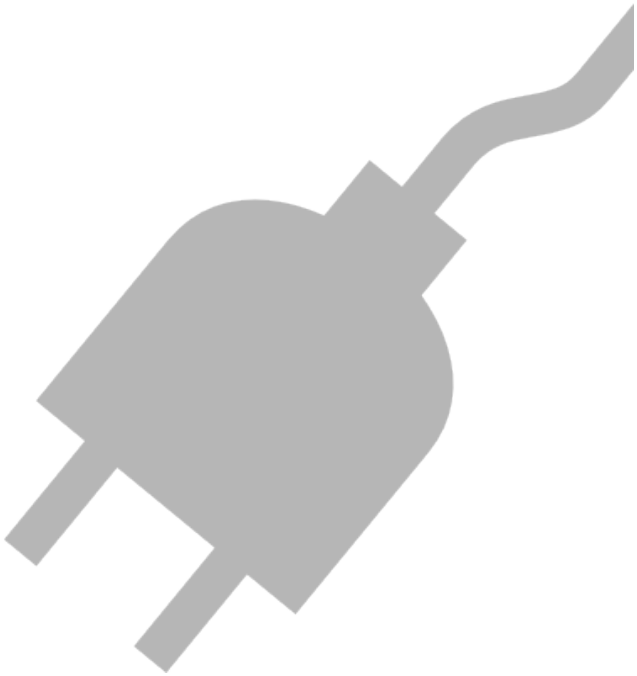
AVF Plug-in User's Manual

Symbolic Nuclear Analysis Package (SNAP)



Version 3.6.1 - August 02, 2021

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AVF Plug-in Users Manual

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Chapter 1. Introduction

The Automated Validation Framework (AVF) plug-in is a SNAP plug-in designed as a generic replacement for assessment and validation tools, such as the TRACE ATF and AV Script. This section discusses the legacy tools and how AVF provides similar or identical functionality.

1.1. Legacy Tools

AV Script

The Automated Validation Script (AV Script) is a Perl application that automates running codes, generating plots, and computing figures-of-merit (FOM). It supports the RELAP5, TRACE, and TRAC-B analysis codes and can also load data directly from ASCII and NRC Databank files. AV Script is incorporated directly into the AVF plug-in. This functionality has been made generic and pluggable so that additional codes can be supported without any modifications to the AVF.

AcGrace and AptPlot

AcGrace and AptPlot are WYSIWYG, scriptable plotting applications with support for analysis-code binary plot-files. The former is a legacy application written primarily for UNIX and UNIX-like systems. Due to the difficulty of building and running the application on Windows, AcGrace has been deprecated in favor of AptPlot, a functional clone rewritten in Java. AptPlot can be run on any platform that supports a Java 6 compatible Runtime Environment.

The legacy AV Script could use either AcGrace or AptPlot to create plots and extract data. Based on user inputs, AV Script generates AcGrace/AptPlot batch files that load, plot, and export data. The AV Script component of the AVF utilizes AptPlot to perform these tasks in much the same way as the legacy system. Unlike the original AV Script, AcGrace cannot be used by the AVF, as the plug-in applies batch commands only supported by AptPlot.

Note AptPlot is not distributed with the AVF plug-in. Installation resources and instructions can be found at www.aptplot.com.

ACAP

The Automated Code Assessment Program (ACAP) is described as "a tool to provide quantitative comparisons between nuclear reactor systems (NRS) code results and experimental measurements." AV Script runs use ACAP to generate figures of merit. AV Script inputs define an ACAP *config* file (essentially a script without data) and the data to compare. AV Script extracts the data from the source, fills out the config file with these values, and runs ACAP with the complete script.

The console version of this utility has been ported to Java so as to run on any platform with a Java 5 compatible Runtime Environment. The Java port of ACAP is included with the AVF distribution.

TRACE ATF

The TRACE Automated Testing Framework (ATF) is a collection of Perl scripts, input files, and AV Script inputs used to analyze TRACE code versions. The framework divides testing into three tiers of varying purpose: measuring consistency between code versions (regression), code health (robustness), and code accuracy (assessment). Each of these tiers are broken into several *suites*: related input groups.

Regression testing involves running a large number of inputs as a baseline, running them again after some modification (such as an updated executable or a modified input base), and comparing the differences. The TRACE ATF achieves this by using GNU make to run the codes: make is chosen for its ability to run multiple inputs concurrently. Once all the results have been arranged, a Perl script parses the results, diffs files, and generates HTML reports that list the comparisons and catalog the diffs. This functionality is supported in the AVF through a set of components that define regression suites, submit options for regression and report jobs, and a generic report generator.

Robustness and Assessment compare results between code versions and data utilizing AV Script along with several utility Perl applications. There is no distinction between Robustness, Assessment, and standard AV Script runs in the AVF. This functionality can be implemented by creating distinct AV Script components and selecting only the scripts of interest at submit time.

1.2. SNAP and the AVF Plug-in

The Symbolic Nuclear Analysis Package (SNAP) consists of a suite of integrated applications designed to simplify the process of performing thermal-hydraulic analysis. SNAP provides a highly flexible framework for creating and editing input for engineering analysis codes as well as extensive functionality for submitting, monitoring and interacting with the analysis codes. The modular plug-in design of the software allows functionality to be tailored to the specific requirements of each analysis code.

The Automated Validation Framework (AVF) is a SNAP plug-in designed to replace the TRACE ATF and AV Script while providing a pluggable system for additional analysis codes. The AVF plug-in uses a client/server model that should be familiar to many SNAP users. Regression suites and AV Script definitions can be designed in the Model Editor and submitted to a Calculation Server. The resulting jobs and their results can then be observed with Job Status.

Chapter 2. Files Bundled with AVF

A number of files are installed with the AVF plug-in, including the following.

- The plug-in JAR file required to use the AVF in SNAP.
- A Java version of the ACAP command-line utility. A launcher is installed in the SNAP `bin` folder.
- An `avf` folder, containing the following folders:
  - `bin` - All executables and scripts employed by post-case and pre-figure commands should be located here if not in the user's PATH.
  - `plugins` - AVF pluggable components are installed here. Several plug-ins are included with the AVF distribution.
  - `reportDefs` - report definition XML files that determine how to generate reports for a specific code type. Each definition is named after the plug-in ID of the code it supports (TRACE.xml, RELAP.xml, etc.). Report definitions must use the `.xml` extension.
  - `templates` - HTML templates used to generate regression reports.

Note Modifying the resources in the `avf` directory is not officially supported. However, it is possible to adjust the layout and contents of reports by modifying definitions and templates. If you intend to do this, *always back-up the `avf` directory before making modifications*, as errors in the XML and template files can break AVF functionality. Note that updating the AVF plug-in overwrites the contents of the `avf` folder, which will eliminate modifications.

Chapter 3. Model Options

The first Navigator element for any given AVF model is *Model Options*, which defines properties and values that reach across the entire model. The following properties are currently supported:

- *Name*. The model name, which appears in the Navigator next to the MED file name.
- *Input Keywords*. Described in the next section.

3.1. Input Keywords

Each AVF model may define a global set of input keywords, which assign a value of `true` or `false` to an arbitrary keyword. The input keywords defined in the Model Options define both the available keywords and their default values. Each keyword value may be overridden by individual input models (see Section 4.1.1, “Input Models”) to control input filtering (see Section 4.2, “Submitting Regression Jobs” and Section 5.4, “Submitting Report Jobs”), case filtering (see Section 6.3, “Submitting AVScript Jobs”), or control flow in a template job (see Section 7.1.2, “Templates”).

The **Edit** button in the *Input Keywords* editor opens the *Edit Input Keywords* dialog (Figure 3.1, “Edit Input Keywords”).

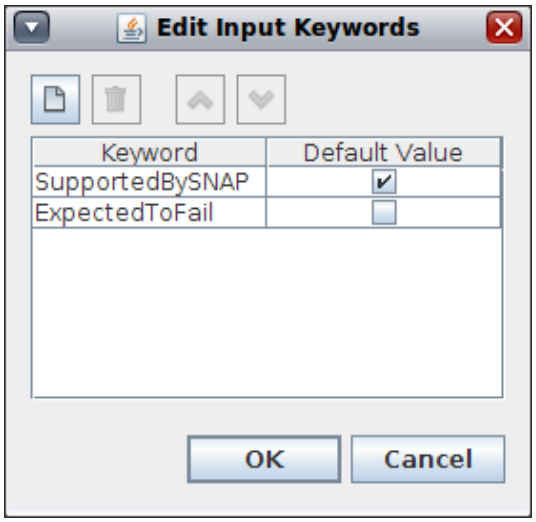

Figure 3.1. Edit Input Keywords

The controls at the top of the window are used to add, remove, and reorder keywords. Upon adding a keyword, the dialog prompts for its name, which may not be changed once the keyword is created. The table in the center of the editor lists each keyword and its default value, which can be edited as needed.

Pressing the **OK** button closes the dialog and sets the model's global keywords.

Chapter 4. Regression Support

Regression testing support is mainly focused around running a large number of inputs from a single submit. Inputs are defined and organized in the model, their location is defined at submit time, and the regression submit generates a job stream with steps for each input model. By running multiple regression jobs over large input sets, variations can be detailed in a generated report.

4.1. Regression Components

Regression components include input models, suites of input models, and sets of suites. All components related to running regression jobs are located in the *Regression* category in the Navigator.

4.1.1. Input Models

Input Model components denote code inputs for regression jobs. An input model component is a file *stub*: the component represents a file without knowing that file's absolute location on the machine. These stubs allow suites to refer to models without specifying exactly where they are. During regression job submission, when the parent location of the input models is known, each stub is used to complete the file's absolute path.

Input Model components have the following noteworthy attributes:

- *File Name*. The name of the file. Names must be unique for all models that share a *Location* and *Type*. Models sharing a location should never have the same name unless the input must be processed by multiple executables.
- *Location*. Each Input Model may specify a folder-path relative to the parent folder chosen at submit time. During the regression job process, this folder path is preserved by creating the appropriate directories in the target folder.
- *Type*. The type of input, discussed below.
- *Restart File*. An optional restart reference to another input model. All restart models are displayed in the Navigator with a modified label: if input model *A* restarts *B*, it will be listed as "*A* > *B*".
- *Related Files*. Described in Related Files.
- *Keyword Overrides*. Described in Input Keyword Overrides.
- **Parallel Cases**. Input models specified to run in parallel with this model. This will be used on job submission to indicate this model as the central process and the other referenced models as the parallel jobs. These cases will be run in parallel using the ECI Library.

The *Type* of an input model determines the executables used to run it. This value is typically a SNAP plug-in ID. In some cases, this value may define which type of input

a model represents instead of the plug-in, as is the case with MELCOR models. When the MELCOR plug-in is installed, an input model may be set as either a MELGEN or MELCOR model. The type then determines which MELCOR plug-in executable is used to run the input. For example, if `a.inp` is used as both a MELGEN input and then a MELCOR input, two input models named `a.inp` would be created. One is set as a *MELGEN* input and the other as a *MELCOR* input that restarts the *MELGEN* model.

4.1.1.1. Adding Inputs by Selecting Files

Input manuals can be created quickly through the selection of files on the local machine. The right-click pop-up menu for the *Input Models* category provides the **Select Files...** item, which opens a file browser. Any files selected in this browser will be added as new input models. Within the file browser, the specified *Type* and *Location* values will be applied to all imported inputs.

4.1.1.2. Related Files

Each input model may specify an arbitrary number of *Related Files*: files that the input model depends on to function correctly. Related files have the following properties.

- *File Name*. The complete name of the file.
- *Location*. Similar to the Location of an input model, defines the relative path of the file. Unlike input models, the relative nature of *Location* may vary based on the next parameter.
- *Relative To*. Defines whether the file's location is relative to the input folder specified at submit time or the parent input model's location.
- *Type*. Defines the purpose of the related file. Different AVF plug-ins support various types of files. For example, TRACE AVF support allows the specification of TRACE-PARCS coupled runs. For such a case, the *Type* of the coupled PARCS input file must be set to *PARCS Input*, while other related PARCS files must be set to *PARCS Auxiliary File*. This is used by the AVF plug-ins to determine how to build the job stream elements used to process the input.
- *File Type*. Indicates whether the file is a text or binary file.
- *Required*. A **True** indicates that the file must be copied to the target folder for the model to execute: if a submitted regression job cannot locate the related file, it does not run the parent model. A **False** indicates that a missing file should not prevent the parent model from running.

Input models containing related files may be expanded in the Navigator to display their contents. Like any other Navigator node, related files may be created, removed, and copied or pasted between input models. The right-click pop-up menu of an input model allows creating related files from files on the disk: selecting **New Related File From File** opens a file browser that may be used to select one or more files to add to the input model.

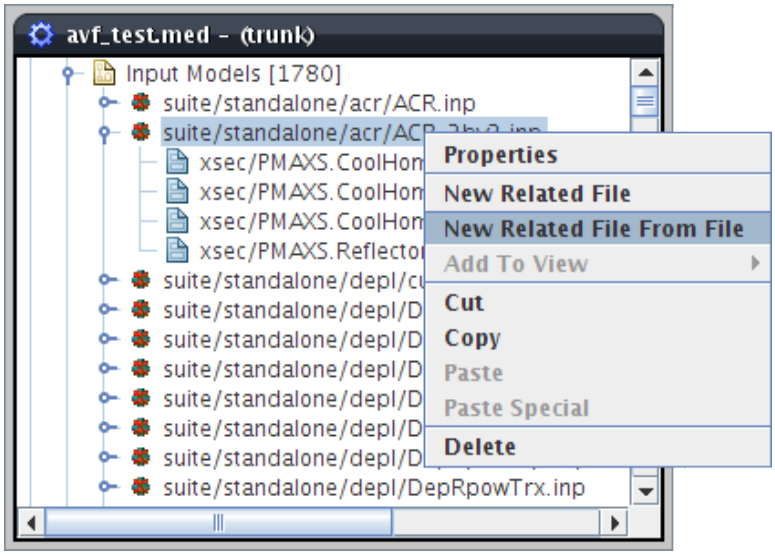

Figure 4.1. Creating a Related File from a File

4.1.1.3. Input Keyword Overrides

Each input model may override the values of the global input keywords (see Input Keywords). There are two methods of defining overrides: the model-wide and input-specific editors, both of which are described below.

Model-wide Keyword Assignment

Selecting the *Input Models* category in the Navigator displays the *Keyword Assignments* attribute in the Property View. The **Edit** button in the property editor displays the *Assign Input Keywords* dialog shown below. This dialog is used to assign keyword overrides for every input in the AVF model (see Input Keywords for more information on defining keywords).

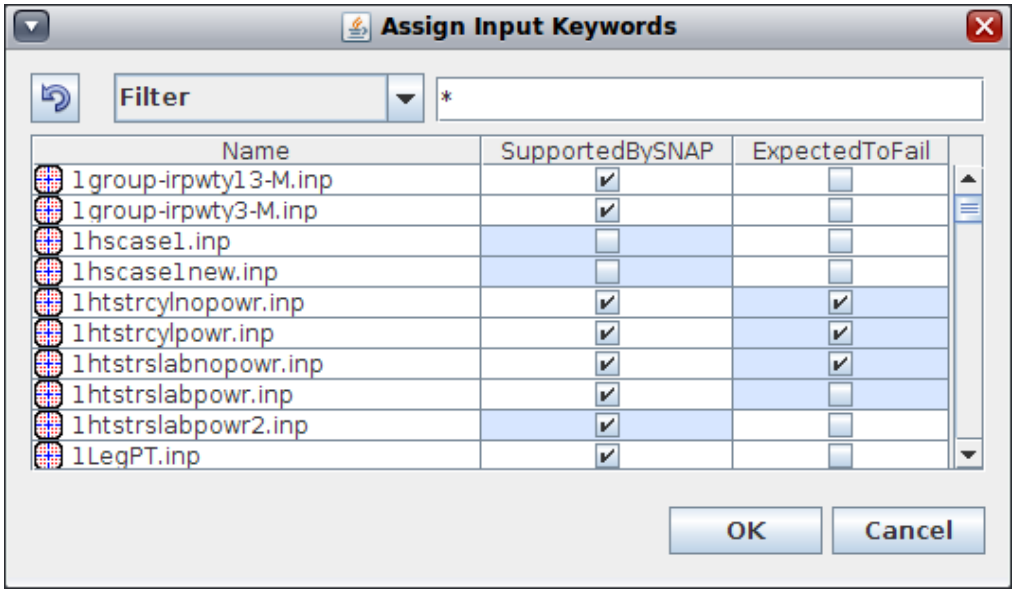

Figure 4.2. Keyword Assignment Dialog

The central table displays a row for each input model and a column for every available keyword. Highlighted values indicate that the input overrides the value of the particular keyword: cells without highlighting correspond to inputs that use the default keyword value. Setting a value to either `true` or `false` overrides the default. Overrides can be removed from the selected inputs by pressing the **Revert** button in the upper-left corner of the window.

AVF models often contain a large number of input models. The listed inputs can be filtered with the text field in the upper right corner of the dialog. When the drop down to the left is set to *Filter*, the filter text is treated as a basic file glob. Such a filter treats an asterisk (`*`) as a wildcard: it matches any sequence of characters, including none. Only inputs whose names match the filter will be displayed. When the drop down is set to *Regular Expression*, a standard Java regular expression is used to filter the inputs. If the regular expression is invalid it will be highlighted in red, and all inputs will be displayed.

Note More information on Java regular expressions can be found at http://java.sun.com/javase/6/docs/api/java/util/regex/Pattern.html.

Specific Input Model Assignment

The *Keyword Overrides* property editor displays the *Keyword Override Dialog*, as shown below. Once the values are set to the necessary values, pressing **OK** will set the overrides for the input.

Note Unlike the model-wide dialog, accepting changes made in this dialog will set overrides for all currently available keywords.

