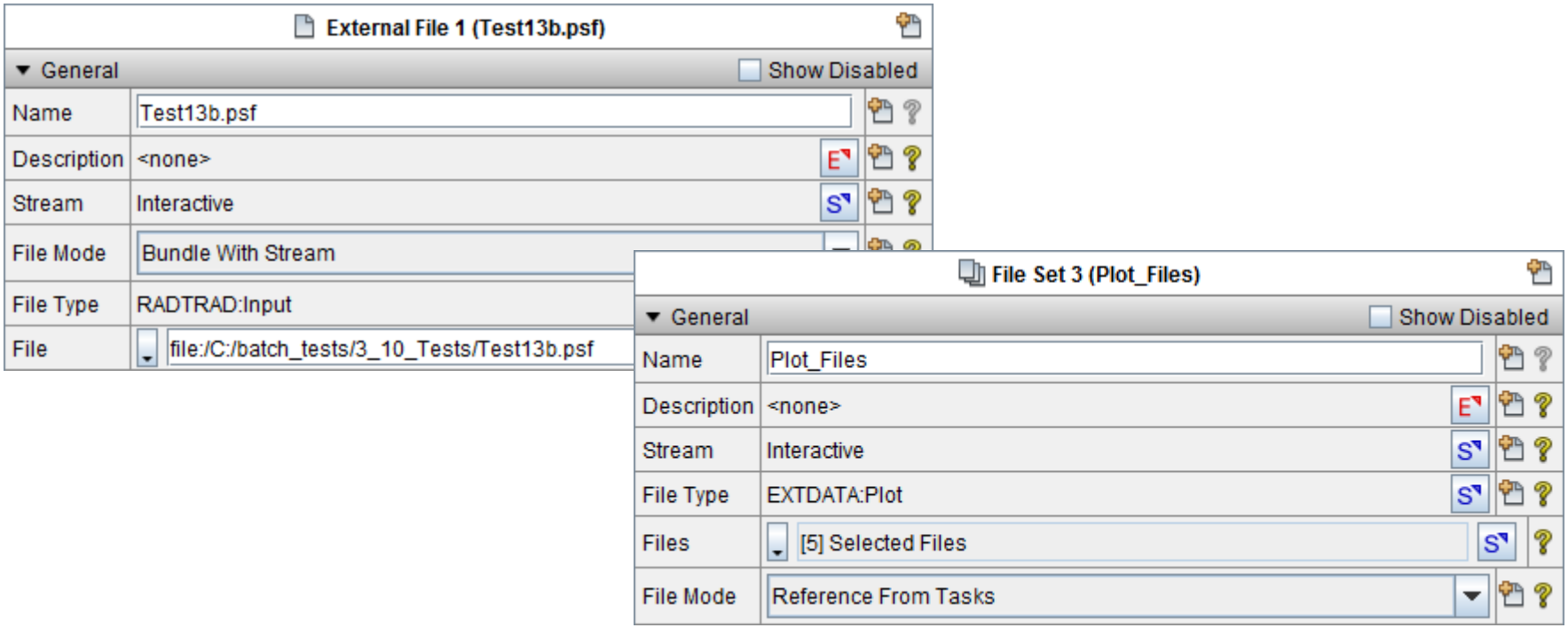
Job Streams – Job Steps

- Job Steps can include:
  - Input Pre-processing (IC retrieval, Renodalize, etc.)
  - Analysis Code Execution (RADTRAD, PARCS, etc...)
  - Post-Processing (Plot generation, Data Extraction, etc...)
  - Notifications (E-mail)
- Application Outputs can be archived after execution.
- Conditional Logic can be used to determine if a step should be included in the stream submission.



