



Technical Documentation Version 7.2

Model Files



Center for Advanced Decision Support for
Water and Environmental Systems (CADSWES)

UNIVERSITY OF COLORADO **BOULDER**

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Model Files

1. Introduction

RiverWare models are saved as ASCII files in the TCL (Tool Command Language). These files may be viewed and edited with a text editor outside of RiverWare, but their complexity and frequent format changes make direct editing difficult and dangerous. CADSWES neither recommends nor supports direct editing of model files.

2. Loading Models

Loading a new model clears any existing model on the workspace after prompting the user for verification. In the case of a blank workspace, no verification is needed. To load a model:

- Select **File** ➔ **Open Model...** from the main workspace menu bar or click on the Open Model File toolbar button. A File Chooser dialog appears.



The file chooser filters by the commonly used file extensions for Model Files:

- Model Files: *.mdl, *.mdl.gz *.rw and *.rw.gz (default)
- gzip Files (*.gz)
- All *

For RPL sets, the filters include

- Ruleset files (*.rls, *.rls.gz)
- Goal Set files (*.opt, *.opt.gz)
- Global function sets (*.gfs, *.gfs.gz)
- gzip files (*.gz)
- All (*)

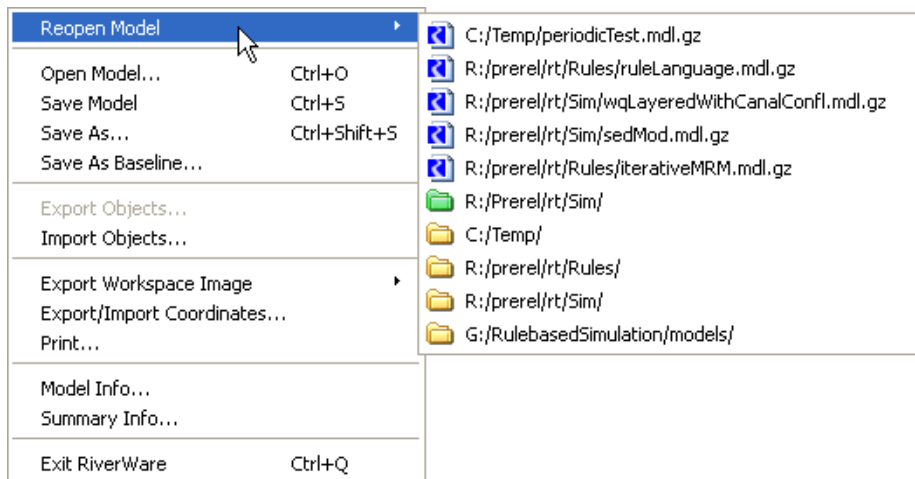
In addition, the user can use asterisks (*) as wildcards in the File name to further filter. Once a file has been selected and the Open button has been clicked, the cursor turns into an hourglass while the model is loading. Once the model is loaded a diagnostic window pops up with information regarding the date and time when the model was last saved, by whom the model was saved, and which version (release) of RiverWare.

If the model is configured to display background images in one or more of the Workspace views, then after the model is loaded, RiverWare reads and displays the background image files. While RiverWare is loading these images, a gray “placeholder” background is displayed in the appropriate views and an

animated “busy” icon is shown at the bottom of the Workspace. All of the usual workspace interaction is still possible while images are being loaded. Note that for many background images, the loading process is so brief that it is not noticeable.

2.1 Reloading Models

On the **Workspace**, the **File** ➔ **Reopen Model** gives the user previously opened models and directories. This is a quick and easy way to reopen a model. For rulesets there are options to **Reopen** and **Reopen and Load** previously viewed rulesets.