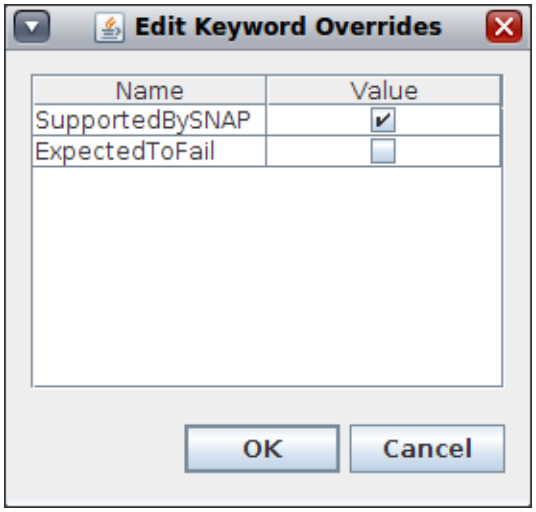

Figure 4.3. Keyword Override Dialog

4.1.2. Data Comparison

Data Comparison components are tests that will extract data from plot files generated from a regression run. These will generate a report on the success or failure of the tests when a report job is submitted.

The component contains fields for specifying the type of tolerance and the limit of the allowed variance. If any tests exceed the limit test will fail.

- **Name.** The name of the test. This is used to generate the HTML report describing the test.
- **Comparison Type**. Determines whether to use one or two channels when making data comparisons. Changing this value affects the logic used when generating a report.
    - *In Single* comparison mode the report will extract files from the same model in two separate regression runs and compare the values at the specified times. The values extracted in single plot mode are then compared between the base and mod runs of a regression suite. They are then determined to have passed or failed if their difference is within the specified tolerance.
    - *In Dual* comparison mode the report will extract values from two model in the same regression run and compare the data at the specified time steps for each model. This requires specifying two sets of inputs. The data values are compared within the same regression run similar to single plot mode. The report in this case will compare the results of the two single plot tests between the base and the mod run.
- **Tolerance Type.** The type of tolerance allowed when comparing values between data channels.

- *Fractional* calculates the difference using abs((b-a)/a) <= lim
- *Absolute* calculates the difference using abs(b-a) <= lim

- **Tolerance Type.** The type of tolerance allowed when comparing values between data channels.
- **Tolerance Limit**. The limit on the difference between the values extracted from the data channels.
- **Input Model**. The input model used to generate the plot file. When in dual mode there are two fields for this property and both must be set in order for the plot test to run. Upon submission of a report job if both input models are defined in a test suite, the plot test will automatically be added to that test suite's definition.
- **Channel Name**. The name of the data channel to be used when extracting values.
- **Times**. A list of times that will be used to extract data from a plot file. Any value <0 will equate to the last time step in a given plot.

4.1.3. Suites and Suite Sets

Suite components are named lists of input models. When submitting a regression stream, suites are selected to determine which inputs to run and their internal organization in the generated job stream.

Suites may define *Tokens* that affect template jobs. Each token is a `name=value` pair of strings that may be substituted into a template. Tokens are explained in more detail in Section 7.1.1, “Input Models and Suites”.

Suites Sets are named lists of suits. Sets provide another layer of organization on top of suites. Suite sets may be chosen in place of suites when submitting regression streams: this has the same effect as selecting all suites represented by the requested sets. Sets have no effect on the organization of regression job files.

Creating Suites From Keywords

Suites can be created from input keyword filters. The *Suite* category right-click pop-up menu item *Create From Keywords* opens a *Create Suites From Keywords* dialog. The *Suite Name* field defines the name of the new suite, and the table defines the filters that dictate which models are added. Keywords are added to the filter via the *Enable* column. Those inputs whose keyword value matches the *Include Value* of all enabled filters will be added to the new suite.

See Input Keywords and Input Keyword Overrides for more information on keywords.

4.2. Submitting Regression Jobs

To submit one or more regression jobs, select *Submit Regression/Report Set* from the *Tools* menu. This opens the submit dialog shown in Figure 4.4, "Submit Regression/ Report Set - Suite Selection". This wizard-like dialog can be used to submit either one (Base) or two (Base and Mod) regression jobs can be submitted at the same time as a Report job that will compare the results of the two regression jobs. Either one (or both) of the regression jobs can also be a previously submitted regression job.

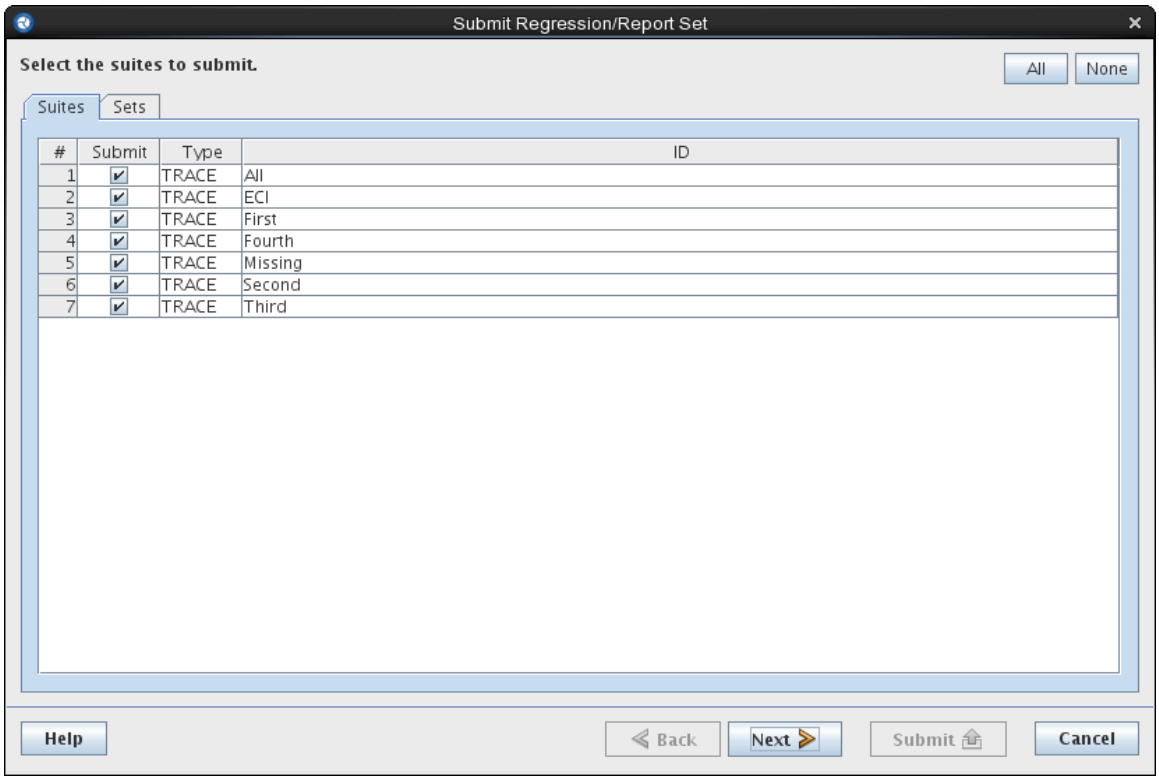

Figure 4.4. Submit Regression/Report Set - Suite Selection

The submission dialog separates the regression information into five steps: Suite Selection, Keyword Filtering, Regression Locations, Input Model Selection, and Report Configuration. Each of these steps is described below. The **Next** and **Back** buttons can be used to move between steps. Once each step is complete, the **Submit** button can be used to submit the regression and/or report jobs. After submission, Job Status will be opened and navigate to the location of the submitted stream.

Each new regression job is generated as an Engineering Template stream that is submitted to the selected platform. The generated job stream is named after the specified run *Name*, and has its root folder and relative location set based on the selected target folder. A single step is generated per input model in each selected suite, with the step's relative location set to the name of its parent suite followed by any location path specified by the input model.

Suite Selection

The suite selection step, shown in Figure 4.4, “Submit Regression/Report Set - Suite Selection”, is used to select which suites are submitted. This is broken into two tabs: *Suites* and *Sets*. The *Suites* tab allows selecting suites from the global list in the AVF model. The *Sets* tab allows selecting from suite sets, with one caveat: suite sets are not actually submitted. Instead, selecting a set selects all of its referenced suites, and vice versa. A suite set is only shown as selected if all of its referenced suites are. If even one suite in the set is inactive, the set will be shown as unselected. If two suite sets overlap, it is possible that changing selected status of one will modify the other.

Keyword Filtering

The table in this step can be used to control which input models are included in the regression job. Files are included based on their keyword value (see Input Keywords for more information on keywords).

The central table includes one row for each keyword. The *Enable* column controls whether the keyword will filter the inputs, and the *Include Value* column dicates what keyword value the input model must have to be included. These values are saved and restored between submits for convenience.

Regression Locations

The *Target Platform* option specifies which platform the regression stream will be run. The Target Platform drop-down includes the platforms specified in the SNAP configuration. Once a server is selected and a valid connection is established, *Target Folder* may be specified. The *Target Folder* specifies where the streams will execute and store their results. The *Select* button opens a dialog used to select a mounted folder on the server.

Note Only Calculation Servers may be selected for the *Target Platform*. The AVF plug-in does not support other platform types.

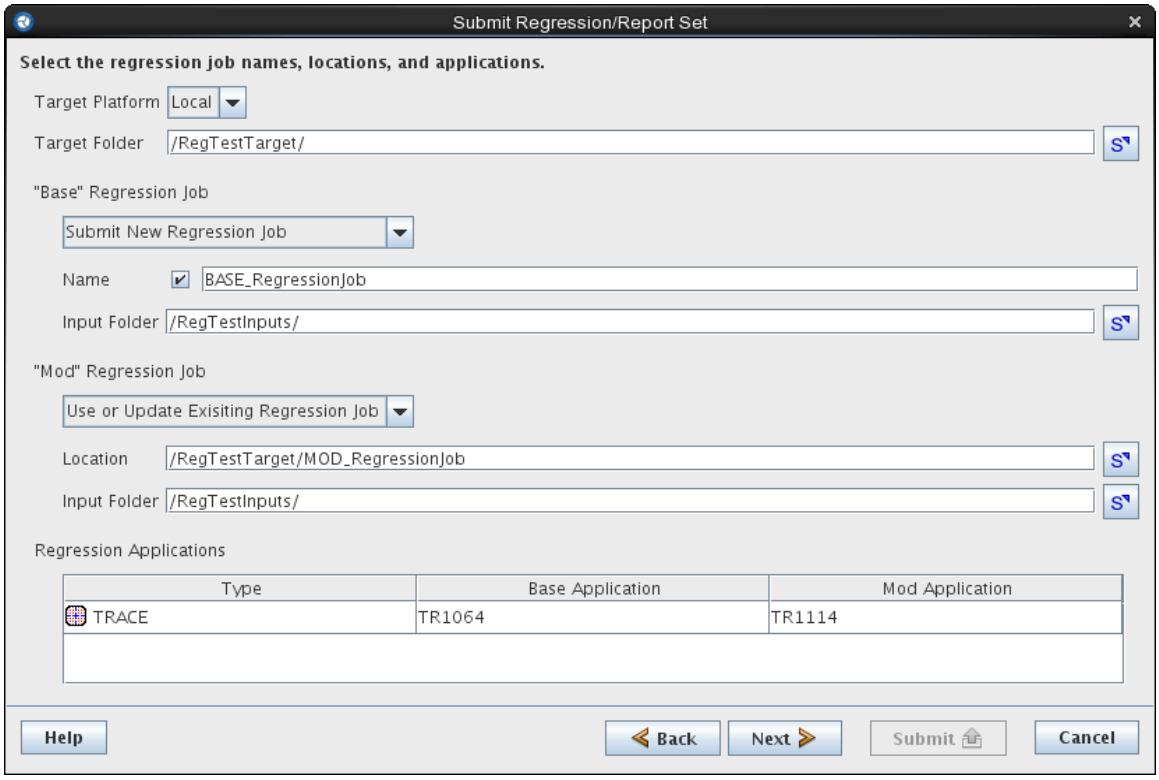

Figure . Submit Regression/Report Set - Regression Locations

The *Base Regression Job* and *Mod Regression Job* sections are used to configure each of the regression jobs and contain essentially the same options. The drop-down in each section includes **Submit New Regression Job**, **Use or Update Existing Regression Job**, and **None** (Mod only).

Selecting the first option (new job) will display the *Name* property. *Name* defines the name of the regression job: all stream tasks will execute in or under a folder with this name. If the name option is not active (un-checked) then the name will be generated based on the current date and time.

Selecting the second option (existing job) will display the *Location* property. *Location* defines the location and name of the existing regression job on the selected platform. The existing regression job location can be selected using its **Select** button much the same way as Target Folder. In this case, the previously selected regression information will be retrieved from the Calculation Server and included in the Input Model Selection step.

Any additional input models models submitted for an existing regression job will be added to the job directly when the regression job is submitted. The Calculation Server will "Restart" the regression job to execute the models selected. This allows additional models or suites to be included in an existing regression/report set without requiring that the entire regression suite be re-run.

The Base/Mod *Input Folder* is the location of the input files for that regression job. Like the Target folder, the Input folders can be entered directly or selected graphically by using the **Select** button.

The *Regression Applications* table is used to select the applications that will be used when running the regression inputs. For each input model type found in the selected suites, a row will be displayed in this table. The *Application* columns (Base and Mod) are used to assign an application defined for the selected platform to each input type.

Input Model Selection

The model selection table displays the list of suites and models in the current submission along with their status (New Run, Re-Run, Not Selected, etc.). This table will also indicate input files that have been modified since the regression was last run ("Input Modified") and input files that are now missing ("Input Missing"). A check-box is included in the table for each input model (e.g. standpipe_01.inp) in each regression job (Base and Mod). Any models selected to run or re-run in the model selection table will be included in the regression job(s).

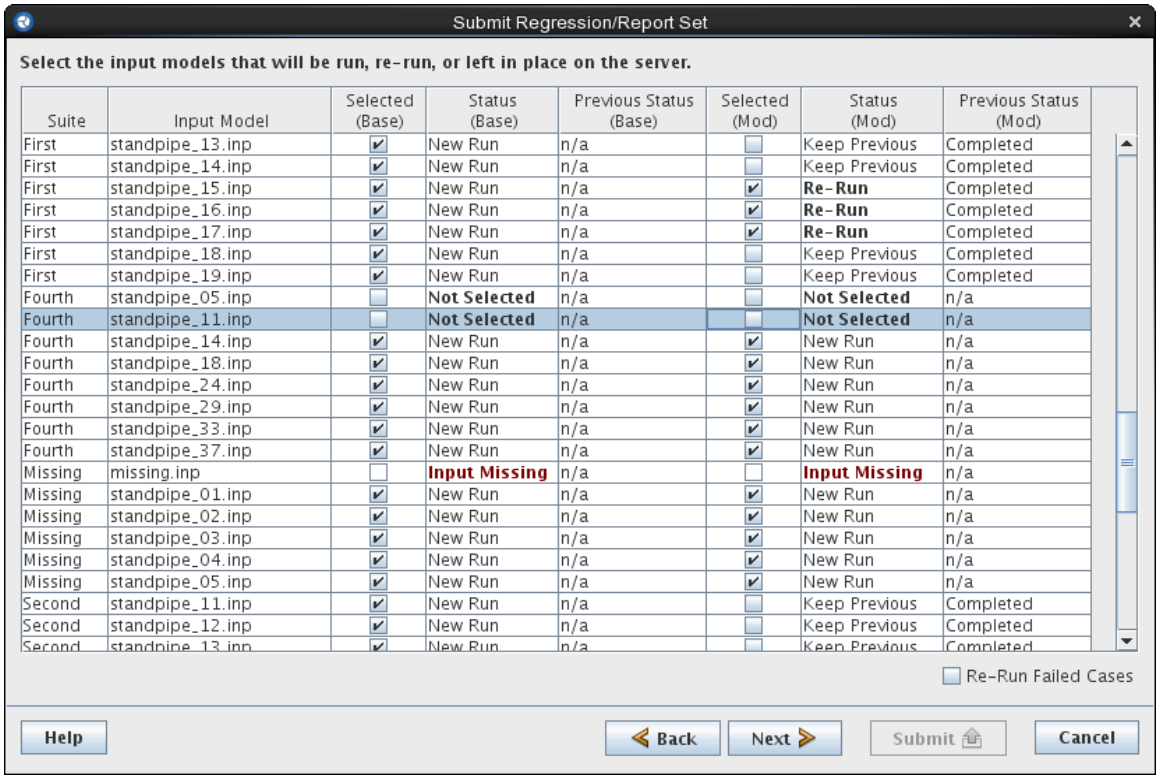

Figure 4.6. Submit Regression/Report Set - Input Model Selection

If either one of the regression jobs is an existing regression job then the previously selected regression information will be retrieved from the Calculation Server and included in the model selection table where the user can choose to keep or re-run any models that were part of the previous job. If the **Re-Run Failed Cases** option is selected then any input models that failed in the existing job will be automatically selected to "Re-Run".

Report Configuration

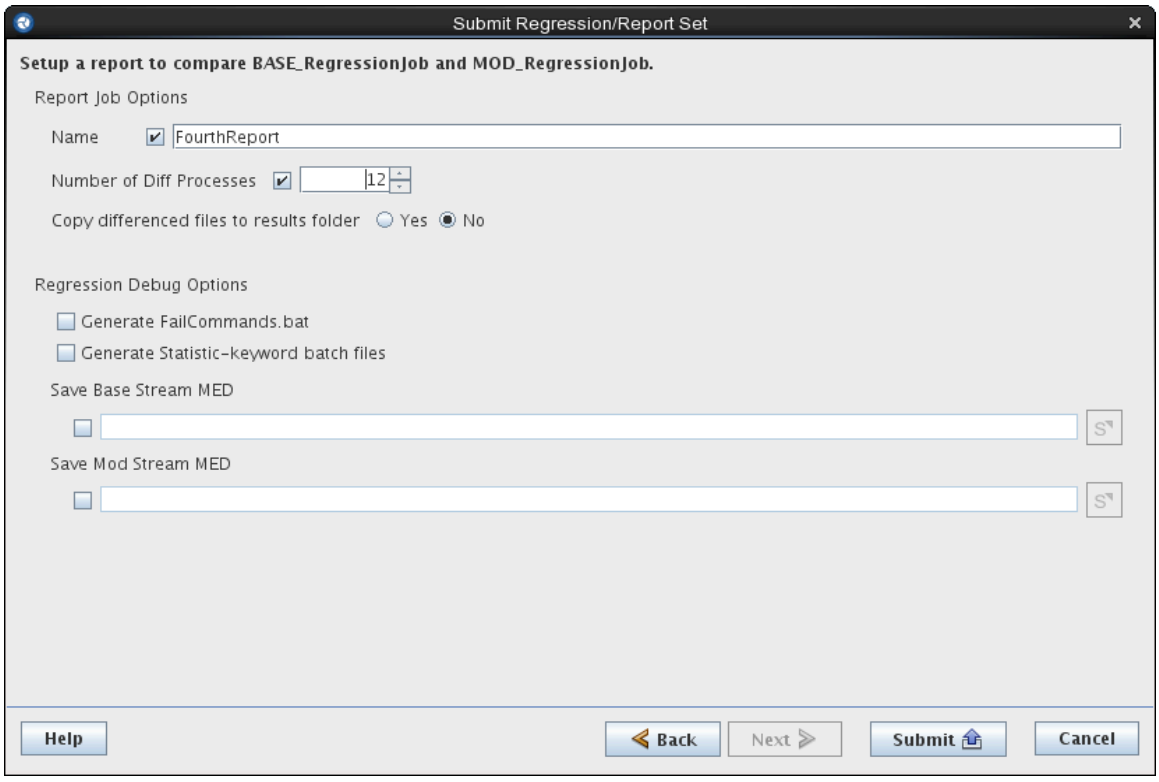

Figure 4.7. Submit Regression/Report Set - Report Configuration

The report configuration step is includes essentially the same report configuration described in Section 5.4, "Submitting Report Jobs". In addition to the report configuration, this step also includes two regression debugging options: *Save Base Stream MED* and *Save Mod Stream MED*. These options allow the user to save the generated regression streams as separate MED files that can be opened after the submission. These MED files contain full Engineering Template models with the generated regression job streams. These models and streams can be used to diagnose any plug-in specific stream generation issues that occur.

