# Smart Links Tool -- Dialog Development for RiverWare 6.3

#### Authors: Phil Weinstein, David Neumann, Patrick Lynn, Edie Zagona / CADSWES

This document provides a basic functional overview and development outline for the new RiverWare Smart Links user interface.

## 0.1 Document Status

11-15-2012: Initial writing; Ready for review.

## 0.2 Related Document

Smart Link Tool -- Requirements / November 2012 David Neumann, Edie Zagona, Patrick Lynn R:\doc\Linking\SmartLinkToolRequirements.fm

## 0.3 Contents

1.0	Functional Overview .	•••••		-
2.0	Initial Completed Develo	opment		ŀ
3.0	Remaining Development	t Tasks		,
4.0	Development Estimates	•••••	5	j

## 1.0 Functional Overview

See the "Requirements" document for an overview of the use of the Smarts Links feature.

The Smarts Links dialog is generally shown through an operation on a pair of Simulation Objects on the RiverWare workspace.

Illustrated here is the "hook" provided for initial development; the "Smart Links..." context menu item is functional when exactly two objects are selected. Additional design is needed for support of this feature for Elements Objects on Aggregate Objects.



Note: Gnats 5257 -- Multiple selected-object context menu operations don't work when Icon Positions are locked -- was filed in the course of the initial development of this feature.

K	Smart Links Tool						
	CentralToIsletaGWArea2River						
	Smart Link Set / Slot Link Status Slot						
	Elevations     M     Previous Adjacent Elevation Right     M     Previous Water Table Elevation     M     Previous Water Table Elevation     M     Previous Adjacent Elevation Left     M     Salit Conc Lower Previous     M     Salt Conc Lower Previous     M     Salt Conc Lower Right Previous     M     Salt Conc Upper Previous     M     Salt Conc Upper Previous     M     Salt Conc Upper Right Previous     M     Salt Conc Upper Previous     M     Salt Conc Upper Right Previous     M     Storage Proportion Previous     M     Storage Proportion Right Previous     M     Storage Proportion Right Previous     M     Storage Proportion Previous						
	Create Selected Links OK Apply Close						

The image above is a mockup (adapted from the completed initial development). Two differences *being considered* for the finished feature are:

- 1. We might prefer to right-align the slots in the left column -- with the slot icon to the right of the slot name text. This may better visually tie together the connection (link) between the left-side and right-side slots which represent a link. This will require custom drawing of list items.
- 2. We are not sure about the use of the green-plus and red-minus icons on the "Create" and "Remove" buttons. In other use, these icons generally add or remove items from a displayed list, rather than altering the state of visual items. However, a benefit of these symbols is that they provide a "color key" for the line colors in the "Link Status" icon.

(Note also that the "Other Existing Slots" item shown above is intended to be "Other Existing Links").

The initial order of the two selected objects (left side and right side) is generally based on the relative positions of the object icons in the workspace, as follows:

- If the horizontal positions of the two object icons is approximately equal (e.g. within 10 pixels), the vertical positions are used: the upper object is placed on the left side of the dialog.
- If the horizontal positions of the two object icons is sufficiently different, then the left-most object is placed on the left side of the dialog.
- Possible exception: In the less common case of heterogeneous object types (e.g. power reservoirs and thermal objects), we may choose to hard-code the order of certain combinations (and disable the "swap" button), e.g. the thermal object always being on the rights side. This would be considered to avoid the necessity of configuring "double" entries in the link topology dictionary (or a workaround which would require more complex processing of the definitions in that dictionary).

The **double-arrow** (icon) button swaps the two objects (left side / right side). It will be disabled when there are any un-applied link "additions" or "removals", or if (for some reason based on object types) the reversed order is not supported. Swapping the two objects recomputes the "Link Set Group" combo box and the link treeview.

The combo box at the top of the dialog is the **"Link Set Group" combo box.** It is populated with each of the Link Set Groups in the link topology dictionary (i.e. collection of Link Sets sharing common object types, message selections, and link direction descriptor) matching the two objects. It will be disabled when there are any tentative (un-applied) link "additions" or "removals".

The **Link Treeview** shows the possible links between the two objects from the currently selected Link Set Group, organized by Link Set (top level treeview items) PLUS other existing links between the two objects. A horizontal line in the "Link" column indicates the following:

- Thin black line: An existing link.
- Thick green line: A tentatively added link.
- Thick red line: A tentatively removed link.

The Create Selected Links and Remove Selected Links buttons operate on the selected set of link items (row items). These tentatively add or remove a link (or cancel a tentatively removed or added link). The proposed changes are applied only if the user subsequently presses the "OK" or "Apply" button. Added links will then become "existing links" and removed links will become blank (i.e. the absence of a link). Each of these buttons are active only when at least one of the selected link items would be changed by the operation; so, clicking either of these buttons causes it to become disabled.