Listed in this menu are previously opened models and a list of recently accessed directories. Selecting a directory item (shown with a yellow folder icon) opens up a file chooser initialized to the specified directory. Also shown is a single user-configured “default” directory (for the specific type of file), based on an environment variable. This directory is shown as a green folder. If this is defined, the file chooser opened using the **File** ➔ **Open** menu will open to that default directory the first time within a RiverWare session. Supported environment variables include:

Type of File	Environment Variable
Model Files	RIVERWARE_DFLT_MODEL_DIR
Rulesets (RPL)	RIVERWARE_DFLT_RULESET_DIR
Optimization Rulesets	RIVERWARE_DFLT_OPTSET_DIR
SCT Files	RIVERWARE_DFLT_SCT_DIR

2.2 Save History, Run History and Model File Comments

When a model is loaded, a diagnostic window opens with the **Model Save History**. The model save history appears as a brown diagnostic message with information regarding the date and time when the model was last saved, the username of person who save the model, and the RiverWare version in which the model was last saved. The last save is part of the Model File Information and is stored with the

model file when a model is saved. The model save history is automatically updated each time a model is saved.

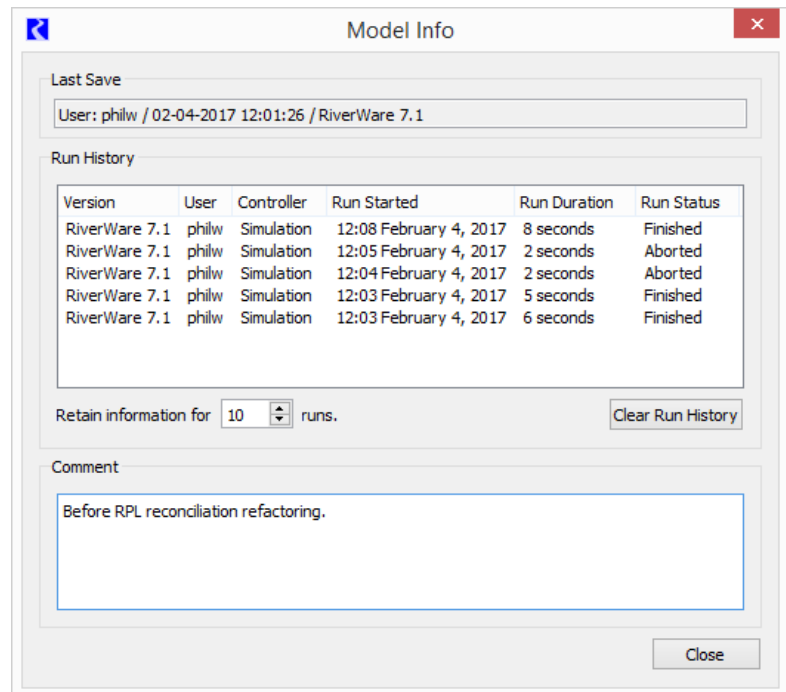
The save history is also accessible within the Model Info dialog accessed by selecting **File** ➔ **Model Info...** from the main RiverWare workspace. This dialog contains the **Last Save**, **Run History** and **Comment**:

Last Save: As described above, The **Last Save** shows a single line, as information for only the last save operation. This text can be selected and copied to the system clipboard.

Run History: The **Run History** panel lists a user specified number of run history records including

- Version
- User
- Controller used
- Time the run was started
- Run duration
- Run status

You can control how many run history records to save in the **Retain information for N runs** field. This panel has a **Clear Run History** operation to clear all of the records. Because the records are saved in the model file, specifying a large number of runs to save will make the model file larger. Clearing these can recover that space.



Note: Since run history items are stored in the model file, items for runs performed since the model load will be retained in the model file only if the model is subsequently re-saved.