Chapter 5. Regression Reports

The AVF plug-in can generate reports detailing two completed regression jobs. Each report compares a base code version to a modified code version (typically abbreviated as *mod*). The report generator assumes that the modified version is a progressive revision of the base version. In practice, this only effects how results are presented. The compared codes can be any two codes or code versions so long as their outputs are comparable.

5.1. Creating Reports

Report generation consists of the following steps.

1. Read the report definition. This file determines the overall structure and content of the report, what files to parse, etc. For more information on the report definition, see Section 5.2, “Report Definition”.

2. If success conditions are defined in the report file, locate failed runs and generate the failure report. See Section 5.1.1, “Creating the Failure Report”.

3. Gather run statistics. To do so, statistics files for each run are read and pertinent statistics are tabulated. Write the statistics reports from these values. See Section 5.1.2, “Creating Statistics Reports”.

4. If diffs are defined in the report file, diff the appropriate files and generate the difference reports. See Section 5.1.3, “Creating the Differences Reports”.

5. Write the summary report. This file contains general information and links to the other generated files.

5.1.1. Creating the Failure Report

The failure report lists runs that failed for either compared executable. The report generator identifies failures with the given checks in the order listed.

1. If the statistics file is necessary and missing, the run has failed. The report configuration determines whether statistics are necessary (see Section 5.2.3, “Element: <success>”). If no other success conditions are defined and the statistics file is available, the run is a success.

2. If the statistics file is present and lists at least one fatal error, the run has failed.

3. If no output file matches a success condition, the run has failed. This can mean either no output files are found, or those that are found fail to meet the success criteria (see Section 5.2.3, “Element: <success>”).

Once failures are identified, the report is written to the file `FailureReport.html`. Failures are sorted in the following order:

1. Unexpected: ran in base but failed in mod
2. Expected: failed in both
3. Fixed: failed in base but ran in mod
4. Misc: the run is not present for one version and failed in the other

5.1.2. Creating Statistics Reports

Statistics reports detail differences between the two code versions for a given statistic. Any given run is only included in a statistics group's reports if a statistics file exists for both versions and both contain the requested value. The report generator computes the difference between the value in both the base version and mod version for each input in the given suite. If the difference exceeds the threshold or percentage threshold set in the report configuration, the value is included in the results (see Section 5.2.2, “Element: <statGroup>”). The differences are sorted and printed out in HTML reports.

5.1.3. Creating the Differences Reports

The differences report tabulates diffs between various output files. Unless defined in the report configuration, this report is not generated (see Section 5.2.4, “Element: <diff>”). Any given run is only diffed if the corresponding files are present in at least one of the version directories. The report generator runs the defined diff command, substituting the location of the base and mod output files. The results are saved to a file with the following path:

<report directory>/<diff directory>/<suite>/<file name>.diff

If the file size of the diff does not meet or exceed the threshold set in the report configuration, the diff is deleted. Otherwise, a link to the diff is included in the report.

5.2. Report Definition

The report generator is configured by reading report definition XML files. These files tell the report generator which statistics are of interest, how to determine run success, whether to diff files and which files to diff, and a number of other miscellaneous values.

Report definitions must be stored in the `avf/reportDefs` directory of the SNAP installation. The AVF plug-in ships with a number of default report definitions that can be modified or serve as an example. Report definition files must be both well-formed and valid XML, or report generation will fail. As in all XML documents, elements, attributes, and attribute values are case-sensitive.

5.2.1. Attributes: <report>

The root tag of a report definition is the **`report`** element. Its child elements may include any number of **`statGroup`** elements, zero or one **`success`** elements, and any number of **`diff`** elements, in that order. The **`report`** element allows the following attributes.

title - The title of the report. This value must contain at least one non-whitespace character and is required.

description - A description of the report. This value is optional.

5.2.2. Element: <statGroup>

Each **statGroup** element defines a number of statistics and how to locate the statistics files containing them. A **statGroup** element may contain one **command** element and must contain at least one child **stat** element, in that order. The report definition may contain any number of **statGroup** elements. A **statGroup** element is allowed the following attributes.

title - The title of the group. When the report summary is broken into sections for each **statGroup**, the title is listed over each section. This value is required and must contain at least one non-whitespace character.

label - The application output label for statistics files. Identifies the keyword used to locate statistics files for jobs of this type. If this is present, the report generator attempts to locate statistics files by loading the stream task defintion created for each input model, and retrieving the corresponding output with the specified label.

extension - The extension of statistics files. Statistics files are only located by extension if *label* is not specified. At least one non-whitespace character must be present. The period delimiter used to separate the file basename and extension cannot be included.

format - A Java format-string for numerical values written to a report in this group. This value is optional. For more information about legal format-strings, see the `Formatter` class in the Java API [http://java.sun.com/j2se/1.5.0/docs/api/java/util/Formatter.html].

optional - a `true` or `false` that determines whether this group of statistics is optional. When a group is optional, it is not considered during failure report evaluation. Additionally, if no statistics can be gathered for an optional statistics group, that section is omitted entirely from the summary report and its files are not generated. This allows creating a group that may not always be present, such as additional statistics files generated during coupled runs.

5.2.2.1. Element: <command>

The optional **command** element defines a command to run before gathering statistics. The command is specified in the body of the **command** element; for example: `<command>createStatistics.pl</command>`. Any use of the construct `%avf_bin` within the command will be replaced with the absolute location of the `avf/bin` folder of the SNAP installation. No attributes are allowed in this element. Typically, it is expected that a command will run some application or script that examines a model's output files and generate additional statistics. When the report generator executes the command, it provides it with the following arguments in the order listed:

1. the absolute location where a regression input was executed

2. the prefix of the input model (the name of the input model without a file extension)

This information should be sufficient for any utility to locate the outputs of interest and generate results. For the report generator to tabulate these results, the utility should generate a statistics file at the provided location with the given prefix and the extension listed in the parent **`statGroup`** element. The statistics file format is detailed in Section 5.3, “Statistics File”, but a general example is provided below.

```
<?xml version="1.0"?>
<statistics>
    <stat name="first value" value="1.0"/>
    <stat name="second value" value="2.0"/>
    ...
</statistics>
```

The executed command is expected to run until it completes writing the statistics report, then exit immediately. It should not spawn a background process that generates the statistics value and then exit prematurely.

5.2.2.2. Element: <stat>

The **`stat`** empty element defines a statistic used to generate a report. At least one **`stat`** element must be defined in each **`statGroup`**. It has the following attributes.

`name` - The name of statistics included in the report. Values must contain at least one non-whitespace character. This attribute is *required*.

`file` - The name of the HTML file created for the report. For portability, this value has some restrictions. Values must begin with at least one letter or number. Afterwards, the file name may consist of any number of letters, numbers, and periods. This attribute is *required*.

`title` - The title of the report. Values must contain at least one non-whitespace character. This attribute is *required*.

`description` - A description of the report. This attribute is *optional*.

`threshold` - A difference threshold for statistics. The magnitude of the difference between statistics must exceed this value to be considered for the report. A difference within this threshold may still be significant if a *`factor`* is specified (see below). Only non-negative real numbers may be provided. This value is *optional* and defaults to `"0"` if unspecified.

`factor` - A percentage of the base value that differences must exceed to be considered for the report. This percentage is specified with 1.0 as 100%. Only non-negative real numbers may be provided. This value is *optional*. There is no default value for this attribute, so a percentage-based difference is not considered if *`factor`* is unspecified.

prefer - Indicates the preferred trend in differences. By default, the results of a report are sorted so that favorable results are displayed first; this attribute indicates what kind of differences are improvements. Only "decrease", "increase", and "neither" may be specified for this attribute. This value is *optional* and defaults to "neither".

format - A Java format-string for numerical values written in this statistics report. This value is optional. For more information about legal format-strings, see the Formatter class in the Java API [http://java.sun.com/j2se/1.5.0/docs/api/java/util/Formatter.html].

5.2.3. Element: <success>

Defines success conditions for code output. Exactly one **success** block may be defined. If **success** is not defined, the report generator will not create a failure report.

The **success** element defines one attribute: *stats*. A positive *stats* value indicates that the existence of a statistics file is a necessary indicator of success. Allowable values are "true" and "false". This attribute is *optional* and defaults to "false". The body of the **success** element consists of one or more **condition** elements. Each **condition** element defines a file-set and success criteria through its attributes and children.

The **condition** element should define only one of two attribute: *label* or *extensions*. The former is a comma-separated list of task definition output labels used to identify output files to check with the type criteria. Likewise, *extensions* can be specified as a comma-separated list of file extensions (sans period) used to identify output files. Each **type** has in its body one or more **message** and/or **regex** elements. These values define a string or regular expression that must be found or matched somewhere in a line of an output file for the run to be considered successful. Both elements require that the expression be contained within the body of the element. An optional *case* attribute is available to indicate whether the expression is case-sensitive: allowable values are "true" and the default "false".

Note Regular expressions must be legal as defined in the Java regex API. The allowed syntax is largely identical to Perl 5 (only a few constructs are unavailable), and should be immediately familiar to seasoned regular expression authors. For more information, see the documentation of the Pattern class [http://java.sun.com/j2se/1.5.0/docs/api/java/util/regex/Pattern.html].

Special considerations need to be made when designing success conditions. The report generator runs through matching outputs once for each defined **condition**. This means that if two **condition** elements define the same file or extension, *each corresponding output file will be read twice*. For any given type, only one of the expressions must match for the run to be considered successful, allowing parallel types to be collapsed into a single element. Consider the following example:

A code creates two output files for any given run: one with the extension .info and the other with .out. The message "done" indicates success in both types of files. The regular

expression "^complete:" also indicates success if found in `.info` files. The following conditions block would correctly locate successful runs.

```
<success>
    <condition extensions="out,info">
        <message>done</message>
    </condition>
    <condition extensions="info">
        <regex>^complete:</regex>
    </condition>
</success>
```

As pointed out earlier, this will cause the report generator to read `.info` files twice. After collapsing the two types, the redundant reads are eliminated.

```
<success>
    <condition extensions="out,info">
        <message>done</message>
        <regex>^complete:</regex>
    </condition>
</success>
```

Unfortunately, this could still lead to problems. If the regular expression matches a line in `.out` files that does *not* indicate success, the report generator can produce false positives. The following eliminates any ambiguity.

```
<success>
    <condition extensions="info">
        <message>done</message>
        <regex>^complete:</regex>
    </condition>
    <condition extensions="out">
        <message>done</message>
    </condition>
</success>
```

Each file is now read exactly once with only those success-conditions that apply.

```
<success>
    <condition extensions="info">
        <message case="true" type="Normal">done</message>
    </condition>
</success>
```

Additionally each <message> or <regex> element has two additional attributes that can be assigned to it. These are the **case** and **type** attributes.

- **case** This attribute defines if the contained message or regex is to be case-sensitive. Valid values are "true" or "false".

- **type** The descriptive name of the message or regex type. This is used when generating the report for the regression run to determine the exit type of the run. This can be used in conjunction with input keywords to differentiate between expected and unexpected failures.

5.2.4. Element: <diff>

Indicates that a diff utility should be run on various code outputs. When present, links to the diffed files are tabulated in a differences report. The report definition may define

any number of **diff** elements: a section will be created in the summary report for each. The **diff** tag has the following attributes:

title - The title of the diff report. This value defaults to "Diff Report" and must have at least one non-whitespace character if modified. This value should be unique between **diff** elements.

file - The name of the file that stores the diff report. This value defaults to "DiffReport.html" and must have at least one non-whitespace character if modified. This value should be unique between **diff** elements.

description - An optional description of the diff report.

location - The location to store the file diffs. This value defaults to "diffs" and must have at least one non-whitespace character if modified. This value should be unique between **diff** elements.

program - The differencing application to use. For Windows users, the default value "diff" indicates that the included GNU diff command line utility should be used. To use the included diff utility directly, use the value %gnudiff. The custom APT diff utility, which allows specifying an exclusion list to ignore certain parts of the diffed documents, can be referenced with the value %aptdiff. Any use of the construct %avf_bin will be replaced by the absolute location of the avf/bin folder in the SNAP installation, while %cafean_home will be replaced by the location of the SNAP installation itself.

command - The diff command arguments. This value supports two symbolic constructs: %base and %mod. These two values are replaced with the path of the diffed files from the base and mod code output. The attribute value must include both %base and %mod at least once. If undefined, the value defaults to "%base %mod".

label - The task definition output labels used to locate files to diff in a comma-separated list.

extensions - The extensions of files to diff, sans period, in a comma-separated list. This value must contain at least one non-whitespace character. If undefined, it defaults to "out".

threshold - The size in bytes that a diff must meet or exceed before included in the report. This value must be a non-negative integer. If undefined, it defaults to "20480" (20kB). To include every diffed file, set *threshold* to "0".

5.3. Statistics File

The statistics file format stores named numerical values and error descriptions in XML. Like report configuration files, the XML contents must be both well-formed and valid. Any code that outputs statistics files in this format can be used with the report generator.

The statistics file has only a few elements: a root **`statistics`** tag, a block of **`stat`** elements, and an optional block of **`error`** elements. The **`statistics`** element serves only as the root tag; no attributes are allowed. Each **`stat`** defines a value through two attributes: *`name`* and *`value`*. The constraints on these attributes are straightforward: both are required, *`name`* must contain at least one non-whitespace character, each **`name`** must be unique within the file, and *`value`* must be a real number.

Statistics files may also define any number of empty **`error`** elements after the **`stat`** block. The following attributes are available for **`error`**.

`type` - The type of error. Allowable values are `"input"` and `"runtime"`. This value is *required*.

`reason` - Specifies a short description of the error. Values must have at least one non-whitespace character. This value is *required*.

`fatal` - Indicates whether the error is fatal, causing the executable to terminate early. Allowable values are `"true"` and `"false"`. This value is *optional* and has no default.

`componentType` - If the error can be directly associated with a component, that component's type is specified here. Values must have at least one non-whitespace character. This value is *optional* and has no default.

`componentID` - If the error can be directly associated with a component, that component's identity is specified here. Values must have at least one non-whitespace character. Values must have at least one non-whitespace character. This value is *optional* and has no default.

`lineNumber` - This attribute can be utilized to specify a specific line in the input file that caused the error. Only positive integers may be specified. This value is *optional* and has no default.

`time` - Allows specifying the simulated time when the error occurred. Only real numbers may be provided. This value is *optional* and has no default.

Below is an example of the statistics file syntax.

```
<?xml version="1.0"?>
<statistics>

    <stat name="cpu time" value="10.0" />

    <error type="input"
           lineNumber="42"
           reason="first column must be greater than 0"
           fatal="false"
           componentType="pipe"
           componentID="11" />

    <error type="runtime"
           time="10.5"
           reason="divide by 0"
           fatal="true"
           componentType="pipe"
```

```
            componentID="11" />
</statistics>
```

5.4. Submitting Report Jobs

To submit a report job, select *Submit Report Job* from the *Tools* menu. This opens the submit dialog shown in Figure 5.1, “Submit Report Dialog”. This dialog is composed of three tabs. The *Location* tab contains information used to specify information about the location at which the job runs and where the compared jobs are located. The *Suites* tab is used to specify which input models are submitted. Finally, the *Filters* tab allows restricting which input models are actually examined.

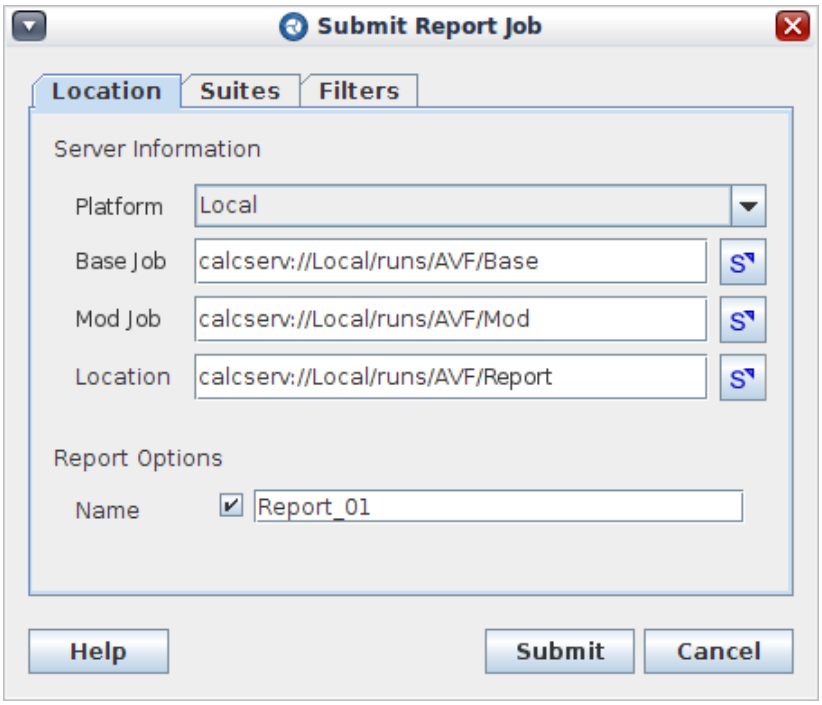

Figure 5.1. Submit Report Dialog

Location Tab

Platform allows selecting the platform to run the report job from the platforms specified in the SNAP configuration. Once a server is selected and a valid connection is established, the *Base Job*, *Mod Job*, and *Location* may be specified.

