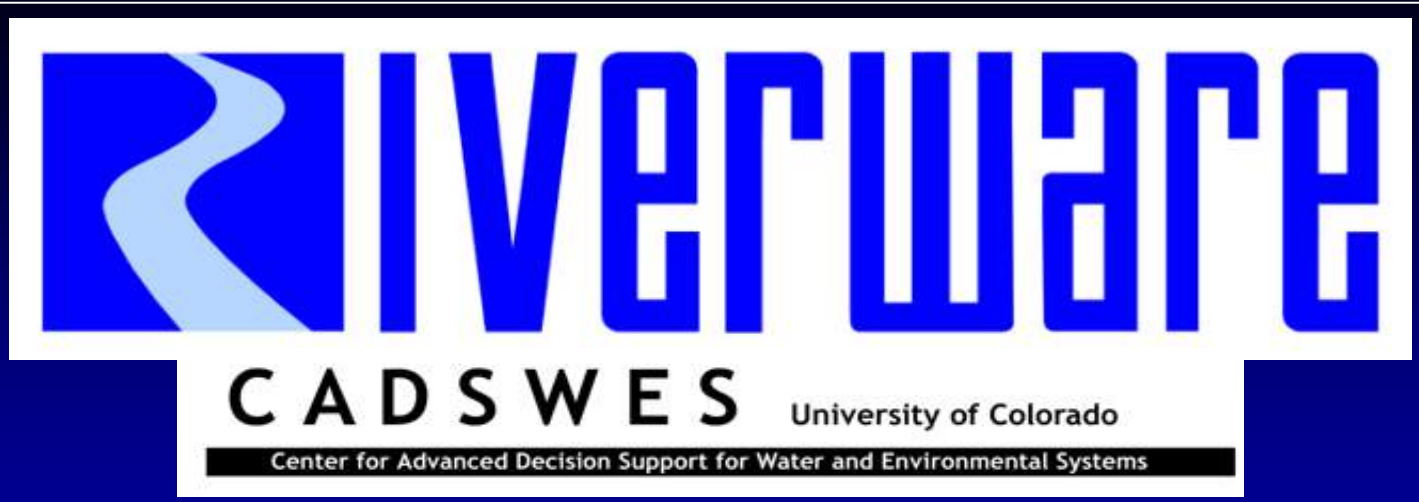


Multiple Run Management Enhancements and Iterative mode

RiverWare User Group Meeting
August 13-14, 2008

David Neumann and Heather Pry

Outline

- Background
- Recent Enhancements
- Upcoming Enhancements
- Iterative Mode
- Yield Study Demonstration

MRM Modes

- Two main modes – Concurrent and Iterative
- Concurrent mode is frequently used for policy studies
  - The inputs are known in advance
  - The number of simulations is known in advance
- Iterative mode is used when the number of simulations is determined based on results (more later)

Concurrent MRM

- All simulations have the same start and finish dates
- Define multiple simulation runs by specifying multiple inputs
- Inputs include rulesets, input DMIs and index sequential (rotating time series data)

Concurrent MRM: Simple example

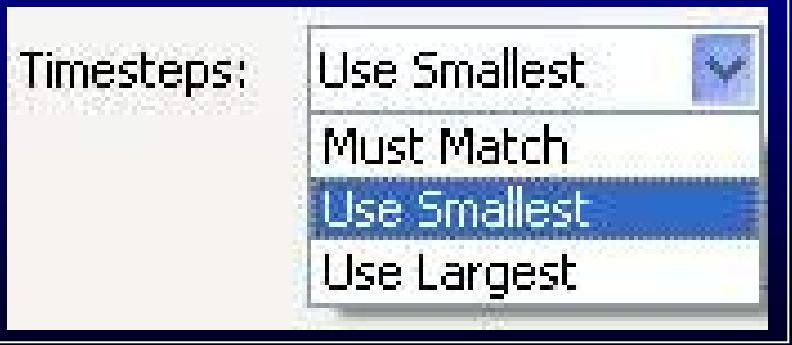
- A policy study might include
  - three rulesets (expressing the proposed policies)
  - five input DMIs (representing the hydrologic scenarios to evaluate the policies)
- RiverWare runs the 15 resulting simulations
- Output is RiverWare Data Format (RDF) file and/or Excel spreadsheet

