

RiverWare SCT Import Paste

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This document describes a design and development issues for a new **Import Paste** function for pasting numeric values from an external spreadsheet application (e.g. Microsoft Excel) into a RiverWare SCT via the **system clipboard**.

The “opposite” operation, **Export Copy**, for copying data from an SCT and pasting it into an external spreadsheet application is already supported by SCT, and is also described in this document.

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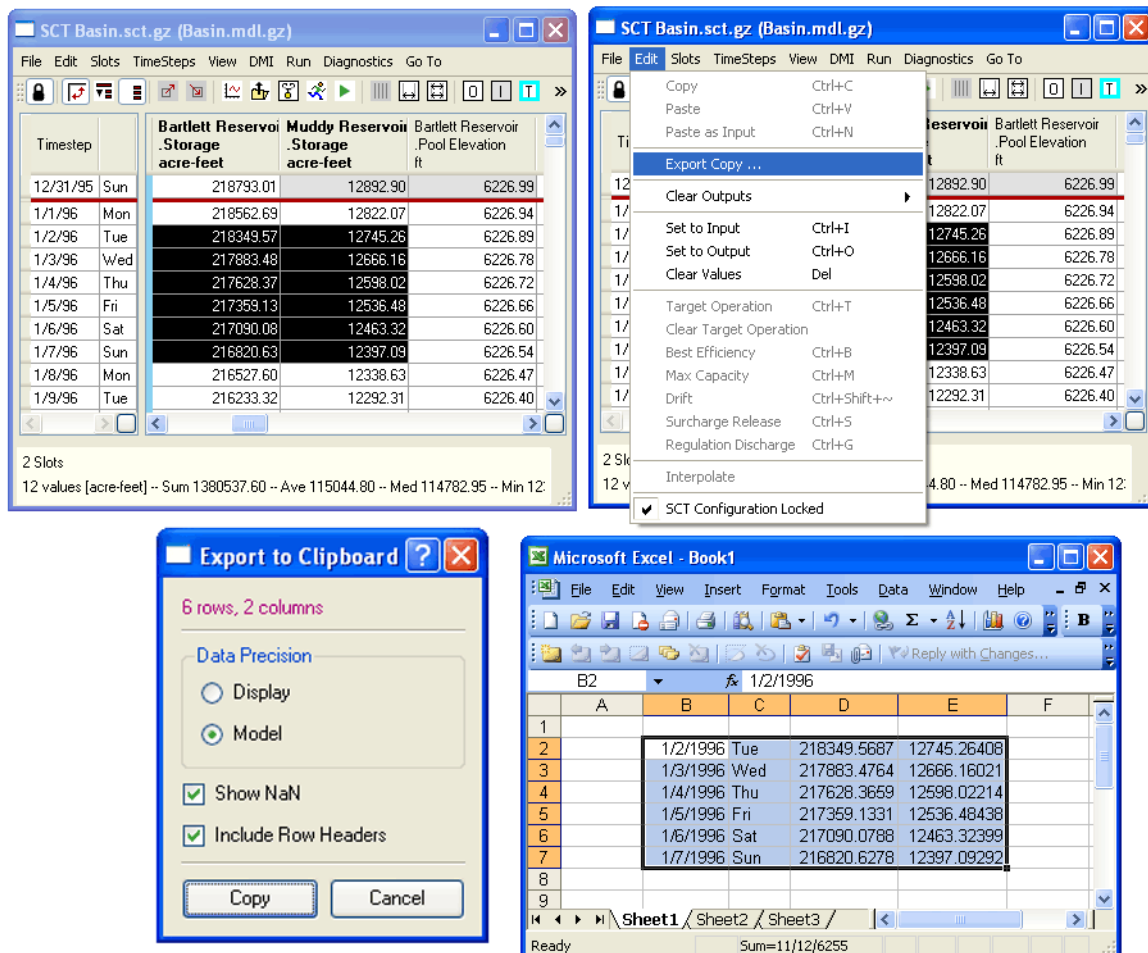
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1.0 Overview of the current Export Copy function (SCT to system clipboard)

The RiverWare SCT 2.0 (Qt, since RiverWare 4.4, February 2004) included a capability of copying a rectangular numeric data selection from the SCT to the system clipboard, for subsequent pasting into some other application, e.g. Microsoft Excel.