The **Run History** panel allows you to right click and **Copy selected items** to the system clipboard. When you paste, you can either paste in a standard “formatted” (i.e. HTML table) or “unformatted” tabular form. A sample is shown below of the paste results for an email program:

Version	User	Controller	Run Started	Run Duration	Run Status
RiverWare 7.1	philw	Simulation	12:08 February 4, 2017	8 seconds	Finished
RiverWare 7.1	philw	Simulation	12:05 February 4, 2017	2 seconds	Aborted
RiverWare 7.1	philw	Simulation	12:04 February 4, 2017	2 seconds	Aborted
RiverWare 7.1	philw	Simulation	12:03 February 4, 2017	5 seconds	Finished

Version	User	Controller	Run Started	Run Duration	Run Status
RiverWare 7.1	philw	Simulation	12:08 February 4, 2017	8 seconds	Finished
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RiverWare 7.1	philw	Simulation	12:04 February 4, 2017	2 seconds	Aborted
RiverWare 7.1	philw	Simulation	12:03 February 4, 2017	5 seconds	Finished

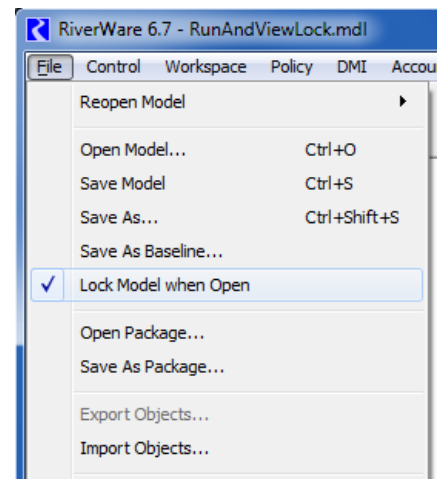
Comments: Enter comments about a model into the **Comment** section. Like the save history, this information is saved together with the model file. You can write comments or a brief description of a model.

Note: Model Info can be shown in a Model Report using the Model Information ([HERE \(Output.pdf, Section 4.2.3.9\)](#)) and Run History ([HERE \(Output.pdf, Section 4.2.3.19\)](#)) items.

3. Locking Models

If more than one user is working on a model, then you may want to lock the model when open to prevent others from simultaneously changing the file. To do this, use the **File** ➔ **Lock Model when Open** menu item and then **save the model**. Then a lock file is created in the same directory as the model. This lock file is also created when the model is opened.

The person who first opens the model is notified that they have locked the model file, which prevents write access by other instances of RiverWare. The lock file is in the same directory path as the model file and has the name of the model plus the “.lock” extension. When the model is closed, the lock file is automatically removed.



If the model is opened when a lock file already exists, the user is notified that the model file is locked by another instance of RiverWare. The time the lock file was created and the owner of the lock file is shown if that information is available from the system. Then, the model is in a state where the “Save” functionality is disabled. But, you can still make changes within the opened model and “Save As” a different name.

4. Saving Models

There are three ways to save a model in RiverWare, the default **Save**, **Save As...** and **Save As Baseline...**

Save: The default **Save** command re-saves the current model with the same name and in the same directory as it was last opened or saved. The save button on the workspace menu bar implements **Save**.

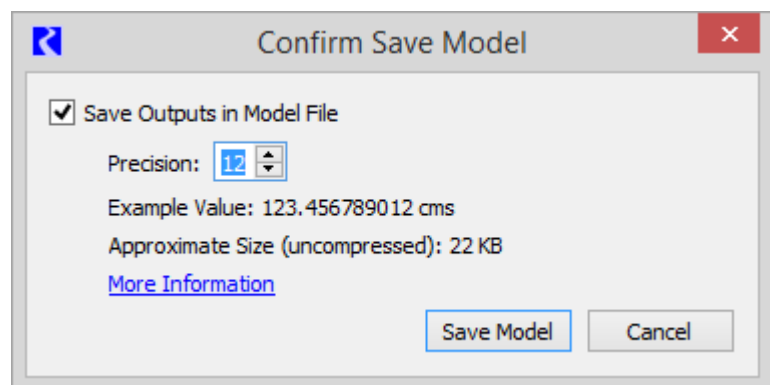


Save As: The **Save As...** command invokes a file chooser to select a new name and/or directory into which to save the current workspace. Once a **Save As...** has been performed, any subsequent **Save** will use the same file name and directory until a new model is loaded, the RiverWare session ends, or a new **Save As...** overrides it.

When using **Save As...**, after you specify the file, a confirmation will allow you to specify whether to **Save Outputs in the Model File** and the **Precision** with which to save outputs. Both are described below.