Recent Enhancements - Output

- Output can be sent to multiple RDFs

  Object.Slot: file=name1.rdf file=name2.rdf

- Output at different timesteps. The user specifies:
  - Must Match – first slot determines timestep, slots with other timesteps are skipped
  - Use Smallest – Uses smallest timestep (e.g. if monthly and yearly data, it uses monthly, the yearly data has 11NaNs)
  - Use Largest – Uses largest timestep (e.g. if monthly and yearly data, use yearly, monthly outputs only Dec value)



Recent Enhancements

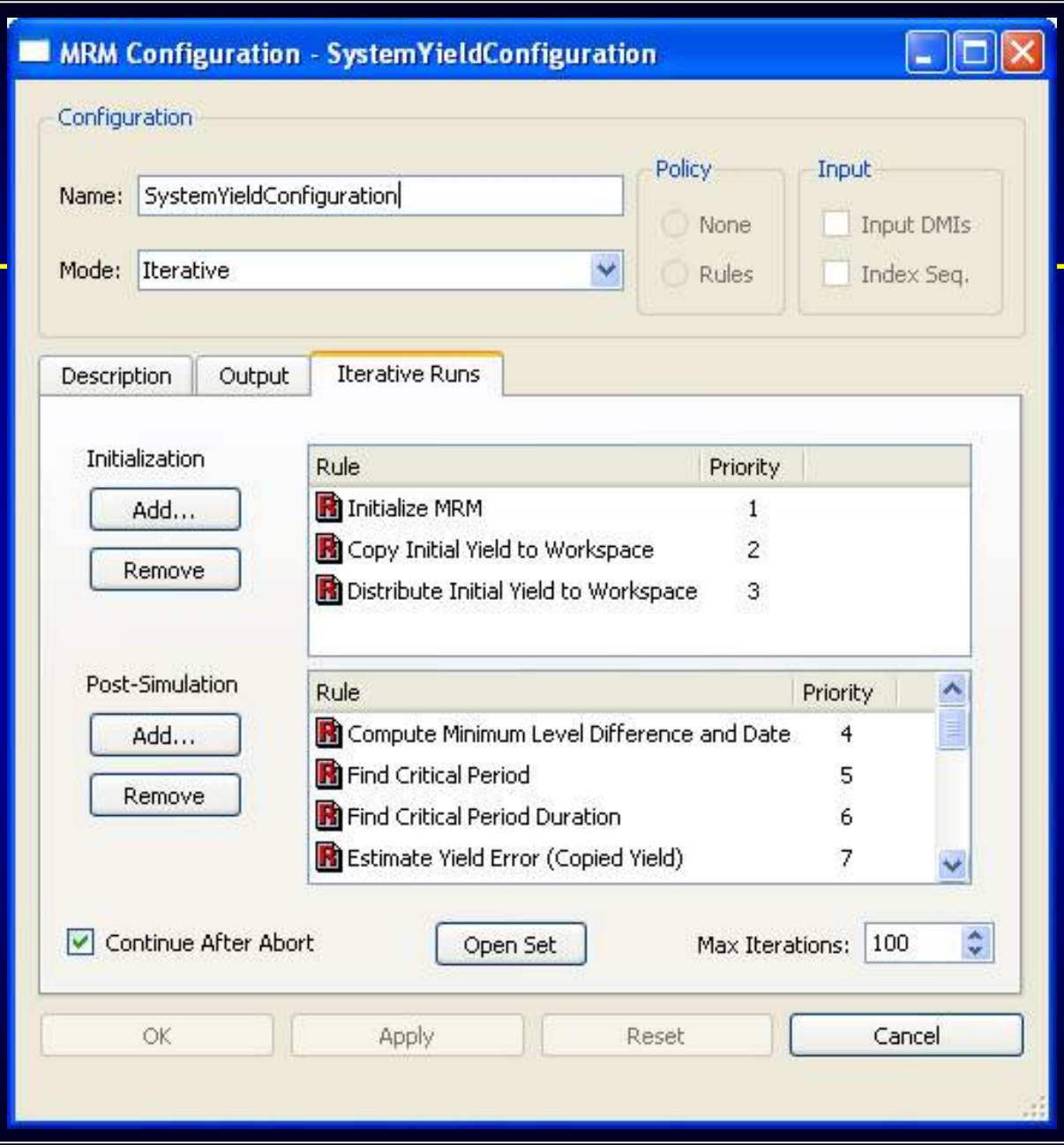
- Account names are now written to RDF and Excel file
- Spaces allowed in File Paths – check box