Note Only Calculation Servers may be selected for the *Platform*. The AVF plug-in does not support other platform types.

Location is the target folder where the report will be generated. The *Select* button opens a dialog used for selecting a mounted folder on the server. *Base Job* and *Mod Job* define the two previously submitted regression jobs that will be compared in the report. The **Select** button to the right of each will open the *Select Regression Job* dialog shown in Figure 5.2,

"Select Regression Job Dialog". All of these values are specified as Calculation Server URLs: note the `calcserv://` protocol shown in the figure. The *Location* URLs take the form `calcserv://Platform/path/to/folder`, while *Base Job* and *Mod Job* also specify the name of a completed run in the form `calcserv://Platform/path/to/RegressionJobName`.

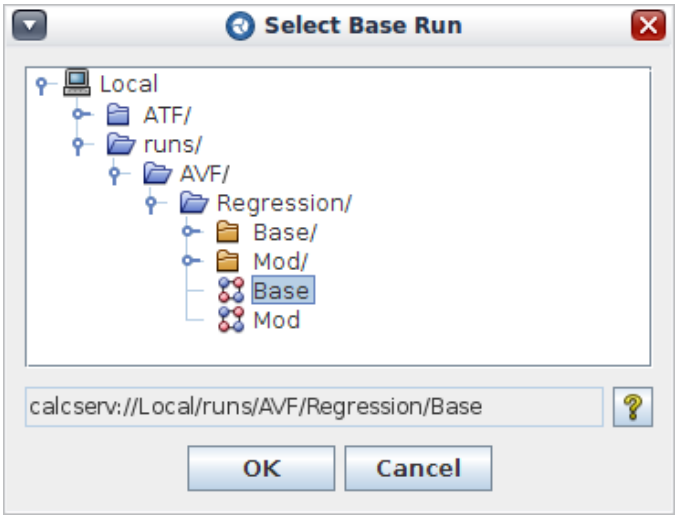

Figure 5.2. Select Regression Job Dialog

Name defines the name of the report job. Any resource associated with this job created in the *Target Folder* will be named with this label. If the check next to the field is not selected, the name will be generated based on the date.

Suites Tab

The *Included Suites* section displays the suites that are included in both selected regression jobs. Any or all of these suites can be selected to be included in the report.

Filters Tab

The table in this tab can be used to control which input models are included in the report job. Files are included based on their keyword value (see Input Keywords for more information on keywords).

The central table includes one row for each keyword. The *Enable* column controls whether the keyword will filter the inputs, and the *Include Value* column dicates what value the input model must have for the keyword to be included. These values are saved and restored between submits for convenience.

Submitting the Report Job

Once all of the above fields have been set, the report job can be sent to the Calculation Server by pressing the **Submit** button. This will add the report run to the server's job

queue. This process compares the statistics, failures, resulting output, etc. and creates an HTML report displaying the results. For more information on how reports are defined, see Section 5.2, “Report Definition”.

Chapter 6. AV Script Support

AV Script jobs allow the automation of running cases, generating figures from the results, and computing figures-of-merit.

The AVF support for AV Script is now a front-end for generating complex Engineering Template streams. The functionality of the legacy AV Script system now be reproduced by standard Job Stream components via the AptPlot and ACAP steps bundled with SNAP. To that end, the AVF supports components that largely mirror the legacy AV Script inputs. These components are then translated directly into Engineering Template models and, when submitted, run as a batch of job streams.

6.1. Changes From Legacy AVScript

For those experienced with the legacy AVScript application, it is important to clearly identify which input values are not necessary or have different semantics in the new system. This section highlights changes to the way scripts are defined. New users can skip this section entirely.

Most values in the path definitions are unneeded. The paths definition file indicates the paths to a number of required applications and resources. Several of these values are defined in the SNAP configuration, such as the location of AptPlot and the demultiplexers. For resources bundled with the AVF plug-in, such as ACAP, the location is already known. No equivalent to *topdir* is necessary: the locations of inputs and outputs have been decoupled and are specified when the script is submitted. Applications are also defined at submit time (see Section 6.3, “Submitting AVScript Jobs”). When importing legacy AVScript inputs, code versions are parsed into Executable stubs with the indicated name and type.

All Location properties define input locations in Calculation Server path syntax. When submitting AVScripts, a mounted folder on a Calculation Server is selected as an input location. On the server, AVF looks for all input files *underneath* this input folder. As an example, a Case input file *a.inp* is located at *C:\trunk\Assessment\WALL\inputs*. The folder *C:\trunk* is mounted on this server with the name *TRUNK*. During submit, the user selects */TRUNK/Assessment* as the input folder. For a case to correctly locate this file, its *File Name* must be set to *a.inp* and its *Location* set to *WALL/inputs*. Note the lack of prefix and the use of the slash character (/) as a folder separator. Constructs such as *../* cannot be used to reach a directory outside the selected input folder. The *Location* field is kept separate from the file name to facilitate multi-edit.

Case files that might not exist before running a post-case or pre-figure command are not prefixed with an ampersand. Instead, set the *Check Existence* property to *false*.

Case file names and ACAP config-file names must include the file extension. These are no longer assumed, except when importing legacy AVScript inputs.

Legend coordinates should never be prefixed by a 'W'. By doing so, the legacy AVScript marked the legend coordinates as world-coordinates on an AptPlot graph. Instead, set the figure's *Legend Coordinate Type* value to *World*.

Annotations are now defined as a component of a figure. Each figure has an *Annotations* property. The editor launches a dialog that can be used to add, remove, and edit annotations. This naturally represents the way annotations related to figures in the legacy input format.

Ellipse annotations are no longer defined in the form: X_{center}, Y_{center}, Width, Height. Instead, they follow the standard convention of X_{min}, Y_{min}, X_{max}, Y_{max}. When importing legacy AV Scripts, the coordinates of an ellipse annotation are automatically converted to the standard form.

Data definition expressions should not be prefixed by an equals sign. Instead, set the *X Variable Type* or *Y Variable Type* value to *Expression*.

Data channel names in expressions must be surrounded by curly braces: {}. This eliminates error-prone channel-name checks that fail for various channel names in Databank files.

Variables in axial data definitions no longer use ZZ or ZZZ to indicate the mesh index segment. Instead, they use the %2N, %3N, etc. format defined for AptPlot's built-in axial plot functionality. The old format is automatically converted to the new format on import.

Figure and page names must be unique between both figure and page definitions. Files generated for figures and pages (AptPlot batch files, images, etc.) are created in common directories. If a figure and a page in the AVScript component share a common name, the figure files will be overwritten, and unexpected errors may arise.

Figures and pages no longer have a file location value. Instead, generated files are automatically sorted into a predefined directory structure.

6.2. AV Script Components

The *AV Script* category contains all components related to AV Script streams. It contains two child categories: *Executables* and *Scripts*. *Executable* components define code-version stubs mapped to an application at submit time. Each *Script* component is composed of cases, figures, and data traces that define how to run inputs and generate plots. Scripts may be expanded in the navigator to display a number of sub-categories, all of which support copy and paste.

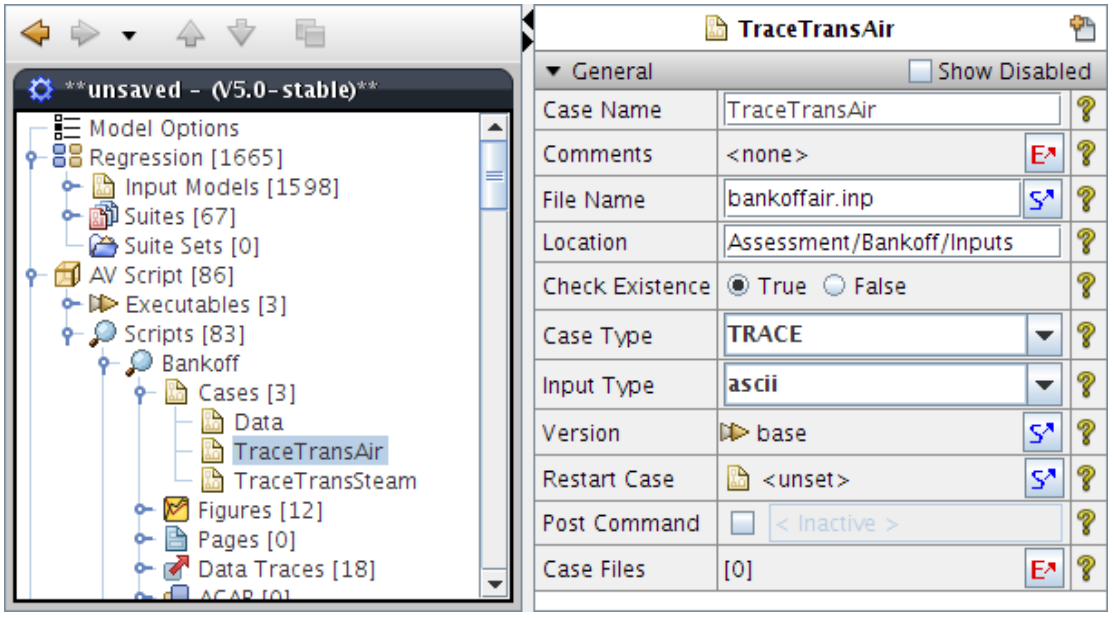

Figure 6.1. AV Script Components in the Navigator and Property View

6.2.1. Executables

Executable components specify named code executables for AVScript runs. Similar to input model components, each executable is a *stub* that takes the place of an executable defined at submit time. This allows AVScript components to reference specific code versions without knowing where the executable is located.

Executable components have the following noteworthy attributes:

- *Executable Name*. The name of the executable. Each name must be unique among executables.
- *Executable Type*. The type of executable. This value must be the name of an AVF code-support plug-in.

6.2.2. Cases

Cases represent code inputs and data sources. A case component defines an input or data file, its type, a code version used to run the input (if appropriate), and any restart information.

Cases have the following properties:

- *Case Name*. The ID of this case. Each *Case Name* should be unique among cases in the parent Script component.

- *File Name*. The complete name of the file referenced by this case.

- *Location*. The *Calculation Server path* where the input or data file is located. This location should use the slash character (/) as a folder separator. Do not prefix the path with separators. Constructs such as ../ will not work here.

- *Check Existence*. This should only be set to false if a post-case or pre-figure command is going to generate the file.

- *Case Type*. The type of this case. The type determines what codes are used to process inputs, how data is extracted from files, etc.. The editor for this value allows selecting from the supported case types *found on the client machine*. If the AVF installation where the script will be submitted contains support for additional codes, their types can be entered manually.

  Several case types for data files are always supported. These include the following.
  - *ASCII Data*. A text file with values in space-delimited columns.
  - *DATABANK Data*. An NRC Databank binary data file.

- *Version*. The executable used to run this case. This is not displayed for known data-file types.

- *Restart File Name*. If activated, this field specifies the optional restart case. This is not displayed for known data-file types.

- *Post Command*. Described below.

- *Case Files*. Described below.

- *Keyword Overrides*. Described below.

Post Command

When *Post Command* is activated, this field specifies the optional command run immediately following execution of the case. This command will be specified as a **`Post Execution`** command on the corresponding job step in exported AV Script streams. As a result, it follows the same semantics and constraints as job step custom processing, such as the use of the backslash '/' as an escape character.

Post Command supports several replacement tokens that can be used for convenience in addition to those normally supported by custom processing commands. A special construct, `${AVF_BIN}`, can be used to indicate the location of the SNAP installation's `avf/bin` directory. Additionally, `${INPUT_FOLDER}` will be replaced by the location of the Input Folder chosen at submit time, while `${TARGET_FOLDER}` is replaced by the location of the script's output directory. The token `${FIGURE_FOLDER}` will be replaced by the location of the directory where figures are created, which may be overridden at submit time. Otherwise, `${FIGURE_FOLDER}` refers to the `Plots` directory under which all AptPlot steps are executed.

Note Scripts and applications called by commands written for the legacy version of AVF (prior to SNAP 2.0) will have to be adjusted for the new directory structure and input file constraints employed by AV Script jobs. Refer to Appendix A, *AV Script Execution* for more information on how this differs from the legacy system.

Note Whenever any case or figure in an AV Script specifies a custom command, the generated stream will run with *Linear Execution* enabled. This is necessary to ensure that custom commands are executed before any subsequent cases or figures that depend on the results.

Case Files

Each case may specify an arbitrary number of *Case Files*: files that the input model depends on to function correctly. Case files have the following properties.

- *File Name*. The complete name of the file.
- *Location*. Similar to the Location of a the parent case, this defines the relative path of the file. **Unlike cases and input models**, this path is relative to the parent case file instead of the input folder.
- *Type*. Defines the purpose of the related file. Different AVF plug-ins support various types of files. For example, TRACE AVF support allows the specification of TRACE-PARCS coupled runs. For such a case, the *Type* of the coupled PARCS input file must be set to *PARCS Input*, while other related PARCS files must be set to *PARCS Auxiliary File*. This is used by the AVF plug-ins to determine how to build the job stream elements used to process the input.
- *File Type*. Indicates whether the file is a text or binary file.
- *Required*. A **True** indicates that the file must be copied to the target folder for the model to execute: if a script job cannot locate the related file, it does not run the parent case. A **False** indicates that a missing file should not prevent the parent case from running.

Input Keyword Overrides

Each case may override the values of the global input keywords (see Input Keywords). There are two methods of defining overrides: the spreadsheet editor (see Section 6.2.7, “Spreadsheet Editor”), and the case-specific editor, which is described below.

The *Keyword Overrides* property editor displays the *Keyword Override Dialog*, as shown below. Once the values are set to the necessary values, pressing **OK** will set the overrides for the case.

Note Unlike the spreadsheet editor, accepting changes made in this dialog will set overrides for all currently available keywords.

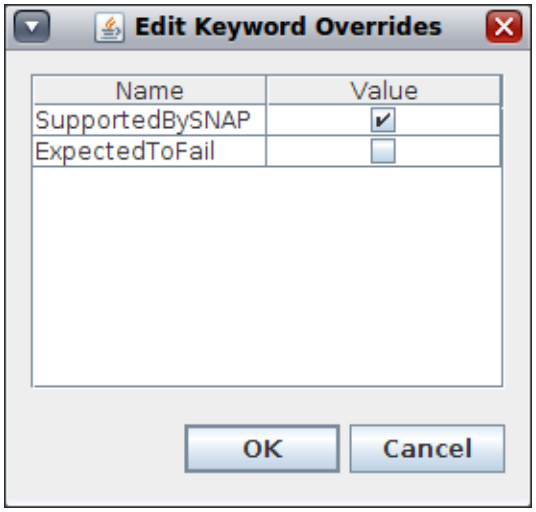

Figure 6.2. Keyword Override Dialog

6.2.3. Figures and Annotations

Figure components define the look of a graph, including the graph's title, subtitle, position on the plot, etc.. Figures may optionally contain annotations: custom lines, boxes, ellipses, and text rendered on the plot.

The following properties are available for figure components:

- *Figure Name*. The figure ID. Each name should be unique among figures *and pages* in the parent Script component.
- *Title Text* and *Subtitle Text*. The optional title and subtitle drawn over the graph.
- *X Axis Label* and *Y Axis Label*. Denotes the labels drawn along the X and Y axes.
- *Scaling Type*. Determines whether the X and Y axes are scaled linearly or logarithmically.
- *X Axis Boundaries* and *Y Axis Boundaries*. Determines if the X and Y axes are scaled automatically or explicitly. Automatically scaled graphs adjust their X and Y bounds to display all data values. Explicit boundaries are defined below.
- *Axis Bounds*. Defines the minimum and maximum values displayed by the figure. This property is only enabled if at least one of *X Axis Boundaries* or *Y Axis Boundaries* is set to *Explicit*.
- *Tick Marks*. Sets the major and minor tick intervals along the X and Y axes.
- *Legend X Coordinate* and *Legend Y Coordinate*. The location of the legend's upper-left corner.
- *Legend Coordinate Type*. Determines if the coordinate described above is a Viewport coordinate or a World coordinate.

- *Legend Length*. The length of the line used in legend entries.
- *Viewport*. The Viewport specifies the placement of the graph on the plot. Valid values always range from 0 to 1 in either direction. If one dimension is longer, that dimension's viewport coordinates extend from 0 to the ratio of the sides, which the shorter side always having a length of 1. For example, if the graph is 3 inches wide by 2 inches tall, viewport X coordinates extend from 0 to 1.5, and viewport Y coordinates extend from 0 to 1.
- *Character Size*. The default size of text rendered in the plot. This value is a multiplier of AptPlot's default font size. Thus, specifying .75 will produce text that is 75% of the normal size.
- *Symbol Size*. The default size of symbols rendered in the plot. Like *Character Size*, this value is a multiplier of AptPlot's default size.
- *Orientation*. Determines the size of the plot on which the figure is graphed.
- *Page Width* and *Page Height*. The size of the plot in inches. Width and height are only available if the *Orientation* is set to *Custom*.
- *Annotations*. The graphical and textual objects drawn on the figure (see below).
- *Pre Command*. Described below.

Pre Command

When *Pre Command* is activated, this field specifies the optional command run before the AptPlot step is executed or its inputs processed. This command will be specified as a **`Setup`** command on the corresponding job step in exported AV Script streams. As a result, it follows the same semantics and constraints as job step custom processing, such as the use of the backslash '/' as an escape character.

Pre Command supports several replacement tokens that can be used for convenience in addition to those normally supported by custom processing commands. A special construct, `${AVF_BIN}`, can be used to indicate the location of the SNAP installation's `avf/bin` directory. Additionally, `${INPUT_FOLDER}` will be replaced by the location of the Input Folder chosen at submit time, while `${TARGET_FOLDER}` is replaced by the location of the script's output directory. The token `${FIGURE_FOLDER}` will be replaced by the location of the directory where figures are created, which may be overridden at submit time. Otherwise, `${FIGURE_FOLDER}` refers to the `Plots` directory under which all AptPlot steps are executed.