The screenshots below illustrate:

1. Making a rectangular cell selection in the SCT
2. Invoking the “Edit >> Export Copy ...” function from the SCT menubar
3. Choosing the Export options: Data Precision, whether “NaNs” should be copied as blank cells or as “NaN”, and whether or not Row Headers are included as the leftmost columns of the copied data.
4. The result of pasting the SCT data into Microsoft Excel



2.0 Differences between Export Copy and Import Paste Operations

Issue	Export Copy (SCT --> Clipboard)	Import Paste (Clipboard --> SCT)
User data selection error.	Not a concern. Export Copy has no effect on RiverWare data.	Import Paste changes RiverWare data. Since there is no “Undo” in RiverWare”, and implementing Undo for this feature is not being considered, there should be some provisions for the user to VISUALLY CONFIRM the set of SCT cells which will be effected by the Import Paste operation. <u>Related:</u> We will support Import Paste only in the SCT’s two Non-Aggregated Views (i.e. in both axis orientations) -- and not in the two aggregated views (where both “Summary” and “Detail” cells are presented). The Import Paste will be disabled in views not supporting the operation.
Data Precision	Explicit option. The numeric data being copied from the SCT is internally represented as double precision floating point values. The “Export to Clipboard” dialog box supports two options for converting that data to decimal character strings before it is copied to the system clipboard: (1) Display precision (as displayed in the SCT) or (2) Model precision (at least 12 decimal digits of precision).	Not a concern. The data being imported from the system clipboard is encoded in decimal character strings -- so we just interpret that with the given precision (up to the limit supported for double precision floating point values).
“NaN” values	Explicit option. The “Export to Clipboard” dialog box supports the option of “NaNs” being sent to the system clipboard as blank cells or as “NaN”.	Not a concern. We will interpret blank cells and “NaN” (in any character case) in the numeric data in the system clipboard as “NaNs”.
Auxiliary data, e.g. Slot names, Date/Times, etc.	Explicit option. The Export Copy function allows the user to either include or exclude the Row Headers currently displayed as initial leftmost columns in the data sent to the system clipboard.	Not a concern. We will support only the importing of actual numeric series values. Any non-numeric data (with the exception of “NaN” in any letter case) will prevent the Import Paste from being enabled (if that can be assessed efficiently enough) OR will at least prevent the operation from being performed (with an error message being displayed).
Invalid data in the clipboard.	Not a concern. Since we are generating the data, we can insure that the data will be in the expected data format. THE FORMAT is straight forward: ASCII encoded text representing a rectangular selection of data (possibly a single value, i.e. 1x1), with TAB characters between the individual values within each row, and each row terminated with a NEWLINE character.	The system clipboard can contain all sorts of data, including images and other binary-encoded objects. When the clipboard contains data not conforming to the <i>format described to the left</i> , we will either disable the Import Paste operation, or report the situation to the user and abort the operation. <i>See also the discussion in the cell above.</i> A function to analyze the state of the clipboard data format will be needed for this development.
Series Value Flags (e.g. “Input”, etc.).	Not supported. Flag values are ignored for Export Copy.	Imported numeric values will be flagged as Inputs , except for NaNs which will be flagged as Outputs. Of course, this applies only to Series-like Slots supporting Flags (e.g. not TableSeriesSlots).

Issue	Export Copy (SCT --> Clipboard)	Import Paste (Clipboard --> SCT)
Read-Only RiverWare values / Value Assignment Errors.	Not a concern.	As with assigning numeric values to Slots, certain errors can occur (such as attempting to assign a value to a Read-Only Slot) which will be reported in the Diagnostic Output. <u>An error in a particular cell will not abort the import operation for the assignment of values to other cells.</u> [TENTATIVE]. It would be difficult to roll-back the effects of assigning values to cells since changes can propagate to other Slots. We will at least confirm that the values in the clipboard represent numeric values (as discussed in previous items).