Save As Baseline: The **Save As Baseline...** is used to create an unalterable baseline model for generating alternate simulation scenarios with the Scenario Manager.

Creating alternate scenarios is described in greater detail in the Scenario Manager section.



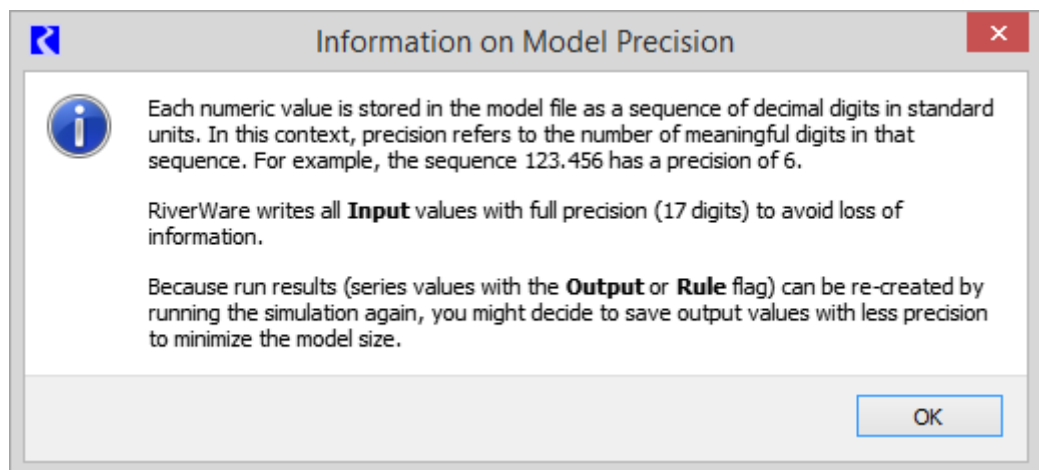
Note: You can save a model for use in the RiverWare Interactive Scenario Explorer (RiverWISE) using the **Export to RiverWISE** option. This is described [HERE \(RiverWISE.pdf, Section 2\)](#).

4.1 Saving Output Values

As models can be large and take up significant disk space, several options are available for minimizing the saved model size. One option is whether or not to save the model with its calculated output values (series values with the **Output** or **Rule** flag). The model file size is greatly reduced if the output values are not saved. This is the recommended option for saving small, frequently run models. Since only the input values are required to reproduce a run, the output may be regenerated by re-running the simulation once the model has been re-loaded. But, if your model is large or takes a long time to run, you will likely want to save results, so that you can look at output values without re-running. Only **Save As...** prompts for whether or not to save output values. The selected choice is then applied for all subsequent **Save**'s until a new model is loaded, the RiverWare session ends, or a new **Save As...** overrides it. The default **Save** behavior for a new session or model is to save output values. All series slot values with the **Input** flag (**I**, **Z** or **i** flag) and all values on non-series slots are always saved in the model file with full precision (17 digits).

4.2 Precision for Outputs

Precision refers to the number of meaningful digits in a numeric value. In the **Save As** confirmation, if you select the option to **Save Outputs in the Model File**, you will also have the option to set the



Precision with which to save output values. You can save outputs with 1 to 17 digits of precision.

Saving with higher precision will increase model size. In the interface, click the **More Information** link for additional information about precision. All series slot values with the **Input** flag (**I**, **Z** or **i** flag) and all values on non-series slots are always saved in the model file with full precision (17 digits).

4.3 Naming conventions

Although there is no required extension for RiverWare model files, the “.mdl” is often used to identify a file as a model file and a “.rls” is used to identify a ruleset file.

Further, files that end in the “.mdl” suffix will display the RiverWare model file icon in windows explorer. Double clicking the icon will open the latest installed version of RiverWare and load that model.