Note Scripts and applications called by commands written for the legacy version of AVF (prior to SNAP 2.0) will have to be adjusted for the new directory structure and input file constraints employed by AV Script jobs. Refer to Appendix A, *AV Script Execution* for more information on how this differs from the legacy system.

Note Whenever any case or figure in an AV Script specifies a custom command, the generated stream will run with *Linear Execution* enabled. This is necessary to ensure that custom commands are executed before any subsequent cases or figures that depend on the results.

Figure Templates

AVF supports exporting a Figure's properties as a template. Such templates can then be imported with only selected values substituted into the edited figure's properties. To export a template, select a figure in the Navigator. In the property view, select the **Export Template** button in the *Figure Template* property editor. Select the location to save the file and press **Save**. To import a template, select the **Import Template** button from the same editor, select the template, and press **Open**. A dialog will be displayed asking which properties to import, and showing the value of each property in the template. Select the desired properties and press the **OK** button to import the values.

Annotations

To edit a figure's annotations, select the **Edit** button from its *Annotations* property. This displays the *Edit Annotations* dialog as shown in Figure 6.3, “Annotation Dialog”. With this dialog, annotations can be created, removed, and edited. Annotations have the following properties:

- *Annotation Name*. The ID of the annotation. Each name should be unique among annotations in the figure.
- *Object Type*. The type of the annotation: box, ellipse, string of text, or line.
- *Color*. The color of the annotation.
- *Location*. The placement of the annotation in world coordinates. Box, ellipses, and lines use minimum and maximum coordinates to specify the absolute placement of the shape. Strings are placed by a single coordinate that places the string based on the *Justification*. All locations are specified in world coordinates, which are relative to the values displayed on the graph.
- *Line Style*. The style of the line: solid, dotted, dashed, or a combination. This value is only available for boxes, ellipses, and lines.
- *Line Width*. The width of the line, from 0 to 20. This value is only available for boxes, ellipses, and lines.
- *Fill Color*. The color used to fill a box or ellipse.
- *Fill Pattern*. The pattern used to fill a box or ellipse.
- *Font*. The font used to render a string.
- *Character Size*. The character size used to render a string. This value should range from 0 to 1000, where 100 is 100% of the default character size.

- *Justification*. The placement of a string relative to the *Location* coordinate. Each value is a combination of horizontal placement followed by vertical placement.
- *Rotation*. The rotation of a string around the *Location* coordinate.
- *String Value*. The text of a string. This value may use AptPlot's typesetting constructs.
- *Arrow Heads Placement*. The placement of arrow heads on a line.
- *Arrow Type*. The type of arrow heads placed on a line.
- *Arrow Length*. The length of the arrows placed on a line. Allowable values range from -10 to 10.
- *Arrow d/L Factor*. The width of the arrow head on a line. Allowable values range from 0 to 10.
- *Arrow l/L Factor*. The triangular shape of the arrow head on a line. Allowable values range from -1 to 1.

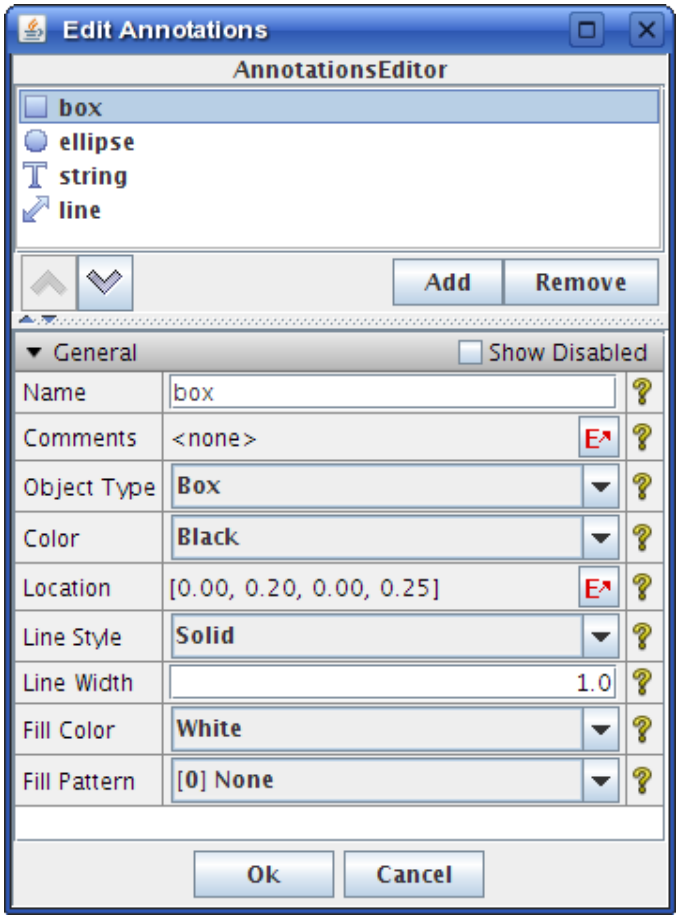

Figure 6.3. Annotation Dialog

6.2.4. Data Traces

Data traces define a data set in a graph. They specify the case from which the data originates, the figure upon which the trace is plotted, the channel or complex expression that defines the data, the appearance of the line, etc.. Data Trace properties are described below.

In the *General* attribute group.

- *Data Name*. The ID of this data trace. Each name should be unique among data definitions in the AVScript component.

- *Case*. Where the plot data originates. Each data trace must have a valid case reference.

- *Figure*. Where the data is plotted. Each data trace must have a valid figure reference.

- *Plot Type*. The type of plot represented by this data trace. The available options are described below. Unless otherwise noted, any two data traces referencing a particular figure must have identical plot types.
  - *Time*. A simple time-history plot. Only *Y Variable* may specify data in the trace. The *X Variable* is either assumed or taken automatically from the appropriate source (such as the time channel in a binary plot file).
  - *Time Point*. A single point from a time-history plot. Only *Y Variable* may specify data in the trace. These plots must also specify the *Time* value (not to be confused with the *Time* plot type). This indicates which point in the data set should be extracted and plotted. *Time Point* data traces may reside on the same figure as *Time* plots.
  - *Parametric*. Similar to *Time*, but *X Variable* is also defined.
  - *Parametric Point*. Similar to *Time Point*, but *X Variable* is also defined. *Parametric Point* data traces may reside on the same figure as *Parametric* plots.
  - *Axial*. An axial profile plot. Only *Y Variable* is specified, but it allows a special construct for substituting incremental channels (described below). *Axial* plots cannot be used with *Databank* cases, and do not allow expressions.

- *X Variable*, *X Variable Type*, *Y Variable*, and *Y Variable Type*. The variable to be plotted on the X or Y axis and whether that value is an expression or a channel. This value can be a channel name, data file column index, or complex channel expression. For ASCII Data, specify the column in the data file to use, with column indexes starting at 1. Other types may use either a channel name or a complex expression.

  For channel variables, enter the name of the channel. The property editor allows selecting channels from a completed job on a Calculation Server. Only those jobs that match the referenced case's *Case Type* will be displayed.

  Expressions may be any valid AptPlot Equation Interpreter expression, with one caveat: channel names must be surrounded by curly braces: {}. This tells AVF

exactly where the channel name begins and ends so that it can substitute the appropriate file-prefix in AptPlot expressions. If a channel name uses curly braces or backslashes, they can be escaped with a backslash; `{` becomes `\{`, `}` becomes `\}`, and `\` becomes `\\`.

Axial data traces use the construct %2N, %3N, etc. to indicate the portion of the channel name substituted with axial mesh indexes. The integer in the construct determines how many digits must be present in channel names for indexes less than the ceiling index.

- *Legend String*. Optional text to be used in the figure's legend for this data trace. If left inactive, the legend value will be automatically generated.

- *Units*. If the case type supports it, determines whether values are converted to *SI* or *British* units. This value has no effect on *ASCII Data* values.

- *X Shift*. Shifts all values along the X axis by this value.

- *Y Shift*. Shifts all values along the Y axis by this value.

- *Slope Factor*. Multiplies all Y values by this value after the shift.

- *Time*. The transient time for which the axial plot or time point information is to be extracted. For *Time Point* and *Parametric Point* traces, the time may be set to a value less than or equal to -1e9 to specify that the first available time step should be used, or greater than or equal to 1e9 to indicate the last.

- *Axial Locations*. Defines the axial or z-direction locations for a series of mesh locations in a single component along the direction of flow for the data channel being plotted (specified by Y Variable). Editing the property displays the dialog shown in Figure 6.4, “Edit Axial Locations Dialog” and Figure 6.5, “Edit Axial Locations Dialog with Fine Mesh Data”. This dialog can be used to add and remove axial locations, and enable and set an optional axial index override. In addition, the *Index Offset* (or Start Index) is specified here, defining the first index used by locations that do not override their index.

In the *Line Properties* attribute group.

- *Symbol*. The type of symbol centered over data points in the figure.

- *Symbol Fill*. Whether the symbols are filled or outlines. This parameter is only enabled if *Symbol* is set to a value other than *None*.

- *Symbol Skip*. How many data points are skipped between rendered symbols. This parameter is only enabled if *Symbol* is set to a value other than *None*.

- *Line Style*. The type of line drawn between points in the data set.

- *Line Color*. The color of the line drawn between points in the data set.
- *Line Width*. The width of the line drawn between points in the data set.

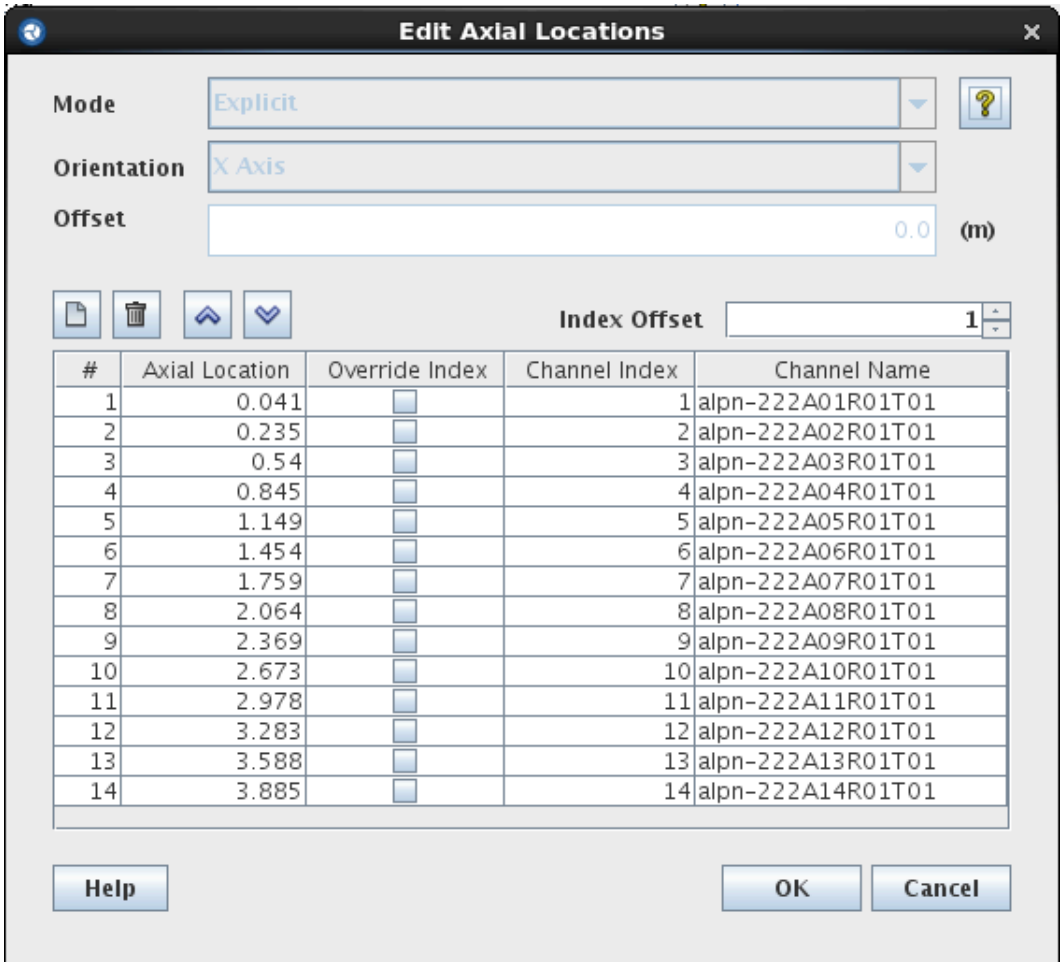

Figure 6.4. Edit Axial Locations Dialog

When setting explicit elevations for channels with fine mesh data, the dialog removes the index fields, as they are determined automatically by AptPlot.

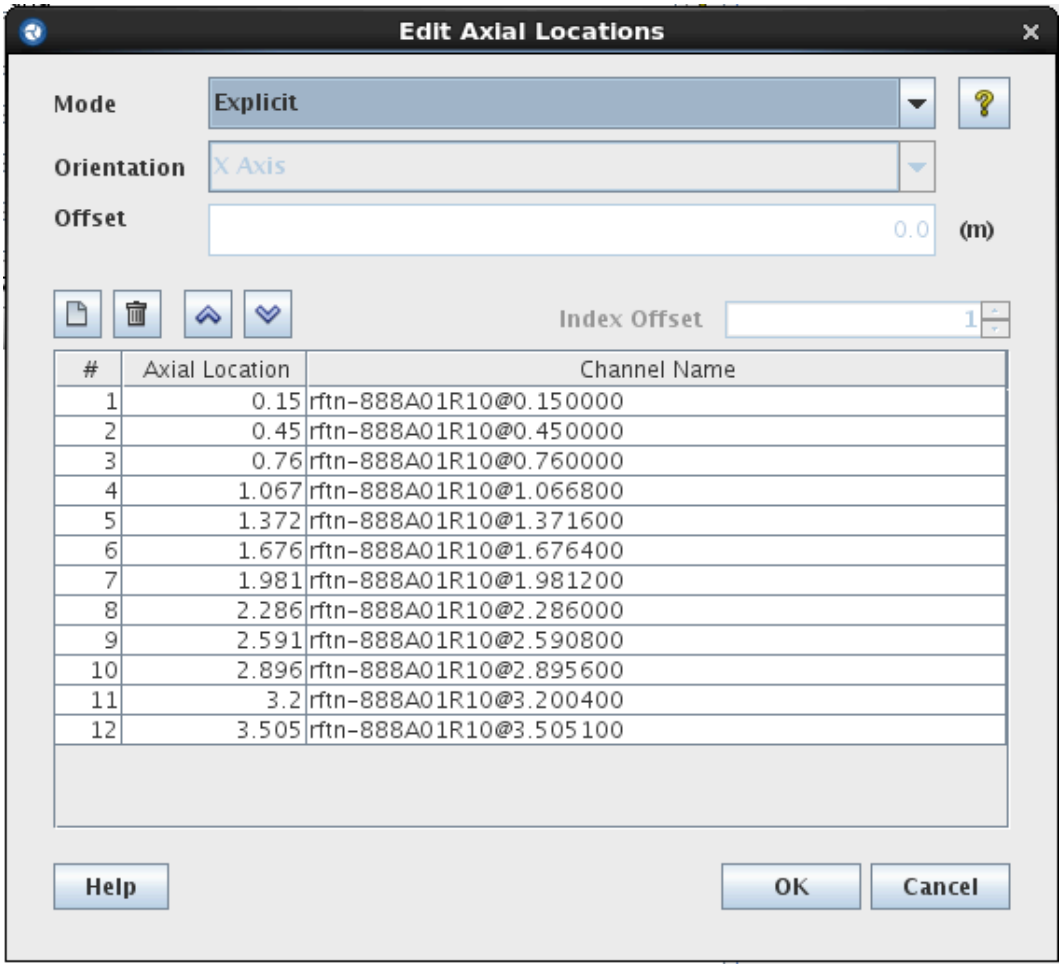

Figure 6.5. Edit Axial Locations Dialog with Fine Mesh Data

6.2.5. Pages

Pages allow displaying several figures on a single plot. Each page has the following properties:

- *Page Name*. The page ID. Each name should be unique among pages *and figures* in the parent AVScript component.
- *Figures*. The figures organized by this page definition. Each page should have at least one valid figure reference. The number of figures should match the product of the *Row Count* and *Column Count* properties.
- *Row Count* and *Column Count*. The number of rows and columns that the referenced figures are organized into.
- *Override Title* and *Override Subtitle*. Optional overridden title and subtitle for the organized figures. When activated, only this title and/or subtitle will be displayed; all other figure titles and subtitles will be discarded.

- *Margin*. The margin between the edges of the plot and the arranged figures, specified in viewport units.

- *Column Gap* and *Row Gap*. The margin between columns and rows in the arranged figures, specified in viewport units.

- *Orientation*. The size of the plot on which the page is graphed.

- *Page Width* and *Page Height*. The size of the plot in inches. Width and height are only available if the *Orientation* is set to *Custom*.

6.2.6. ACAP

ACAP definitions are used to produce figures of merit using the ACAP application. These components have the following properties:

- *ACAP Name*. The ACAP definition ID. Each name should be unique among ACAP definitions in the parent AVScript component.

- *Config File Name*. The name of the config file used to drive the ACAP calculation.

- *Location*. The path, relative to the *Top Directory*, where the config file is located. This location should use the slash character (/) as a folder separator. Do not prefix the path with separators. Constructs such as ../ will not work here.

- *Base Data Set*. The base data set against which all other data sets are compared in the figure of merit computation. Each ACAP definition should have a valid base data set reference.

- *Compared Data Sets*. The data sets compared against the base data set in the figure of merit computation. Each ACAP definition should have at least one valid compared data set reference.

6.2.7. Spreadsheet Editor

Script components can also be edited in a spreadsheet editor, shown in Figure 6.6, "Script Spreadsheet Editor". This dialog allows editing the case, figure, page, data trace, and ACAP components in a script definition in a table. There are two ways to access this dialog. First, right-click on a *Script* component in the Navigator and select *Open Table Editor* from the pop-up menu. Second, press the *Edit* button on any of the *Script* component editors for *Cases*, *Figures*, *Pages*, *Data Traces*, and *ACAP*.