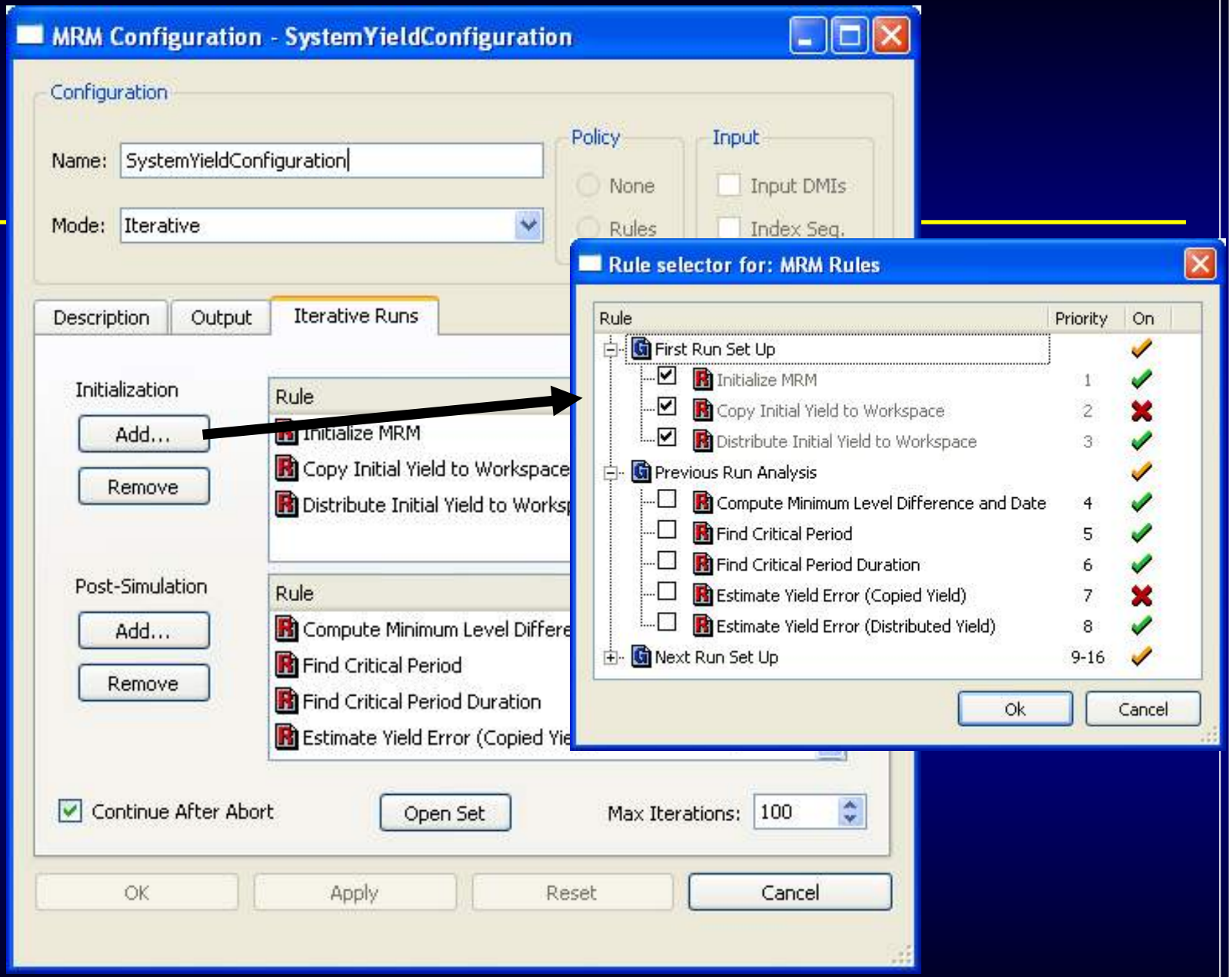
Upcoming Enhancements

- Better support for long term modeling (paleo, climate change, etc)
  - Upwards of 1000 input DMI's
  - Improve performance of these runs
  - Proposed Approach:
    - Fix memory issues
    - Use multiple machines

Iterative Mode

- The number of simulations is not known in advance – it is determined by the state of the system after each simulation
- User develops rules in the “MRM Ruleset”
- Configure MRM to call these rules at either:
  - Initialization – once at beginning
  - Post-Simulation – after each run
- Another simulation is made if any post-simulation rule changes a value


MRM Configuration - SystemYieldConfiguration
Configuration
Name: SystemYieldConfiguration
Mode: Iterative
Policy
None
Rules
Input
Input DMIs
Index Seq.
Description
Output
Iterative Runs
Initialization
Add...
Remove
Rule
Priority
Initialize MRM 1
Copy Initial Yield to Workspace 2
Distribute Initial Yield to Workspace 3
Post-Simulation
Add...
Remove
Rule
Priority
Compute Minimum Level Difference and Date 4
Find Critical Period 5
Find Critical Period Duration 6