 C:/Temp/periodicTest.mdl

4.4 Compressing Model Files

Model files may be automatically compressed when they are saved by giving their file name a “.gz” extension (the gnu zip compression). When the model is re-loaded, the extension is detected, and the file is uncompressed automatically. Manually compressing and uncompressing files in WINDOWS is accomplished using any zip program such as WinZip. Manually compressed model files which do not have a “.gz” extension will not be recognized by RiverWare, and will produce an error upon loading. Thus, the “.mdl.gz” is often used to identify a file as a model file and a “.rls.gz” is used to identify a ruleset file when compression is desired.

In Windows, the association between RiverWare and the “.gz” file extension has not been made because of the general nature of the “.gz” extension,. You can manually associate “.gz” files with RiverWare so that RiverWare will automatically open when you double click a “.gz” file. To do this (in XP), right click on a .gz file and select **Properties**. Then click the **Change** button and select RiverWare from the list of files.

4.5 Backup files when manually saving

The first time a model is saved to an existing file, a backup of the original file is made. This prevents data loss if an overwrite is unintentional or the save process fails and the model is corrupted. The backup file has the same name as the original with a “.bak” extension. A single backup file is made for each model. When upgrading to a newer version of RiverWare, the backup model file name will contain the previous RiverWare version number to the model file (e.g., SampleModel.6.5.mdl.gz). This ensures that there will be a model file compatible with RiverWare version 6.5 until the user explicitly removes it.

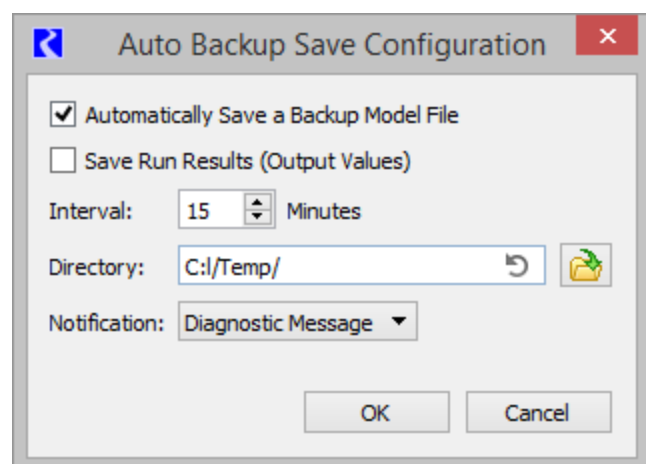
4.6 Automatic Backup Save

The automatic backup save utility saves a backup file in a temporary directory at a defined interval. It is strictly a backup save of the model file, it never overwrite the model that the user opened.

The feature is configured from the workspace **File** ➔ **Automatic Backup Save Configuration...** menu item, which opens the **Automatic Backup Save Configuration** dialog:

From the dialog, you configure:

- Whether the model file should be Automatic Backup Saved. If unchecked, the remaining fields are irrelevant.
- Whether the Automatic Backup Saved backup file should contain run results (output values).
- The Automatic Backup Save interval. (More on this [HERE \(Section 4.6.1\)](#).)



- The Automatic Backup Save directory, by default the user's temporary directory. (More on this [HERE \(Section 4.6.2\)](#).)
- The Automatic Backup Save notification:
 1. **None:** RiverWare beeps at the beginning of the Automatic Backup Save and provides no further notification.
 2. **Diagnostic Message:** RiverWare beeps at the beginning of the Automatic Backup Save and displays a diagnostic message upon its successful completion. A single message is posted in green if successful.
 3. **Status Dialog:** RiverWare opens a notification window at the beginning of the Automatic Backup Save and closes the window upon its successful completion. If the **Automatic Backup Save** is unsuccessful the notification window remains open and displays the error.

In all cases, if the **Automatic Backup Save** is unsuccessful an error message is displayed and Automatic Backup Save is disabled (with a red highlight message in the diagnostics):

```
Auto-saving the model file failed: Cannot open "C:\Bad\Directory\Model.mdl" for writing: No such file or directory
```

```
Automatic Backup Save has been disabled for model file(s)
```

If you want to see additional messages on the automatic backup save process, turn on **Workspace** ➤ **Model Load/Save** diagnostic category.