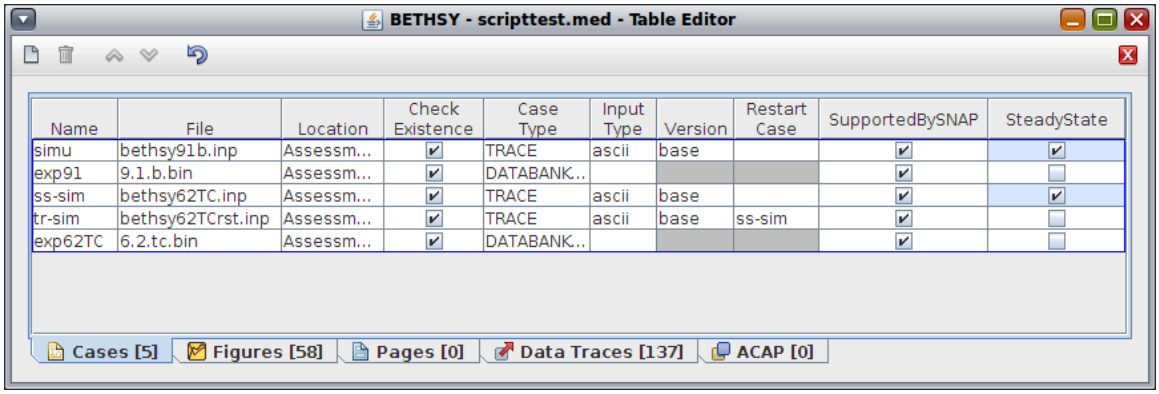

Figure 6.6. Script Spreadsheet Editor

This dialog allows comparing components while editing individual or multiple values, reordering definitions, adding and removing components, copying and pasting values to and from spreadsheet applications, etc..

The blue **Undo** button is a **Revert** button: it removes all overridden values from the currently selected rows. Overridden values, such as input keyword overrides in Case definitions, are highlighted by a light blue color.

6.3. Submitting AVScript Jobs

To submit an AVScript job, select *Submit AVScript Job* from the *Tools* menu. This opens the submit dialog shown in Figure 6.7, “Submit AVScript: Location Tab”.

Location Tab

The *Location* tab specifies where the script is submitted, where its files originate, and the modes of execution for the generated stream.

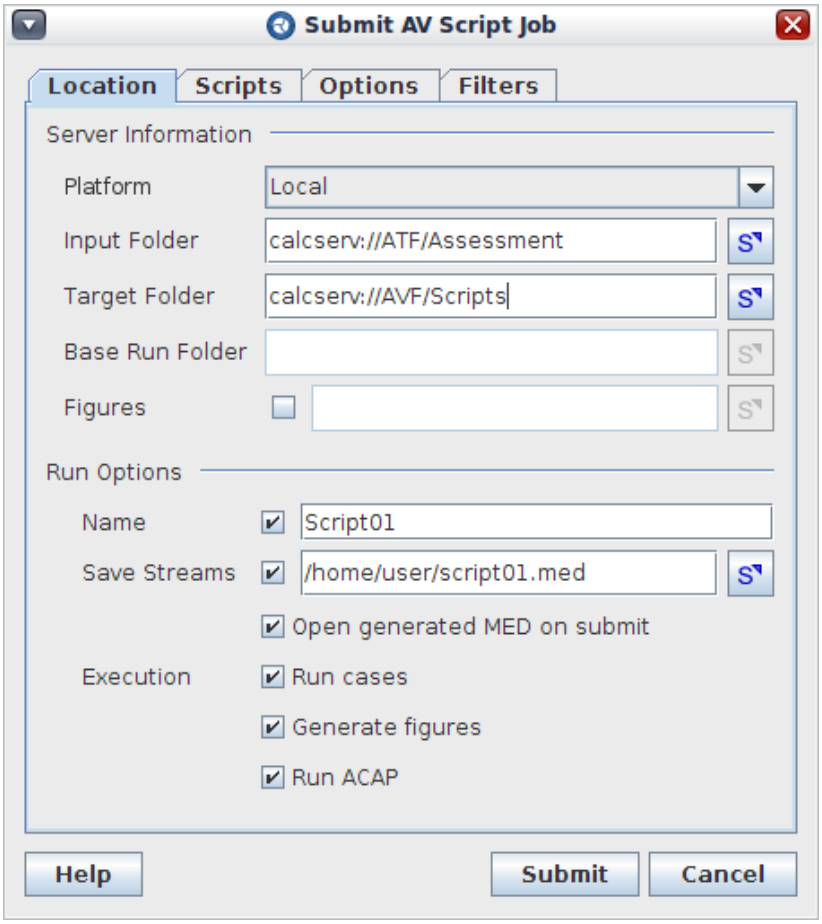

Figure 6.7. Submit AVScript: Location Tab

Platform allows selecting the location to run the script streams from the platforms specified in the SNAP configuration. Once a server is selected and a valid connection is established, the *Input Folder* and *Target Folder* may be specified. The *Select* button on either opens a dialog used for selecting a mounted folder on the server. With *Input Folder*, the chosen directory must be the location of the input files. The *Target Folder* is where the streams will execute and store their results. Both of these values are specified as Calculation Server URLs: note the `calcserv://` protocol shown in the figure. All Calculation Server URLs take the form `calcserv://Platform/path/to/folder`.

Note Only Calculation Servers may be selected for the *Platform*. The AVF plug-in does not support other platform types.

The optional *Figures* field can be used to specify a location in which all generated images are stored. Like *Input Folder* and *Target Folder*, this is specified as a Calculation Server URL to a folder. The adjacent *Base Run Folder* field is described below.

Name defines the name of the AV Script job: all stream tasks will execute in or under a folder with this name. If the check next to the field is unselected, the name will be generated based on the date.

The *Save Streams* field can be used to save the generated Engineering Template stream to an MED file. An option is also present to immediately open the generated MED upon submit.

Finally, the *Execution* options control whether cases are run, figures are generated, and ACAP figures-of-merit are computed. When either *Run cases* or *Generate figures* is disabled, necessary data files will not be generated by the AV Script job, and must be referenced from an already completed AV Script submit, as described below.

Base Run Folder

The *Base Run Folder* is used to specify the location of a completed AV Script job when either of the *Run cases* or *Generate figures* options are disabled. This is used to identify the resources used as inputs for figure and/or ACAP FOM generation, as an AV Script run in the same location with the same name as a previous AV Script job removes all files associated with the former run.

The *Base Run Folder* value will always take the form of the *Target Folder* of a completed run in addition to the folder created for its run *Name*. For example, an AV Script is submitted with the *Target Folder* of `calcserv://Local/AVF/Scripts` and a *Name* of `Script01`. In this example, when submitting `Script02` with *Run cases* disabled, the *Base Run Folder* would be set to `calcserv://Local/AVF/Scripts/Script01`.

Note The name of an AV Script job that uses a base run must differ from the base run name when they share a target folder.

Scripts Tab

The *Scripts* tab is used to select which script definitions are submitted and which code versions on the selected *Server* will be used for each *Executable* stub. The list of executables in the bottom table is includes every executable referenced by the scripts selected in the first table, and application definitions for ACAP and AptPlot, when required by the stream. Each executable can be edited by selecting a value from the editor in the *Executable* column.

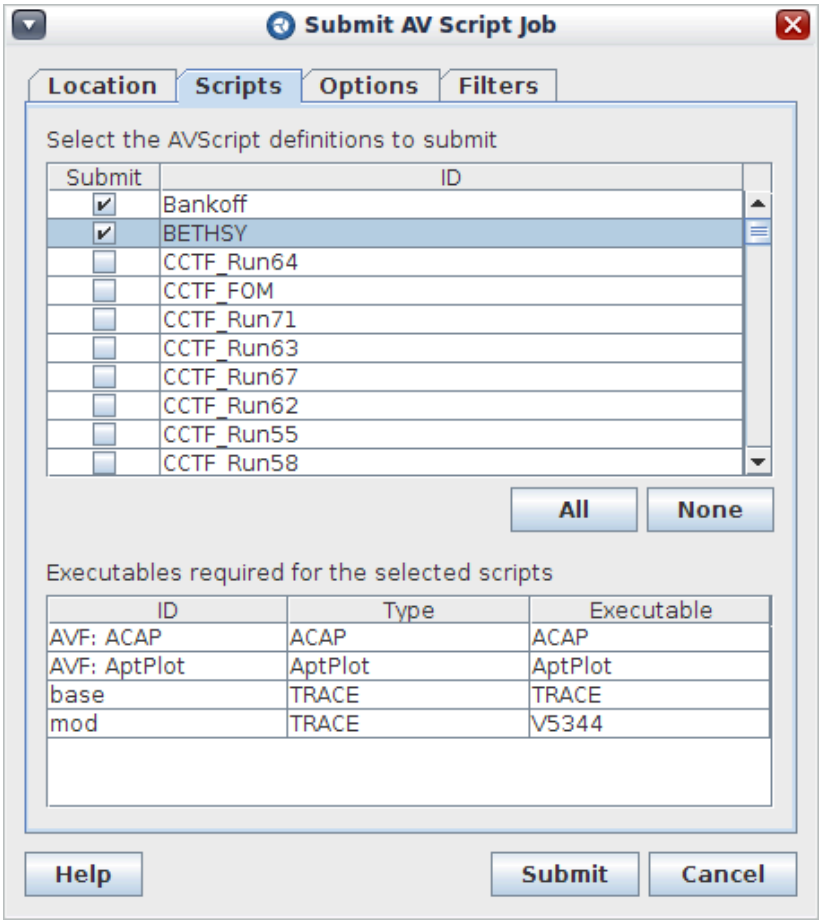

Figure 6.8. Submit AVScript: Scripts Tab

Options Tab

The *Options* tab is used to specify several options related to figure generation.

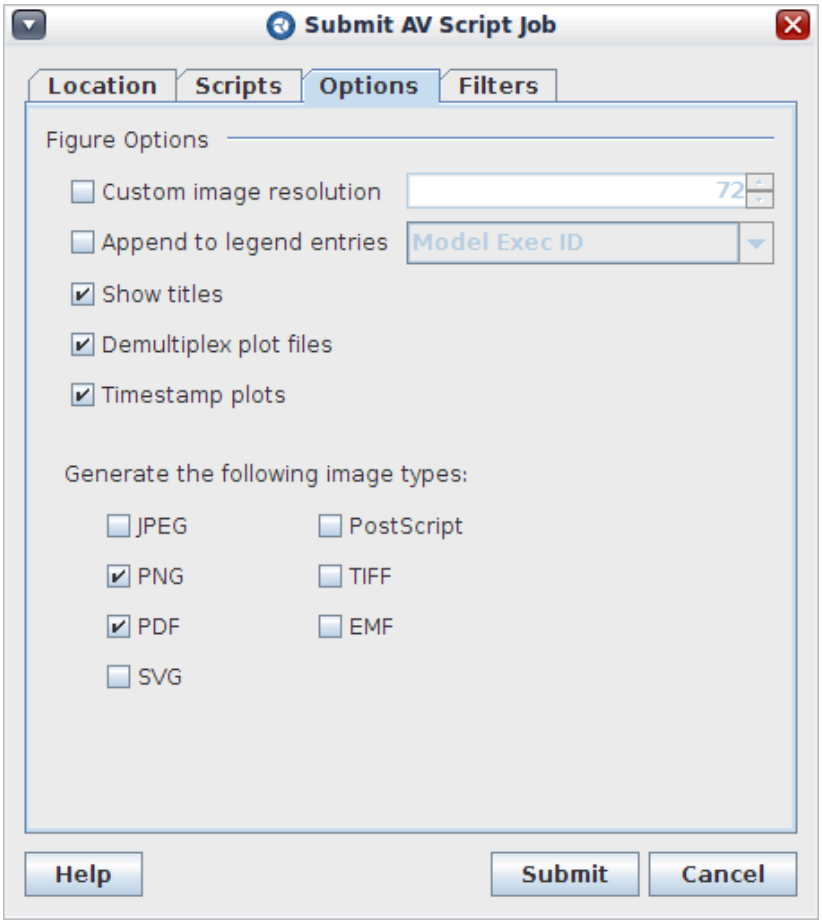

Figure 6.9. Submit AVScript: Options Tab

- *Custom image resolution*. A custom image resolution to be used in all images generated for figures.

- *Append to legend entries*. When selected, a label is appended to the legend entries of all data traces on all figures and pages. The choices are as follows.
  - *Model Exec ID*. The name of the executable stub as defined in the AVF model.
  - *Application ID*. The ID of the application on the in the SNAP configuration.
  - *Application Desc*. The description of the application in the SNAP configuration.

- *Show titles*. Display the titles specified for figures and pages.

- *Demultiplex plot files*. When selected, all plot files created by running cases will be automatically demultiplexed when the case completes. This incurs an initial, expensive read of the entire plot file, but offers significant improvements to performance when a case plot file is read by more than one figure or page.

- *Timestamp plots*. Add a timestamp to each generated figure.

Filters Tab

The table in this tab can be used to control which cases are run in the script job. Cases are included based on their keyword value (see Input Keywords for more information on keywords).

The central table includes one row for each keyword. The *Enable* column controls whether the keyword will filter the cases, and the *Include Value* column dicates what value the keyword must have for the case to run. These values are saved and restored between submits for convenience.

Note Any data sets referencing cases that do not pass the keyword filter will not be included in the generated stream. Additionally, this can prevent the inclusion of ACAP cases that reference an excluded data set when either the base case is filtered out or all compared cases are filtered out.

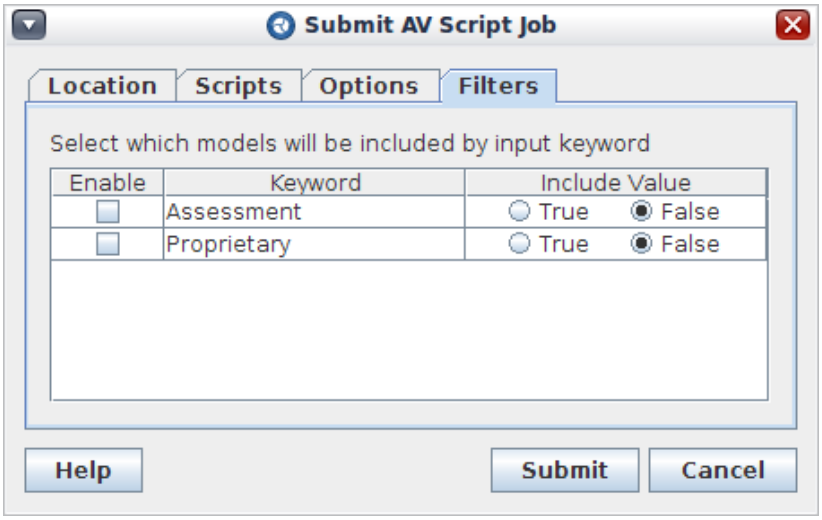

Figure 6.10. Submit AVScript Filters

Running an AV Script Job

Once all of the fields in the dialog have been set to the desired values, the AV Script job can be sent to the Calculation Server by pressing the **Submit** button. This will generate the Engineering Template stream model and submit its streams to the selected Calculation Server.

AVScript jobs organize files into a very strict directory hierarchy. All streams are executed in a folder defined by the submit *Name*. Each submitted AV Script is created as a distinct stream, named after the component, so that each script is executed in an appropriate sub-directory. Within that stream folder, files are organized into the following directories:

- *Cases*. All executable cases with a corresponding job step are located within this folder. This is accomplished by setting the *Relative Location* of all job steps to `Cases/`.
- *Plots*. All AptPlot steps are executed in this directory. Similar to cases, the generated AptPlot steps responsible for generating figures and pages have their *Relative Location* set to `Plots/`.
- *FOMs*. All resources associated with computing figures of merit. The generated ACAP scripts and computed results are all stored here. The *Relative Location* of generated ACAP steps is set to `FOMs/`.

6.4. Exporting AV Script Models

An option also exists to generate the Engineering Template model used to represent a series of AV Scripts without submitting any streams. Selecting **File** > **Export** > **AVScript Model** from the main menu will open a dialog similar to the submit dialog described in Section 6.3, "Submitting AVScript Jobs". All available settings are the same, with the **Submit** button replaced by an **Export** button. Pressing the **Export** button opens a file browser used to select where the Engineering Template model will be generated. Selecting a file will close the export dialog and create the MED, which is then opened in the Navigator.

6.5. Importing Legacy AVScript Inputs

AVScript components can be created by importing legacy input files. Selecting **File** > **Import** > **AVScript** from the main menu will open a file dialog that can be used to select one or more files. Which of the input files are selected is not important; the AVF Plug-in uses the AVScript filename rules to determine which selected files are valid AVScript inputs and which files it should look for. To be precise, the plug-in will import files with the following names:

- Any of the default AVScript input file names:

avcasedefs.txt	case definitions file
avpathdefs.txt	path definitions file
avfigdefs.txt	figure definitions file
avdatadefs.txt	data definitions file
avpagedefs.txt	page definitions file [optional]
avacapdefs.txt	ACAP definitions file [optional]
avannodefs.txt	annotations definitions file [optional]

- Prefixed file names, where <NAME> is a particular prefix.

<NAME>Cases.txt	case definitions file
<NAME>Path.txt	path definitions file

<NAME>Figs.txt	figure definitions file
<NAME>Data.txt	data definitions file
<NAME>Page.txt	page definitions file [optional]
<NAME>Acap.txt	ACAP definitions file [optional]
<NAME>Annotations.txt	annotations definitions file [optional]

For example, suppose the target directory contains the files:

```
Test1Acap.txt    Test1Figs.txt    Test2Data.txt   updates.txt
Test1Cases.txt   Test1Path.txt    Test2Figs.txt
Test1Data.txt    Test2Cases.txt   Test2Path.txt
```

This indicates the directory contains two sets of input: one prefixed by "Test1" and one prefixed by "Test2". Note that the optional ACAP definitions file is present for the first file set. The directory also contains a file named *updates.txt*, which is of no interest to the importer. If the user were to open the file dialog and select the files: *Test1Figs.txt*, *Test1Path.txt*, *Test2Cases.txt*, and *updates.txt*, the importer will create two AVScript definitions, one named *Test1* populated by definitions from the five corresponding inputs (including the optional ACAP definition), and one named *Test2*, defined by the other four inputs. The importer ignores the *updates.txt* file, as its name does not follow the input file naming conventions. In this sample case, two files were included which matched the "Test1" prefix; the plug-in will still do the right thing when multiple files are selected that match one file set.

