Ordering

Introduction

A regulated river system may be composed of several upstream reservoirs on multiple flow paths, thus providing a number of options to supply the downstream water order. During the ordering phase, water orders are accumulated from downstream to upstream and consider the average travel time, or order time of water (bound by the minimum and maximum travel time). Order time is calculated in the demand phase and is used to determine how many time-steps into the future water orders need to be processed for at each network component.

Orders can be processed in one of two ways:

- Rules-based ordering - Uses in-built rules which process the release of water; or
- Network Linear Programming (NetLP), also known as Multiple Supply Path (MSP) ordering - uses "linear programming" techniques to find optimal solutions. The term "linear programming" is often described as "planning with linear models" to avoid any confusion with the discipline of writing computer programs.

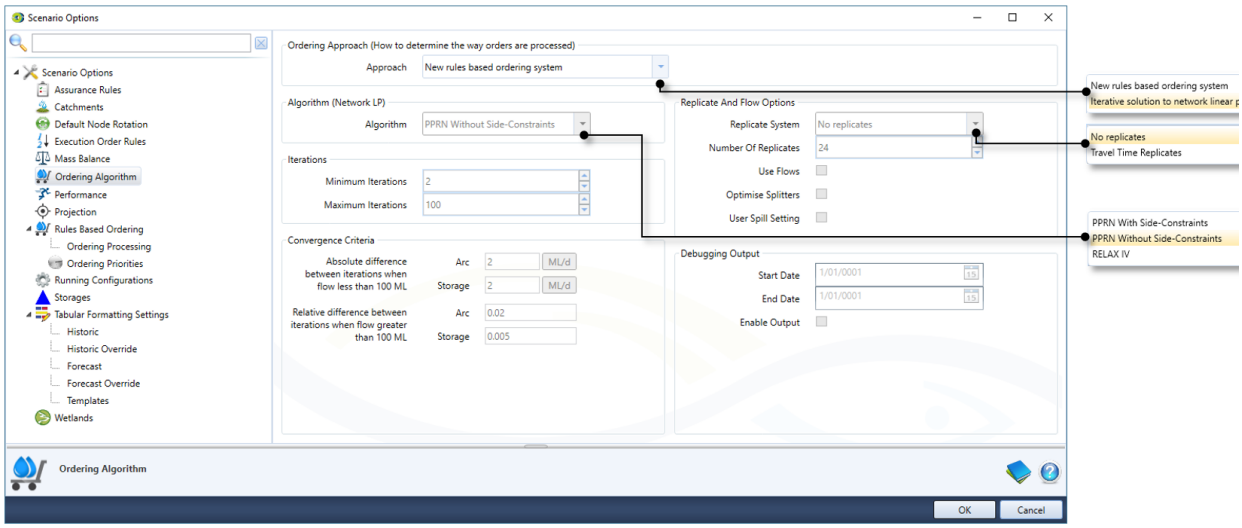
Take the following into consideration when deciding which type of ordering to configure for your scenario:

- Rules based ordering performs well for both daily and longer time-steps. A daily time-step may cause performance issues with optimised ordering, as the number of nodes in its solution network multiplies as the time-step reduces from monthly to daily unless travel times are short. Also, the optimised solution only considers inflows in the current time-step, so its solution may not be as efficient. If a longer time-step (such as monthly) is used, the optimised ordering system is likely to provide more efficient solutions than rules based ordering, with comparable performance;
- If you know about future inflow to and losses from the supply system, optimised ordering is a better solution as it provides a method of forecasting;
- If the rules that determine which supply path to use at various storage levels are well established, rules based ordering should be more efficient than optimised ordering; and
- Rules based ordering should be used if the objective of the scenario is to model what an operator does.

Choosing ordering approach

Begin by choosing ***Edit » Scenario Options*** and selecting ***Ordering Algorithm.*** This opens the Ordering Algorithm section of Scenario Options (Figure 1). Choose ***New rules based ordering system*** from the ***Ordering Approach*** drop-down menu to configure rules-based ordering. To configure netLP, choose ***Iterative solution to network linear program***, this will make the rest of the display active and allow you to configure options for netLP, refer to Network Linear Programming and the NetLP - SRG for further information.

Figure 1. Enabling ordering



Each node must be configured differently depending on the type of ordering approach used. The sub-pages describe how to set up nodes for each approach:

- Rules-based ordering
- Network Linear Programming
- Maximum Order Constraint node

Ordering with ownership

When ownership is enabled in Source, every water order is associated with an owner and is generally supplied using that owner's water. Where there is insufficient water to supply an owner's order at any location, and another owner has water surplus to their requirements, the owner with a deficit may borrow water from the owner with surplus to help meet demand (Distribution systems, Borrow and payback systems).

> **Note:** The ordering phase needs to consider the ownership of losses and gains such that when the order reaches a storage, the correct volume of each owners' water is released. It also needs to consider ownership of maximum and minimum order constraints.

Ordering priorities

If using rules-based ordering, you can set the priority that the system will attempt to meet orders originating from individual nodes. This configuration is still available if the Network Linear Programming method is selected, but will not affect the ordering system. Priorities are set at the scenario level.