4.6.1 Automatic Backup Save Interval

RiverWare performs activities during which an **Automatic Backup Save** isn't appropriate, for example during a simulation. If an **Automatic Backup Save** comes due during such an activity the **Automatic Backup Save** feature enters "retry mode":

- The **Automatic Backup Save** interval is set to one minute.
- Within a minute of the activity's completion the model file is Automatic Backup Saved.
- The **Automatic Backup Save** interval is restored to its configured value.

4.6.2 Automatic Backup Save Directory

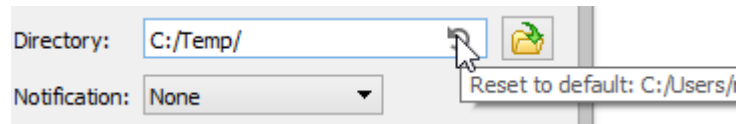
By default the Automatic Backup Save directory is the user's temporary directory. On recent versions of Windows this is:

```
C:\Users\\AppData\Local\Temp
```

It's unlikely a user will have write permission for another user's temporary directory. To facilitate sharing models, if a user loads a model file with Automatic Backup Save enabled and doesn't have write permission for the Automatic Backup Save directory, the Automatic Backup Save directory is changed to the user's temporary directory (with a green highlight diagnostic message):

Automatic Backup Save directory has been changed to: C:/Users/Voltaire/AppData/Local/Temp/

Finally, because the **Automatic Backup Save** directory might not be obvious to all users, the configuration dialog has a reset button which resets the Automatic Backup Save directory to the user's temporary directory as shown in the screenshot



4.6.3 Open Automatic Backup Save Model Menu Item

If the model file has been Automatic Backup Saved the backup file can be opened by selecting the **File** ➤ **Open Automatic Backup Save Model** menu item. (If the model file hasn't been Automatic Backup Saved, the menu item is hidden.) This is equivalent to selecting the **File** ➤ **Open Model...** menu item, navigating to the Automatic Backup Save directory and selecting the backup file.

4.6.4 Backup File Name

If the model file name ends with either .mdl or .mdl.gz, the suffix is preserved and the backup file name is <file name>~1~.mdl or <file name>~1~.mdl.gz. Otherwise the backup file name is <file name>~1~. If there isn't a model file loaded from a named file, the backup file name is Workspace~1~.

5. RiverWare Packages


A model and associated files can be grouped together and saved as a RiverWare “package”. These always contain a model file and can also contain ancillary files including:

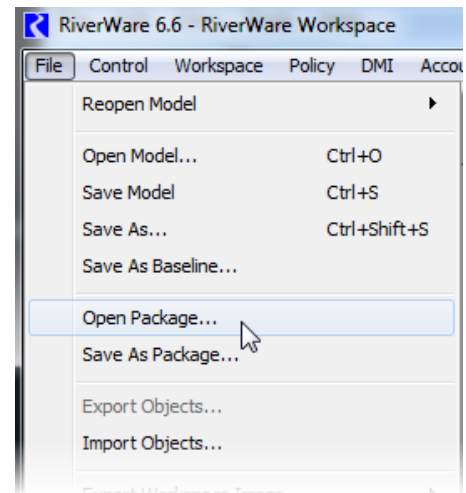
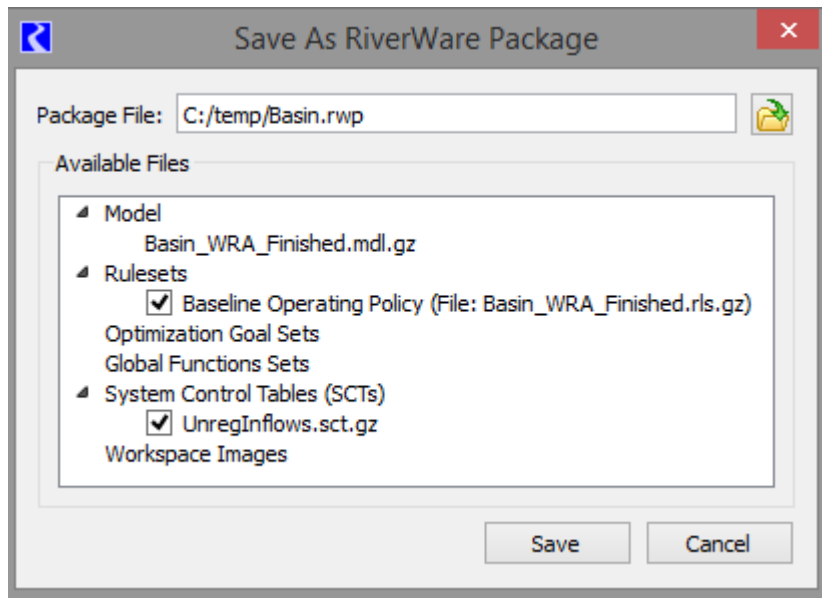
- Rulesets
- Global Functions Sets
- Optimization Goal Sets
- System Control Tables (SCTs)
- Workspace Images,