If the current model is an AVF model, the imported AVScript definitions will be added to that model. Otherwise, a new model will be created with the new definitions. Any errors encountered while importing the selected inputs will be reported to the ModelEditor's message window.

Chapter 7. Templates

Templates define incomplete ModelEditor batch scripts that are completed, assembled, and processed on a local or remote server. Commands are constructed with substitution tokens, which are replaced by the appropriate value or file path during a template job. By iteratively constructing and reconstructing these commands for individual suites and models, exhaustive testing of plug-in I/O logic can be performed in a small amount of time.

Note Unlike older versions of the AVF, template jobs can now be executed on "headless" machines, such as servers, that operate without a graphical environment.

7.1. Template Components

7.1.1. Input Models and Suites

Templates jobs are primarily defined by the contents of the template and the files the template iterates over. The Input Models and Suites defined in the *Regression* category may also be used to determine the files processed by a template. For an in-depth look at input models and suites, see Section 4.1, “Regression Components”.

Suites in particular have one property related solely to template jobs: *Tokens*. This attribute defines `name=value` pairs that may be substituted directly into a template. By allowing suites to define tokens, a batch command may be tailored to the needs of a specific group of inputs, such as specifying a data flavor for input model imports.

7.1.2. Templates

Template components are placed in their own root-level category within the Navigator.

Batch Commands

Each template can specify batch commands in five sections: header, init, model, post, and footer. During a template job, the header commands are written first and then never written again. Similarly, the footer is written once after all other sections are complete. The init and post batch commands are repeated once for every submitted suite. After the init commands, but before the post, the model commands are written once for every model in the current suite.

Batch commands may use replacement tokens to substitute specific values into the final script. All tokens take the form `${<token>}`, with `<token>` replaced by the appropriate name (i.e. `${InputFolder}`).

The header and footer may use the following tokens. These tokens may also be used in init, model, and post batch.

- `JobInfo` - The location of the input file that specifies the particulars of a template job. This token is only intended to be used with the **`AVF REPORT_CONFIG`** command (see Section 8.3, “AVF Plug-in Batch Commands”).
- `InputFolder` - The input folder chosen at submit time, expanded to its full path.
- `TargetFolder` - The output folder where all results should be stored, expanded to the full path.
- `SnapVersion` - The SNAP version. For example: `"2.0.3"` (sans quotes).

The init and post batch sections may use the following additional tokens. These tokens may also be used in model batch.

- `TargetFolder` - The output folder where all results should be stored, expanded to the full path. `TargetFolder` is adjusted for each submitted suite by appending the suite name to the full path of the target folder chosen at submit time.
- `SuiteName` - The suite name for the current iteration.

Model batch commands are allowed the following additional tokens.

- `ModelName` - The file name of the input.
- `ModelBaseName` - The name of the input without its file extension. For example: "`cctf.inp`" becomes "`cctf`".
- `ModelLocation` - The Location defined for the input model.
- `ModelPath` - Defines the full path to the input. This construct is equivalent to `${InputFolder}/${ModelLocation}/${ModelName}`.
- `ModelInputFolder` - The full path to the folder that contains the input.
- `PathPrefix` - A model prefix based on the file path. This includes the location and model base name, with all folder seperators replaced by underscores. An example model with the path `foo/bar/test.inp` would result in a path prefix of `foo_bar_test`.
- `LocationPrefix` - A model location prefix. This is similar to `PathPrefix` above, without the model name. So the exaple `foo/bar/test.inp` would give `foo_bar`.
- `RestartModelName` - The name of the input's restart file, if one is defined.
- `RestartModelBaseName` - The name of the input's restart file without its file extension: "`cctf.inp`" becomes "`cctf`".
- `ModelLocation` - The Location defined for the input's restart model.
- `RestartModelPath` - Defines the full path to the input's restart model. This construct is equivalent to `${InputFolder}/${ModelName}`.

Note To use the `$`, `{`, or `}` characters directly in the batch, escape them with the `\` character. To use a backslash, escape it in the same fashion. Thus `$`, `{`, `}`, and `\` become `\$`, `\{`, `\}`, and `\\`.

Branching in Batch Commands

Additionally, Model Batch commands have access to branching blocks. The `${if}`, `${else}`, `${fi}` constructs are used to determine whether commands are added to the batch file based on the current input model. Branching has the following basic structure:

```
${if:condition}
... commands for matching models ...
${else}
... commands for models that do not match ...
... the else block is optional ...
${fi}
```

The contents of the `${if}` condition are compared to each model. If they match, the commands specified before the `${else}` (or `${fi}` if no `${else}` is defined) are added to the batch file. If the model does not match, only those commands in the optional `${else}` block are added. Branches may contain other branches, but any given branch may only include one condition.

Each `${if}` must be followed by a `${fi}`, and each `${fi}` must be preceeded by an `${if}`, or the template may fail in unexpected ways. Additionally, all `${else}` commands must be placed between an `${if}` and a `${fi}`.

The following `${if}` conditions are supported (see Section 4.1.1, “Input Models” for explanations of the indicated properties).

- `InputType="TYPE"` - This branch is only used if the current input model has a *Type* matching the specified value .
- `Key="KEYWORD"` - This branch is only used if input model value for the given keyword is `true`.
- `IsRestart` - This branch is only included if the current input model restarts another.

Template Tokens

Templates may define their own custom tokens. These values are interpreted as server-paths during a template job. Because a path may differ between platform, each template token has a default value and any number of server-specific values.

Editing the *Tokens* attribute displays the *Edit Template Tokens* dialog (see Figure 7.1, “Template Token Editor”). Individual tokens may be added and removed on the left. Selecting a token in this list displays its properties on the right, where its name and values may be edited. Pressing the **Add** button displays a list of known servers for overriding the default value. The **Remove** button can be used to delete any server-specific value; the default value cannot be removed. Assuming the corresponding server is running, the table editor for the **Value** column allows editing the path of the value by selecting from a tree of available server-folders.

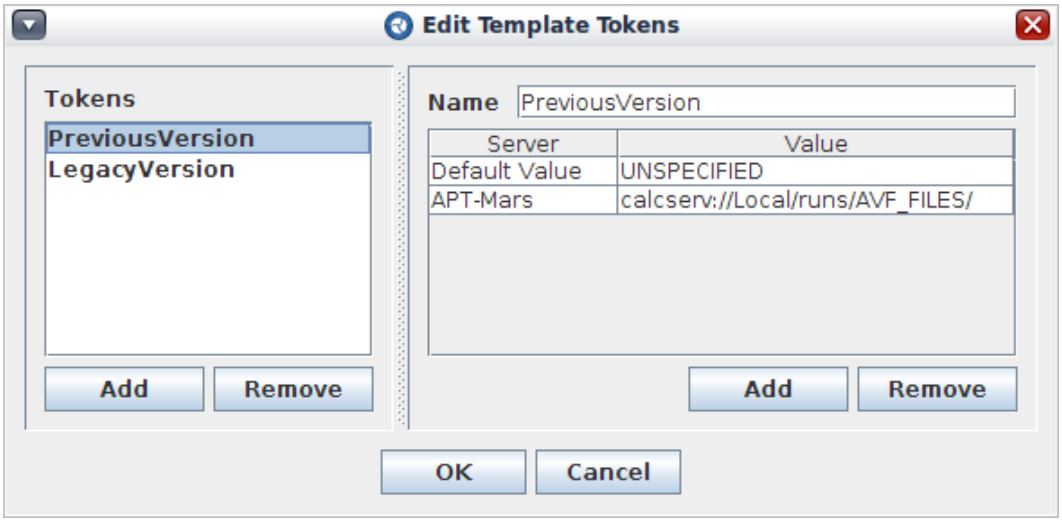

Figure 7.1. Template Token Editor

Editing Batch Commands

The *Header*, *Init Batch*, *Model Batch*, *Post Batch*, and *Footer* attributes of a template component provide access to the appropriate command segments. Editing these attributes displays the *Edit Batch* dialog displayed in Figure 7.2, "Edit Batch Editor". This dialog highlights template keywords, tokens, unrecognized `${...}` constructs, and comments. It applies the following rules for highlighting:

- The `$`, `{`, and `}` and characters in any `${...}` construct are colored blue.
- Branch keywords are orange. The conditional portion of the `${if}` construct has additional highlighting to aid in distinguishing individual segments.
- Keywords are highlighted in cyan.
- Template tokens are highlighted in purple. This type of highlighting is only available when editing batch for a single template.
- All other values within the `${...}` construct are highlighted in red. This includes suite tokens and template tokens when editing multiple templates.
- Escaped characters (`\$`, `\{`, etc.) are highlighted in magenta.
- Comments are rendered in gray. Take note that keywords and escaped characters are highlighted in comments. This is to indicate that these values are still substituted during a template job, regardless of their placement within a comment.

Note Template job splice the template commands into one large batch file; using the `EXIT` command is generally unwise.

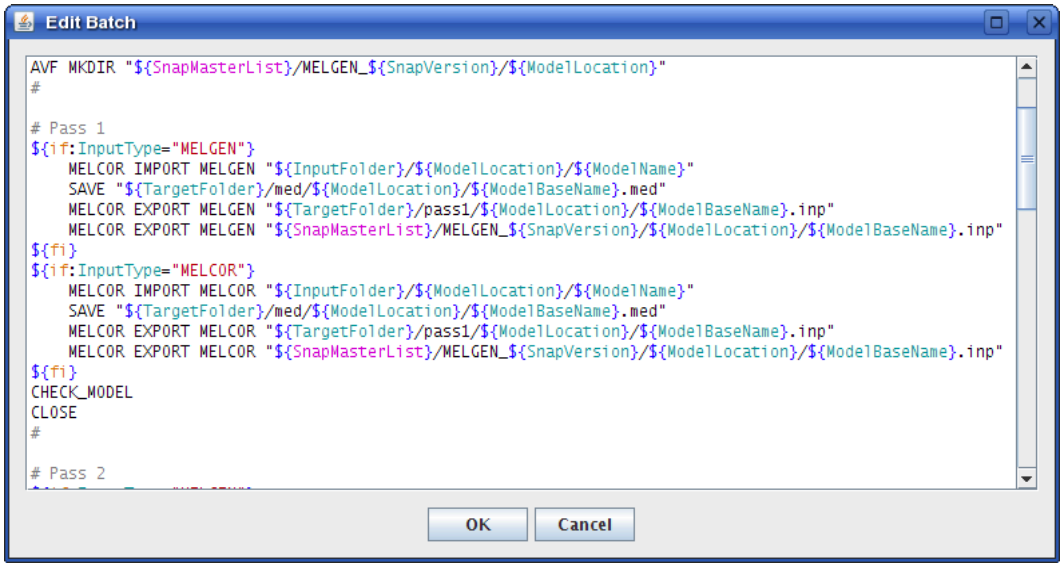

Figure 7.2. Edit Batch Editor

HTML Report Definitions

Within each template component's *HTML Report Definitions* attribute group are a collection of properties that can be used to adjust template job reports. When the command **`AVF REPORT_CONFIG "${JobInfo}"`** is present somewhere in the template's init batch, these definitions will be used to shape the HTML report created by an **`AVF DIFF_REPORT`** command (see Section 8.3, "AVF Plug-in Batch Commands").

Similar to batch commands, template HTML report definitions support several replacement tokens. HTML tokens have the same syntax as batch tokens, placing keywords within a ${...} construct. Token availability varies by property, and is explicitly defined in the individual property descriptions below. The following tokens are related to info about a given group of diffs:

- `PassLabel` - The name of the diff group.
- `PassLabelLink` - A linkable name for the diff group. HTML definitions may use this as a named anchor and target. Typical usages would be: `<a name="${PassLabelLink}">${PassLabel}</a>` to set the anchor to the group and `<a href="#${PassLabelLink}">${PassLabel}</a>` to link to the anchor.
- `PassCount` - Represents the number of comparisons made in the diff group.
- `PassWithDiffsCount` - Represents the number of comparisons made in the diff group that resulted in non-empty differences.

The following tokens are related to individual diffs:

- `DiffLeftName` - The name of the first file in the diff.

- `DiffRightName` - The name of the second file in the diff.
- `DiffLeftLink` - A link to the first diffed file. HTML definitions may use this token in an href to refer to the file. A typical use would be: `<a href="${DiffLeftLink}>${DiffLeftName}</a>`.
- `DiffRightLink` - A link to the second diff file. Usage follows `DiffLeftLink`.
- `DiffLeftSize` - The size, in bytes, of the first file in the diff.
- `DiffRightSize` - The size, in bytes, of the second file in the diff.
- `DiffLink` - A linkable name for this diff. HTML definitions may use this as a named anchor and target. Typical usages would be: `<a href="${DiffLink}">${PassLabel}</a>` to set the anchor to the group and `<a href="#${DiffLink}">diff</a>` to link to the anchor.
- `DiffSize` - The size of the diff results, or "no differences" (sans quotes) for empty diffs.

The report is constructed by assembling the HTML found within the HTML Report definitions properties, repeating various sections as needed. The following properties are available:

- *Header* - the first segment of the report, added only once. This section should be used to open the document and contain any single declarations, such as adding a report description and explaining various diff groups. Replacement tokens are not supported in the *Header*.
- *Summary Header* - the first portion of the summary block, which is placed after the *Header*. For each diff group, a summary block is constructed as follows: *Summary Header*, *Summary Body* (repeated once for each diff), *Summary Footer*. All four pass tokens are supported in *Summary Header*.
- *Summary Body* - the middle portion of the summary block. It is repeated for each diff in the current diff group. *Summary Body* supports all diff tokens, in addition to `PassLabel` and `PassLabelLink`.
- *Summary Footer* - the final portion of the summary block. *Summary Footer* supports all four pass tokens.
- *Diff Section* - placed between the summary blocks and the diff blocks, added only once. Replacement tokens are not supported in *Diff Section*.
- *Diff Group Header* - the first portion of the diff block, which is placed after the *Diff Section*. For each diff group, a diff block is constructed as follows: *Diff Group Header*, the diff (explained below), *Diff Group Footer*. All four pass tokens are supported in *Diff Group Header*.

- *Diff Header* - placed immediately before the contents of each diff. *Diff Header* supports all diff tokens, in addition to `PassLabel` and `PassLabelLink`.
- *Diff Footer* - placed immediately after the contents of each diff. *Diff Footer* supports all diff tokens, in addition to `PassLabel` and `PassLabelLink`.
- *Diff Group Footer* - the final portion of the diff block. *Diff Group Footer* supports all four pass tokens.
- *Footer* - placed at the end of the report, added only once. Replacement tokens are not supported in the *Footer*.

7.2. Submitting Template Jobs

To submit a Template job, select *Submit Template Job* from the *Tools* menu. This opens the submit dialog shown in Figure 7.3, “Submit Template: Location Tab”.

Location Tab

The *Location* tab specifies where the job is submitted, and where its files originate.

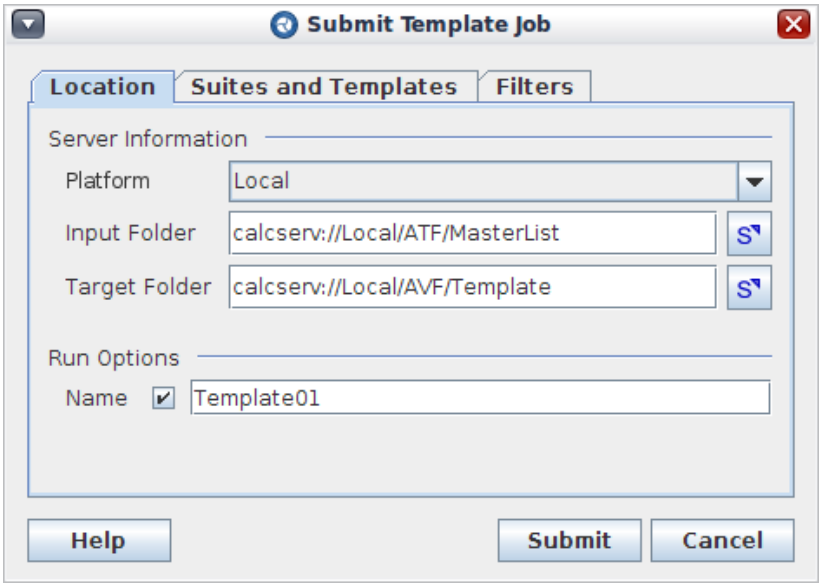

Figure 7.3. Submit Template: Location Tab

Platform allows selecting the location to run the template job from the platforms specified in the SNAP configuration. Once a server is selected and a valid connection is established, the *Input Folder* and *Target Folder* may be specified. The *Select* button on either opens a dialog used for selecting a mounted folder on the server. With *Input Folder*, the chosen directory must be the location of the input models; it also defines the path of the `${InputFolder}` token. The *Target Folder* is where the stream will execute and store its results. Both of these values are specified as Calculation Server URLs: note the `calcserv://` protocol shown in the figure. All Calculation Server URLs take the form `calcserv://Platform/path/to/folder`.

Note Only Calculation Servers may be selected for the *Platform*. The AVF plug-in does not support other platform types.

Name defines the name of the job. Any resource associated with this job created in the *Target Folder* will be located in a folder with this name. If the check next to the *Name* field is not selected, a name will be generated based on the date.

Suites and Templates Tab

The *Suites and Templates* tab is used to select which suites and template to submit.