3.0 Import Paste Operation Design

The second operation below will be added to the SCT's Edit menu. *(See screenshots earlier in this document showing the menu before this addition) ...*

- Export Copy ...
- **Import Paste ...**

The "Import Paste" operation will be enabled:

1. **Only in the Non-Aggregated SCT Views** (where there are only "detail" cells -- no "summary" cells).
2. **Only if at least one cell within the SCT is selected.** That cell will be the top-left anchor for the "destination" of the paste operation.
3. Only if the **SCT's cell selection is rectangular** (as is a single cell).
4. [Depending on the efficiency of this query] ... **Only if the system clipboard contains a valid rectangular set of numeric values.**

Optional Feature [Note 3-1-2006: Phil recommends that we don't bother with this] ... If more than one SCT cell is selected, we could limit the effect of the paste operation to the selected rectangle.

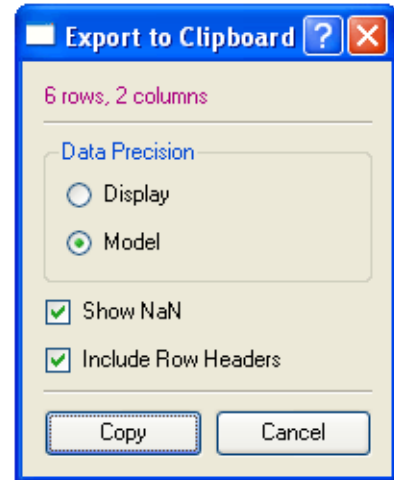
Upon operating the **"Edit >> Import Paste ..."** menu operation, the following occurs:

1. The system clipboard is evaluated for suitability for the numeric paste operation. It must be an ASCII text selection representing a scalar or matrix of decimal values, in the format described above. If this test fails, the user is notified and the operation is aborted.
2. The set of SCT cells which would be effected by the Import Paste operation are **ornamented with a cross-hatch pattern**, based on the geometry of the value rectangle. (The appearance would be similar to the "copied cell" ornamentation used to indicate the cells in the SCT's copy buffer).
3. The "Import from Clipboard" dialog box is shown. *(See next page).*

The “**Import from Clipboard**” dialog box is similar to the “**Export to Clipboard**” dialog box (*see image to the right*), but addressing the fundamentally-different issues particular to *pasting values* into the SCT. It contains:

1. A one-line text description of the dimensions of the clipboard data, e.g. “**6 rows, 2 columns**”
2. [OPTIONAL -- TO BE CONSIDERED]: A small uneditable QTable (with scrollbars if necessary) showing the numeric data in the clipboard.
3. Button: “Paste”
4. Button: “Cancel”

“**Round Tripping**” data from an SCT, and back into an SCT through the system clipboard -- **using the Export Copy and Import Paste operations** -- should work well. However, even when “model precision” is selected for the Export function, there will be **minor precision loss** (for most purposes, trivial) since the export and import operations are done with decimal values in user display units (rather than with binary values in standard internal units).



4.0 Development Task Estimates

Estimate (Phil Hours)	ToDo (Phil Hours)	SCT “Import Paste” operation Development Task
5		Analysis -- This document. [Done]
8	8	Interpretation of the data in the system clipboard; checking suitability for “Import Paste” operation. Computation of a 2D array of numeric values.
2	2	Enabling / Disabling “Import Paste” operation
15	15	GUI graphics: Import Paste Target Cell Ornamentation
10	10	GUI widget work: “Import from Clipboard” dialog box.
10	10	Paste operation -- assigning 2D array (from system clipboard) to SeriesSlot values; Error handling & reporting.
50	45	TOTAL (Phil Hours)

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