A package is used to group the files together into one file and compress them. This functionality is often used to share a set of files with other users. For example, you can package all the files used with a model and send them to a co-worker. The co-worker opens the package to create all the files in the destination directory and then RiverWare automatically opens them.

Packages are accessed through the workspace's File menu. The **Save As Package...** and **Open Package...** menus on the workspace File menu allow you to work with packages:

5.1 Saving a Package

Use the **Save As Package...** menu to save a set of files together as a package. This opens a dialog where you specify the package file name. Use the  button to use a file chooser or type in a file path and name. Also, choose the components to include. By default, all available files will be checked.



The model is not checkable and is always included in the package. This includes the model file and any RPL sets that have been configured to be saved into the model file itself. Click [HERE](#) ([RPLUserInterface.pdf, Section 1.3](#)) for more information on embedding sets in a model.

RPL sets (Rulesets, Goalsets, and Global Functions Sets) that are open and that have been saved as files will be listed as individual options for inclusion in the package. If a set has been created, but not saved to a file, you will get a warning message that the set must be saved to be available in the list.

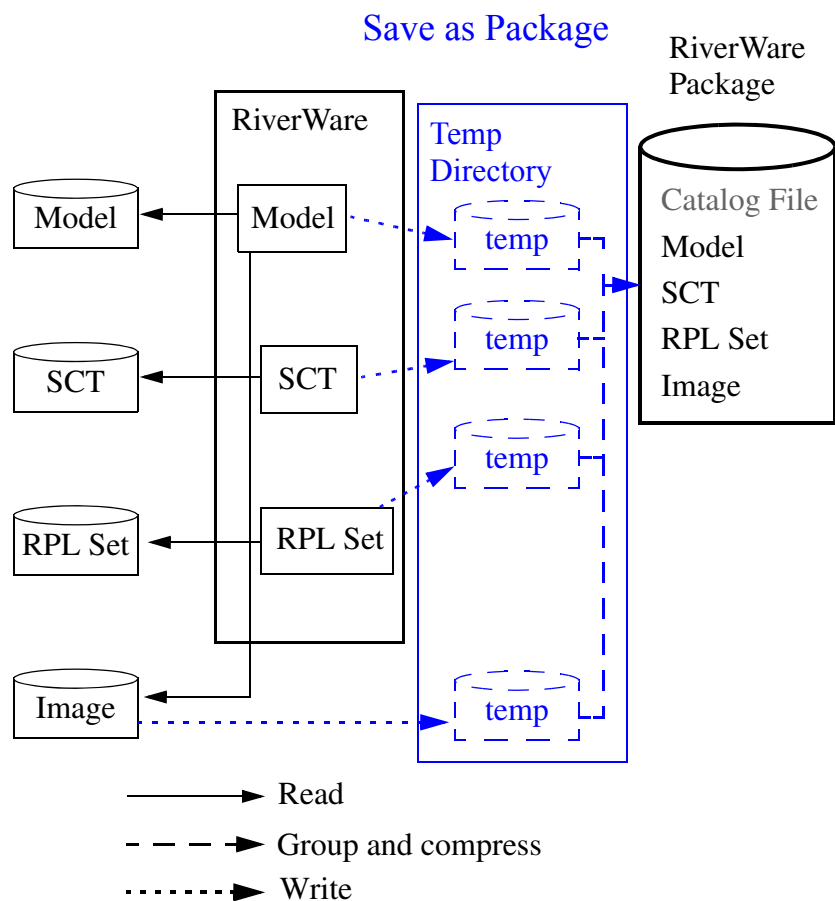
SCTs that are open and that have been saved as files will be listed for inclusion in the package under the SCT category. You can individually select whether or not to include each SCT from the list. If an SCT has been created, but not saved to a file, you will get a warning message that the SCT must be saved to be available in the list.