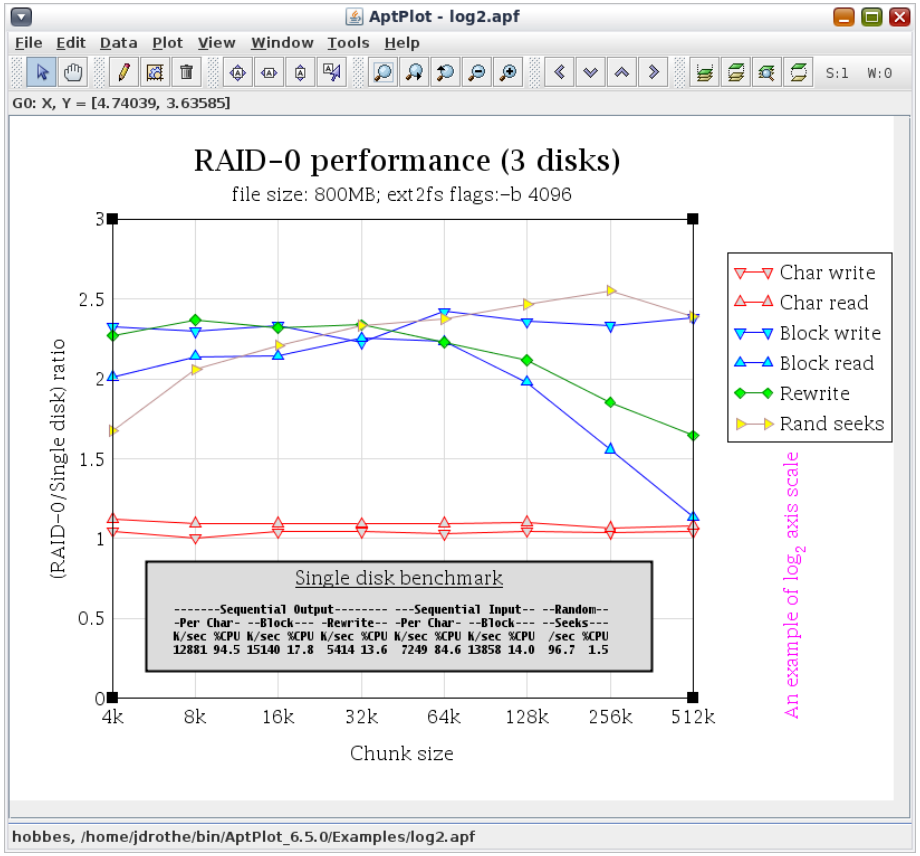
Job Streams – External Files

- Represent one or more files that will be included in the Stream.
- Each file has an explicit file type that determines where it can be used in a Job Stream. e.g. EXTDATA:Plot, RADTRAD:Input
- Files can be bundled with the stream, retrieved as they are needed during execution, or directly referenced.



AptPlot

- Pure- Java WYSIWYG Plotting Application
- Creates Publishing-Quality plots
- Supports Several output formats:
  - PDF, JPG, PNG, EMF, TIFF, PostScript
- Analysis Code Support Plug-in (ACS)



AptPlot: Scripting

- Batch commands can control all aspects of a plot: formatting and data
- Simple command syntax
  - case insensitive “declaration” style commands
  - examples:
    - TITLE “title” - set the current graph's title
    - COPY G0.S1 TO G0.S2 – copy the data in set1 to set2
- Print plots directly to several supported formats
  - HARDCOPY DEVICE “PDF” -set the output image type to PDF
  - PRINT TO “filepath” - print the PDF to the given location
- Equation Interpreter provides advanced mathematical and statistical data analysis.
  - Automatic vector interpolation across all operations
- Supports headless mode for batch execution on a server.

Analysis Code Support (ACS) plug-in

- Allows reading analysis-code plot-file data directly
  - Select code type, file type, and file.
  - Supports demultiplexed (demux) plot files
  - Demux files are optimized for plotting
- Ties directly into scripting
  - Open command makes the plot-file available
    - TRAC DEMUX “filepath”
  - Read command to mark which channels to read and retrieve them
    - TREAD “pn-12A01”
    - TREAD DONE
  - Ties directly into Equation Interpreter:
    - CALC “G0.S0 = t0_pn-12A01”
- Currently supports the following plot files:
  - TRAC/TRACE: XTV, TRAC-B: TRCGRF, RELAP5: RSTPLT, PIB, & Strip, MELCOR, PARCS, COBRA, CONTAIN, GOTHIC, EXTDATA, NRC Databank
- RADTRAD uses a EXTDATA data file for its' plot data.