The "OK" button applies the link changes and dismisses the dialog.

The **"Apply" button** applies the link changes. The swap button and the Link Set Group combo box are re-enabled (if those controls are disabled only because of the existence of un-applied changes). This is enabled only when there are pending link "additions" or "removals". (So, clicking it causes it to become disabled).

The "**Close**" **button** dismisses the dialog. If there are any un-applied changes, a warning dialog is shown, allowing the user to abort the "close" operation to continue operating the Smart Links Tool dialog.

# 2.0 Initial Completed Development

We spent just a few days laying out basic *display features* for the Smart Links Tool Dialog, in part, to support the independent work to define the Smart Link Topology Dictionary representing the links required for use with particular method selections on particular engineering objects.

The Links treeview was implemented as a Qt4 model-based QTreeView subclass in order to support the possibility of custom rendering of link items.

The Link Set Group combo box and the Link Treeview are dynamically built from data provided by a hard-coded test instance of the Smart Links Topology Dictionary public interface in the RiverWare Link manager. This provides definitions for the Groundwater link example shown in section 5.1 of the requirements document.

The draft version of the Smart Link Topology Dictionary data model can be seen at these URLs:

- http://cadswes2.colorado.edu/~philw/2012/SmartLinking/Data/SmartLinkSet\_hpp.txt
- http://cadswes2.colorado.edu/~philw/2012/SmartLinking/Data/LinkMgr\_cpp\_exerpt.txt

The displayed slot icons function to confirm that the slots to be linked -- those involved in the current method selections of the two selected simulation objects -- *actually exist* on the respective objects. When those slots are missing, a question mark is displayed in place of the corresponding slot type icon. (*See the following screenshot*). This may be useful during the development of the Smart Link Topology Dictionary data, but is not expected to occur during actual operation of the finished feature.

Smart Links Tool					
	CentralToIsletaGWArea2East	t side to Centra	CentralToIsletaGWArea2River		
Sr	mart Link Set / Slot	Link Status	Slot		
	<ul> <li>Elevations</li> <li>Previous Adjacent Elevation Right</li> <li>Previous Water Table Elevation</li> <li>Salinity</li> <li>Salt Conc Lower Previous</li> <li>Salt Conc Lower Right Previous</li> <li>Salt Conc Upper Previous</li> <li>Salt Conc Upper Right Previous</li> <li>Salt Conc Upper Right Previous</li> <li>Storage Proportion Previous</li> <li>Storage Proportion Right Previous</li> </ul>		<ul> <li>Previous Water Table Elevation</li> <li>Previous Adjacent Elevation Left</li> <li>Salt Conc Lower Left Previous</li> <li>Salt Conc Lower Previous</li> <li>Salt Conc Upper Left Previous</li> <li>Salt Conc Upper Previous</li> <li>Storage Proportion Left Previous</li> <li>Storage Proportion Previous</li> </ul>		
4	Create Selected Links	cted Links	OK Apply Close		

## 3.0 Remaining Development Tasks

See the "Requirements" document for more information about these features.

## 3.1 Smart Link dialog initiation from the Workspace

The initially developed test hook just causes a "beep" when the number of selected objects is something other than "two". See the Requirements document for the message dialogs which need to be shown in these cases, and when Smart Links cannot be applied to the pair of selected objects.

Controls need to be designed and implemented to support Element Objects on Aggregate Objects. (Only the Aggregate Object is represented as an icon on the workspace).

The initial object orientation logic described above has yet to be implemented.

## 3.2 Custom Rendering

A Qt4 QAbstractItemDelegate subclass needs to be defined to provide custom drawing for the Link Status column (horizontal lines) and for right-aligning and reversing the order of the slot names and type icons in the left-side column.

We may also want to implement some sort of ornamentation to indicate non-multislot slots having a link to a slot on a different simulation object.

## 3.3 "Other Existing Links" item support

The Link Treeview internal implementation will be expanded to support the "Other Existing Links" section. These links do not "come from" the Smart Link Topology Dictionary. Rather, they are other existing links between the two objects. If they are removed by the user (after applying that removal), these items disappear from the treeview.

## 3.4 Link Editing Operations

The Link Treeview internal implementation will be enhanced to represent the "pending creation" and "pending removal" states on link items. The Creation, Removal, and Apply-change operations will be implemented.

## 4.0 Development Estimates

Task	Days	Description
3.1	1.5	Smart Link dialog from the Workspace, including design of Element object selection
3.2	0.5	Custom Rendering
3.3	1.0	"Other Existing Links" item support
3.4	1.0	Link Editing Operations
TOTAL	4.0	[Days]