If simulation, accounting, or geospatial images are used in the model, they are available as options for inclusion in the model package.

In creating the package, all selected files will be saved to a temporary directory for packaging as shown in the diagram to the right. When packaging is completed, these files and the temporary directory will be deleted, leaving just the specified package file.


Although not mandatory, we recommend using the suffix “.rwp” to represent RiverWare packages.

If you have made changes to any of these items since they were last saved to files, the copies made for the package will include these changes, but the original files will not. You must save them in normal RiverWare operation to save the changes to the individual files. But, creating a package saves everything as it currently appears in the session without affecting any of the individual files on disk.

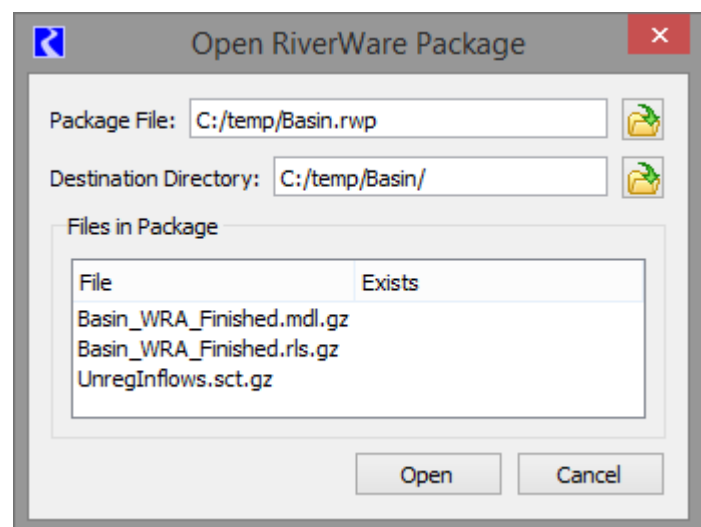


5.2 Opening a Package

Use the **Open Package** option in the workspace **File** menu to unpacks all the files and then open those files into the RiverWare session. This menu opens a dialog in which you specify the package file to open and a destination directory to which the files will be unpacked.

The package file can be chosen via a file chooser  or the name can be typed into the **Package File** line (environment variables are supported). Similarly, the directory where the files will be opened to can also be specified by selection or by typing.

Once the package file is chosen, a default “**Destination Directory**” is shown, which consists of a subdirectory using the name of the package. Change the directory as desired.



The **Files in Package** list displays the names of the files that are in the package. If files corresponding to these names already exist in the specified **Destination Directory**, this will be indicated with a “yes” in the **Exists** column of the list. If any of the files currently exist, the message at the bottom appears warning that the existing files will be overwritten when opening the package.

When the package is opened, files in the package will be extracted to the specified directory. The model file will be loaded, and RPL sets and SCT files will be opened. If a RPL set was loaded when the package was saved, it will be reloaded when the package is opened. The workspace images loaded with the model will now have the extracted image files as their source. Extracted files are persistent in their directory even after the RiverWare session is closed, so are just like any other set of RiverWare files. The files can be repackaged at any time into the same, or a different package file using the “Save as Package” functionality described above.