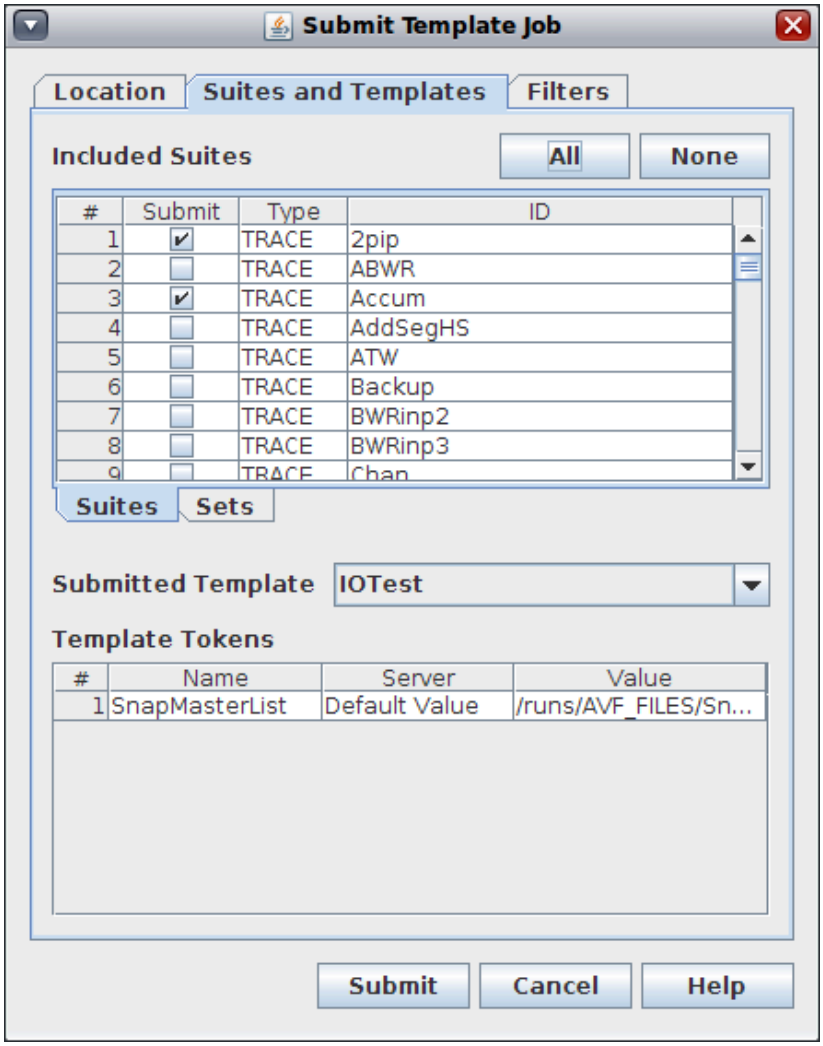

Figure 7.4. Submit Template: Suites and Templates Tab

The *Included Suites* section is used to select which suites are submitted. This is broken into two tabs: *Suites* and *Sets*. The first allows picking suites from all suites in the AVF model. The second allows selecting from suite sets, with one caveat: suite sets are not actually submitted. Instead, selecting a set marks all of its referenced suites as selected, and vice versa. A suite set is only shown as selected if all of its referenced suites are. If

even one suite in the set is inactive, the set will be shown as unselected. If two suite sets overlap, changing the selected status of one may modify the other.

Submitted Template indicates which template drives the template job. The selected template's tokens are displayed in the table below. This table displays which defined values are appropriate for the selected server. If none match, the default value is submitted. By editing the *Server* column of a value displaying the default, a custom value may be entered for the selected server. The *Value* column may be edited in the same fashion as the *Value* column in the template *Tokens* editor.

Filters Tab

The table in this tab can be used to control which input models are included in the report job. Files are included based on their keyword value (see Input Keywords for more information on keywords).

The central table includes one row for each keyword. The *Enable* column controls whether the keyword will filter the inputs, and the *Include Value* column dicates what value the input model must have for the keyword to be included. These values are saved and restored between submits for convenience.

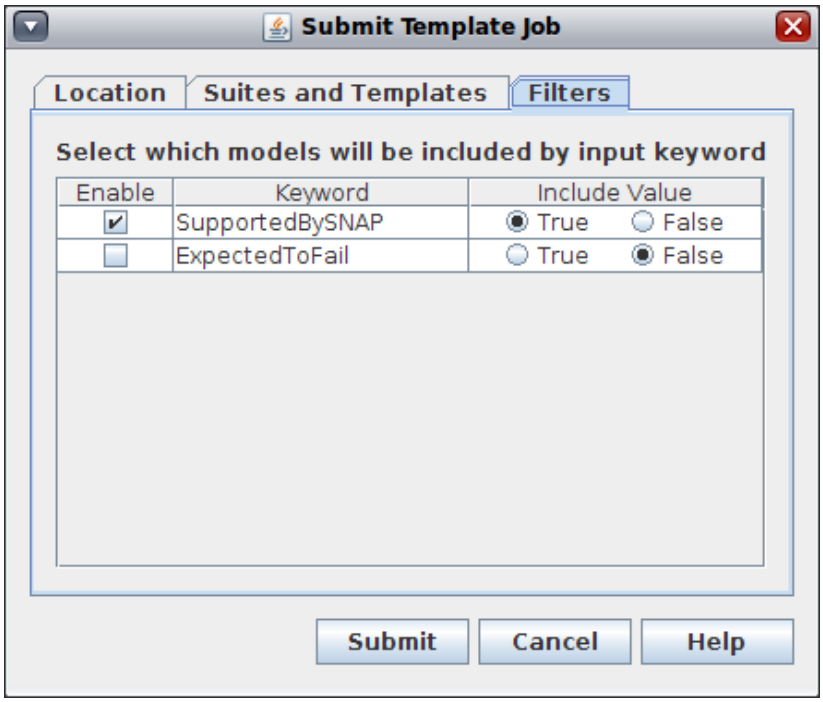

Figure 7.5. Submit Template: Suites and Templates Tab

The Template Job

Once all of the above fields have been set to the desired values, the Template job can be sent to the Calculation Server by pressing the **Submit** button. This will add the template run to the server's job queue. Once the job begins execution, it takes the following actions.

1. The job's batch file is generated. This substitutes the appropriate values into the init, model, and post batch sections, once for each suite, and once for each suite input for the model batch. Suite tokens are resolved before template tokens, and template tokens are interpreted as server paths: the resolved path is substituted in their place.

2. The job batch file is run with the server's ModelEditor installation.

Template jobs organize files into a simple directory hierarchy. A folder is created with a name in the form "*<JOB>_Template*". The batch file is created here with the title `template.bat`. All ModelEditor message generated while running the batch are stored in `template.screen` in the same directory. Another folder, *results*, is created in this directory, this folder contains all results created by a well-written template, and includes a folder for each submitted suite. After that, it is up to the template batch commands to determine what is placed into the suite folder.

Chapter 8. Other Features

This section details additional AVF features.

8.1. Importing TRACE ATF

An entire AVF Model can be created by importing an existing TRACE ATF installation. To do so, select **File** > **Import** > **TRACE ATF**. This displays a file dialog which may be used to select the directory in which the ATF is installed. This dialog also displays a list of check boxes which can be used to select which segments of the ATF are imported (see Figure 8.1, "ATF Import File Dialog"); these options are detailed below.

Note Although this process is described for TRACE ATF installations, it will work for any inputs organized as described.

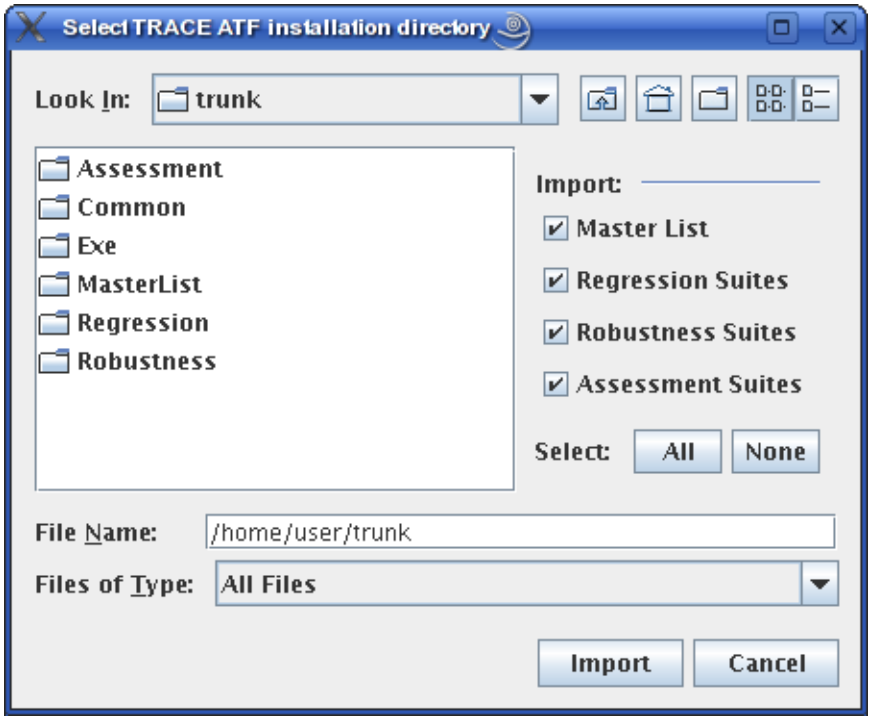

Figure 8.1. ATF Import File Dialog

- **Master List** - imports all files located in the `MasterList` directory of the selected location. Each file with an appropriate file extension is imported as a new input model. The accepted file extensions, and the input types they correspond to, are described below.
  - Files whose names end with the `.inp`, `.tpr`, and `.rst` extensions are imported as TRACE input files. Furthermore, any files ending with *.n*, where *n* is any positive integer, are also imported as a TRACE input file.
  - File names ending with `.i` are imported as RELAP5 input files.

  The importer ignores any files prefixed by a period character.

- **Regression Suites** - imports all suite directories located in the `Regression` directory of the selected location. Each suite is imported as a new suite object.

  Only directories containing the file .isSuiteDir file are imported. In such directories, the plug-in looks for a file named `fileList`, which it expects to follow the TRACE ATF file list syntax. This file is scanned to determine which input model definitions should be associated with the newly created suite.

  Note A suite's list of input models references existing input model components only. Thus, if no input model exists with a file name matching that found in the `fileList`, the reference cannot be created.

- **Robustness Suites** - imports all suite input files in the `Robustness` directory of the selected location. Each set of input files is imported as a new AV Script definition.

  Only directories containing the file .isSuiteDir are imported. In such directories, the plug-in examines all files to see if they match the allowed AV Script input file names (avpathdefs.txt, TestPath.txt, etc.). For each set of inputs found, an AV Script component is created with a name matching the input file prefix, or is left unnamed if the inputs use the default names.

- **Assessment Suites** - same as **Robustness Suites**, but for the `Assessment` directory.

Any errors encountered while importing the selected inputs will be reported to the ModelEditor's message window.

8.2. Editing Graphs from AptPlot

Figures and pages can be edited directly in AptPlot, if the SNAP configuration's *Plotting Tool* property indicates an AptPlot installation. Selecting the **Edit** button for the *Configure Page* property of an AV Script component will display a dialog listing the page definitions for that component. By selecting a page from that dialog, the AVF plug-in will use the page definition and any figures it references to determine the placement and decorations of AptPlot's displayed graphs. When closing AptPlot, the application will prompt for permission to export its current configuration. The plug-in then reads the exported file to configure the page and its referenced figures, creating new figures for any extra graphs. Figures are reconfigured by the properties of visible AptPlot graphs, and Pages are likewise adjusted by the appropriate fields of AptPlot's *Arrange Graph* dialog. Similarly, figures can be edited from the *Configure in AptPlot* property editor.

Note This feature overrides the placement settings of each referenced figure. If you do not want to override them, only edit empty page definitions.

Note This feature will **not** work with AcGrace. It depends on AptPlot extensions that are not present in AcGrace.

8.3. AVF Plug-in Batch Commands

The AVF plug-in supports a number of batch commands primarily intended to assist template jobs. These commands are as follows:

- **`AVF REPORT_CONFIG <config file> [report file]`** - Specifies that an HTML diff report should use the given configuration file. In template batch, the `${JobInfo}` token can be used for **`config file`** to always specify the correct location.

  If **`report file`** is specified, it indicates the location to which the next AVF diff report should be created. Using this method of indicating where to create the diff report is preferred over specifying the location with **`AVF DIFF_REPORT`**. Due to how the diff reports are constructed, if the report knows its final destination in advance, `${DiffLeftLink}` and `${DiffRightLink}` can be made into relative paths (when appropriate), facilitating report portability.

- **`AVF MKDIR <path>`** - Creates a directory with the given path. This should be used in template init batch sections to create any necessary directory structures. Unlike mkdir on certain systems, this command attempts to make all non-existent folders in its path.

- **`AVF DIFF <left> <right> <output> [label] [options*]`** - Diffs two files to the given location. If label is specified, these diffs will be aggregated into a section of a diff report. Options allows any number of supported diff options. Currently, only the **`NO_IDENTICAL_DIFFS`** option is supported: this tells the generated report to omit identical diffs from the report header.

- **`AVF DIFF_REPORT <output>`** - Creates an HTML report at the given location listing all generated diffs since the last **`AVF DIFF_REPORT`** command. If **`AVF REPORT_CONFIG`** has been previously used with a **`report file`** argument, this option requires no **`output`** argument. This will most likely be present exactly once in the post batch section of a template.

- **`AVF SUMMARY_CONFIG <target folder> <report name>`** - Indicates that generated diff reports should be summarized in a report at the indicated location.

- **`AVF SUMMARY_REPORT`** - Creates an HTML report summarizing all labelled diffs made since the last call **`SUMMARY_CONFIG`** command.

- **`AVF KEYWORD [input model] <keyword> <value> [label]`** - Sets the value of a keyword. If `input model` is specified, a keyword override is set on the indicated input model. The name of the input model must reflect the full relative path name of the input model (i.e. an input with the location `foo` and name `bar.inp` must be specified as `foo/bar.inp`). The the input model is not specified, the default keyword value is set. The specified keyword must exist in the Model Options keyword definitions. The value must be `TRUE`, `T`, or `1` for a `true` value, and `FALSE`,

`F`, or `0` for a `false` value. If `label` is specified, it must denote the model label attached to a model with the `OPEN` command.

- **`AVF KEYWORD CLEAR <keyword> [label]`** - Removes all input model overrides for a given keyword. The optional `label` has the same functionality as that of the standard **`AVF KEYWORD`** command described above.

- **`AVF KEYWORD CASCADE <keyword> [label]`** - Cascades keyword overrides to their restart input models. The optional `label` has the same functionality as that of the standard **`AVF KEYWORD`** command described above.

- **`AVF KEYWORD DUMP <file name> [label]`** - Writes a ModelEditor batch command file to the indicated location. This file will contain commands to completely recreate the model's input keyword setup for general keyword definitions and input model overrides. The optional `label` has the same functionality as that of the standard **`AVF KEYWORD`** command described above.

Appendix A. AV Script Execution

AV Script supports the execution of arbitrary commands after processing a case or before processing a figure. The core directory structure of an AV Script job must be understood before scripts, filters, and other applications used as commands can be written. This section details that folder hierarchy, and also how it differs from the structure used by the legacy AVF plug-in, before SNAP 2.0 and job streams were available.

Consider an AV Script stream with the following:

- Three cases: `Case1`, `Case2`, and `FomData`. `Case1` refers to a TRACE input file named `test1.inp` with a *Location* of `ShortRuns/Inputs`. `Case2` also refers to a TRACE input named `test1.inp` with a *Location* of `LongRuns/Inputs`. `FomData` refers to an ASCII data file named `fom.dat` with the *Location* set to `generated`.
- One figure, `Figure1`.
- One page, `Page1`.
- Two ACAPs, `Acap1` and `Acap2`. `Acap1` refers to a configuration file `fom.bat` with a *Location* of `FomInput`. `Acap2` refers to a configuration file `test.bat` with no *Location*.
- The AV Script is named `Sample`.
- The job is submitted with a run label of `Script01`.

When executed, the stream will execute in the specified target location with the directory structure indicated below:

```
Script01/
    Sample/
        Cases/
            Case1/
            Case2/
        Plots/
            Figure1/
            Page1/
        FOMs/
            Acap1/
            Acap2/
```

In this example, a stream named `Sample` is generated to run the AV Script job, with its relative location set to `Script01` (accounting for the top two directories). `Case1` and `Case2` are represented by TRACE steps with their *Relative Location* set to `Cases`. As a data file, the `FomData` case does not have a job step (in the job stream, it connects directly to AptPlot steps that require it). Consequently, `FomData` does not have a directory. Given the semantics of stream execution, this puts constraints on where generated case files must be placed.

When writing post-case or pre-figure commands that generate a case file, the result must be created in the input folder, in the location and with the file name defined by the case. If the example `FomData` case represents a generated data file and the specified input folder is defined as `/home/user/AVF`, the input file must be created at `/home/user/AVF/generated/fom.dat`.

Note In the above example, the `FomData` case does not receive a folder. However, if `FomData had` specified a post-case command, a `FomData` directory would be created. This is because an AVF step is used to run the command in its *Post Execution* phase (the AVF step itself will perform no other execution or processing). This directory exists solely for the "execution" of the step; the folder does not contain a copy of the data file represented by the case.

In legacy versions of AVF (those released prior to SNAP 2.0), the directory structure used for AV Script execution was substantially different. As a result, custom scripts and applications written for use as post-case and pre-figure commands in legacy versions of AVF will have to be adjusted before they can used with the current system. Given the same AV Script component, the legacy AVF job directory would be as follows:

```
Script01_Jobs/
    Sample/
        Runs/
            Case1/
                ShortRuns/
                    Inputs/
            Case2/
                LongRuns/
                    Inputs/
            ExpData/
        Batch/
        Data/
        Figures/
        FOMs/
```

First, notice that the run name is appended with the text '`_Jobs`'. This suffix is no longer necessary when working with job streams.

The `Runs` folder contained all files related to executing cases and storing data files. The files related to running `Case1` and `Case2` were still given their own appropriately named sub-directories under the `Runs` folder. However, the input locations (when present) had to be preserved under these directories due to the constraints of the legacy run-time system. As a result, the inputs were actually run in the `Case1/ShortRuns/Inputs` and `Case2/LongRuns/Inputs` directories. Also note that the `ExpData` file was copied into the `Runs` directory in its own folder, sans the relative location.

The `Batch` folder contained all AptPlot batch scripts used to generate figures and pages, the results of which were stored directly in the `Figures` directory. The `Data` folder contained ASCII data files for every data trace plotted on the figures. Finally, the `FOMs` directory contained all scripts, data files, and outputs related to running ACAP. Unlike the cases, these folders held no subdirectories to distinguish between AV Script definitions. Instead, file name prefixes were used to differentiate outputs.

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