Estimate Yield Error (Copied Yield) 7
Continue After Abort
Open Set
Max Iterations: 100
OK
Apply
Reset
Cancel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Configuration
Name: SystemYieldConfiguration
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None
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Input
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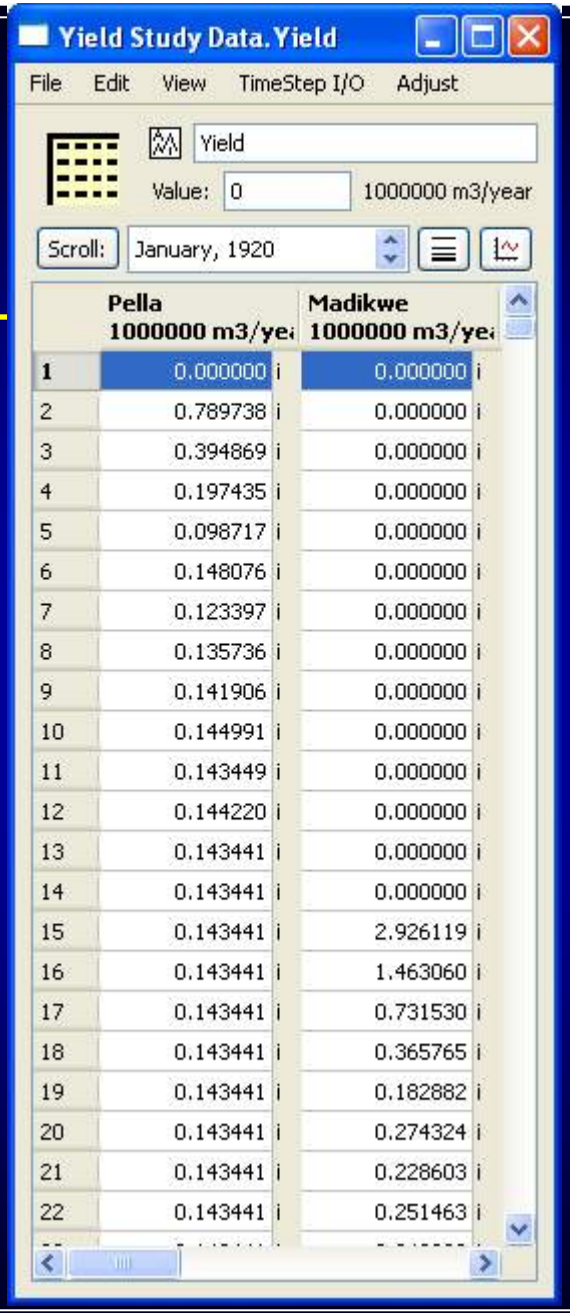
Iterative Runs
Initialization
Add...
Remove
Rule
Initialize MRM
Copy Initial Yield to Workspace
Distribute Initial Yield to Works
Post-Simulation
Add...
Remove
Rule
Compute Minimum Level Differe
Find Critical Period
Find Critical Period Duration
Estimate Yield Error (Copied Yie
Continue After Abort
Open Set
Max Iterations: 100
OK
Apply
Reset
Cancel
Rule selector for: MRM Rules
Rule
Priority
On
First Run Set Up
Initialize MRM 1
Copy Initial Yield to Workspace 2
Distribute Initial Yield to Workspace 3
Previous Run Analysis
Compute Minimum Level Difference and Date 4
Find Critical Period 5
Find Critical Period Duration 6
Estimate Yield Error (Copied Yield) 7
Estimate Yield Error (Distributed Yield) 8
Next Run Set Up 9-16
Ok
Cancel

