Accounting Visualization Functional Requirements

Kenny Gruchalla

1.0 Introduction

This paper presents the functional requirements for providing a visualization capability of the accounting network in RiverWare. RiverWare supports two parallel representations of water: physical water and paper water. The physical water is modeled in the simulation objects, and the network of the physical water is displayed on the workspace through simulation object icons and links. The paper water represents water types and ownership and is modeled in the accounting network. RiverWare does not provide any visualization of this accounting network. Currently, the only mechanism to explore the accounting network is through large tables provided on various accounting dialogs.

This paper is a draft document of the accounting visualization requirements. Input from and discussion with the RiverWare accounting userbase is still needed. This is a requirements document; therefore, it only describes "what" needs to be done. The "how" will be described in the design document.

2.0 Functional Requirements

2.1 The RiverWare workspace shall provide a graphical representation of the of the accounting network.

2.1.1 The workspace shall be capable of depicting accounts and the supplies that connect the accounts.

2.1.2 The workspace shall be capable of depicting the directional supply-demand relationship between accounts.

2.1.3 The workspace shall be capable of depicting the association of each account with the simulation object on which the account resides.

2.1.4 The workspace shall be capable of depicting exchanges.

2.1.5 The workspace shall be capable of depicting release types and destinations. Is this actually needed/helpful?

2.1.6 The workspace shall be capable of graphically distinquishing the different account types:

- Storage Accounts
- Pass Through Accounts
- Transfer Accounts

2.1.7 The workspace shall be capable of graphically distinquishing the different supply types:

- Inflow / Outflow
- Transfers

- Diversion / Return Flow

2.1.8 The workspace shall be capable of graphically distinquishing water owners. Water owners are user defined and unlimited in number. Therefore, the graphical representation will have to be user configurable.

2.1.9 The workspace shall be capable of graphically distinquishing water types. Water types are user defined and unlimited in number. Therefore, the graphical representation will have to be user configurable.

2.2 The RiverWare workspace shall provide varing levels of detail of the accounting network

The accounting networks are typically more topologically complex than the physical water networks, since each simulation object can contain many accounts. This leads to an exponential explosion of topological complexity of the accounting network. Therefore, the visualization of the accounting network will have to be dynamic, allowing the user to control varying levels of detail to explore the accounting space.

2.2.1 The workspace shall be able to hide and show accounts and their supplies by account type, but still show the ultimate route of the paper water (e.g., hide the pass through accounts, showing connections between storage accounts).

2.2.2 The workspace shall be able to hide and show accounts and their supplies by supply type.

2.2.3 The workspace shall be able to hide and show accounts and their supplies by water type.

2.2.4 The workspace shall be able to hide and show accounts and their supplies by water user.

2.2.5 The workspace shall be able to hide and show accounts and their supplies by simulation object.

2.2.6 The workspace shall be able to hide and show accounts and their supplies by subbasin?

2.2.7 The workspace shall be able to hide and show accounts and their supplies by paper water flow routes?

2.3 The RiverWare workspace shall allow direct interaction with the accounting network.

The visualization of the accounting network on the workspace will provide the opportunity to allow direct manipulation of the accounts, much like current workspace interaction with simulation objects.

2.3.1 The workspace shall provide the ability to create an account.

2.3.2 The edit account dialog shall be presented upon a double click of an account icon.

2.3.3 The workspace shall provide the ability to create supplies by a drag and drop operation between existing accounts.

2.3.4 Others Account Workspace Interactions?

2.4 The RiverWare workspace shall provide standard GUI interfaces to interact and view the

accounting network.

The current workspace architecture cannot support the visualization of RiverWare accounting networks. In order to support accounting visualization, the current workspace will be redesigned. The visualization of the accounting network will either be provided as an accounting view separate from the simulation network, or an accounting layer that can be viewed in conjuction with the simulation network. The workspace design should be capable of supporting either. Which approach will be futher explored in the accounting visualization design document. The following general workspace requirements were derived from the workspace functional analysis document*.

2.4.1 The workspace shall provide a rich zooming interface, which should include the ability to zoom-in on an area by selecting the area with a drag box, as well as, predefined zoom level buttons to zoom in and out.

2.4.2 The workspace shall provide an ability to reconfigure the size of the model canvas.

2.4.3 The workspace shall provide context sensitive popups
Details - TBD

2.4.4 The workspace shall provide the ability to hide links (and supplies), and stylize links (and supplies).
Details - TBD

2.4.5 The workspace shall provide the ability to print the graphical representation of the accounting network. The print feature shall be capable of printing a selected region, the current view of the model, or the entire model canvas.

2.4.6 The workspace shall proivde the ability to export an image of the graphical representation of the accounting network. The image export feature should be capable of exporting a selected region, the current view of the model, or the entire model canvas. Standard (open) graphics image formats should be supported including: PNG, BMP, JPG, PMB, PGM, PPM, XMP, XBM.

3.0 High Level Design Considerations

3.1 Graph layout algorithms

The location of the simulation objects on the model canvas are placed manually by the user. How the account icons will be placed on the model canvas needs to be considered. Should we force the users to place the each of the account icons on the workspace? If so, how do we handle automatic PassThrough account creation? Or should the account icons be placed solely by an graph layout algorithm? Or possibly a combination of manual placement and graph layout algorithm placement?

3.2 Layers and views

The workspace functional analysis has exposed the need for two new concepts in the RiverWare workspace: a data layer and a data view. Data layers are like transparencies that can be laid one on top of the other and interactively enabled or disabled. A data view is a high level entity. Any particular view might consist of multiple layers. A view would provide a unique way to display some aspect of the model on the workspace. The new workspace will pro-

*.The workspace functional analysis document can be found at: /projects/riverware/doc/guiRework/workspace/workspaceFA.fm

vide both layers and views. Which approach will be appropriate for the accounting visualization will be futher explored in the design document.

3.3 Colormaps

The accounting visualization will be a complex data space and will need broad range of colors to effectively visualize all the different features of that space (i.e., water users, water types, supply types, ...). The current version of RiverWare is based on a 8-bit colormap. This means that RiverWare is restricted to 28 (256) colors. However, almost all modern graphics cards will support 24-bit true color (16 million colors). Therefore, the accounting visualization work should be optimized to run on 24-bit true color and not constrained to 8-bit color.