Useful Tools for Iterative Mode

- Integer Indexed Series Slots
- GetRunIndex predefined function
- STOP RUN statement: Stop the iterative run because results have converged



	Pella 1000000 m3/ye	Madikwe 1000000 m3/ye
1	0.000000 i	0.000000 i
2	0.789738 i	0.000000 i
3	0.394869 i	0.000000 i
4	0.197435 i	0.000000 i
5	0.098717 i	0.000000 i
6	0.148076 i	0.000000 i
7	0.123397 i	0.000000 i
8	0.135736 i	0.000000 i
9	0.141906 i	0.000000 i
10	0.144991 i	0.000000 i
11	0.143449 i	0.000000 i
12	0.144220 i	0.000000 i
13	0.143441 i	0.000000 i
14	0.143441 i	0.000000 i
15	0.143441 i	2.926119 i
16	0.143441 i	1.463060 i
17	0.143441 i	0.731530 i
18	0.143441 i	0.365765 i
19	0.143441 i	0.182882 i
20	0.143441 i	0.274324 i
21	0.143441 i	0.228603 i
22	0.143441 i	0.251463 i

Iterative MRM – Execution Order

- An iterative run executes as follows:
  - Initialize the iteration count.
  - Execute the initialization rule(s), if specified.
  - Perform the simulation run.
  - Execute the post-simulation rule(s), if specified.
  - If the post-simulation rule(s) return “no change”, that is they do not assign one or more new (different) values, the iteration is complete.
  - Otherwise, the iteration count is checked. If it equals the maximum number of iterations specified, then the iteration is complete also.
  - If the iteration is not complete, then increment the iteration count and make another run.

Yield Study using Iterative MRM

- Purpose:

  Republic of South Africa Department of Water Affairs and Forestry Modeling Workshop, May 2008, Case Study

- Approach:
  - Yield – Diversion that exactly draws down reservoir to minimum level
  - System Yield – Find yield of upstream reservoirs, use this yield when determining yield of downstream reservoirs
- Demonstration