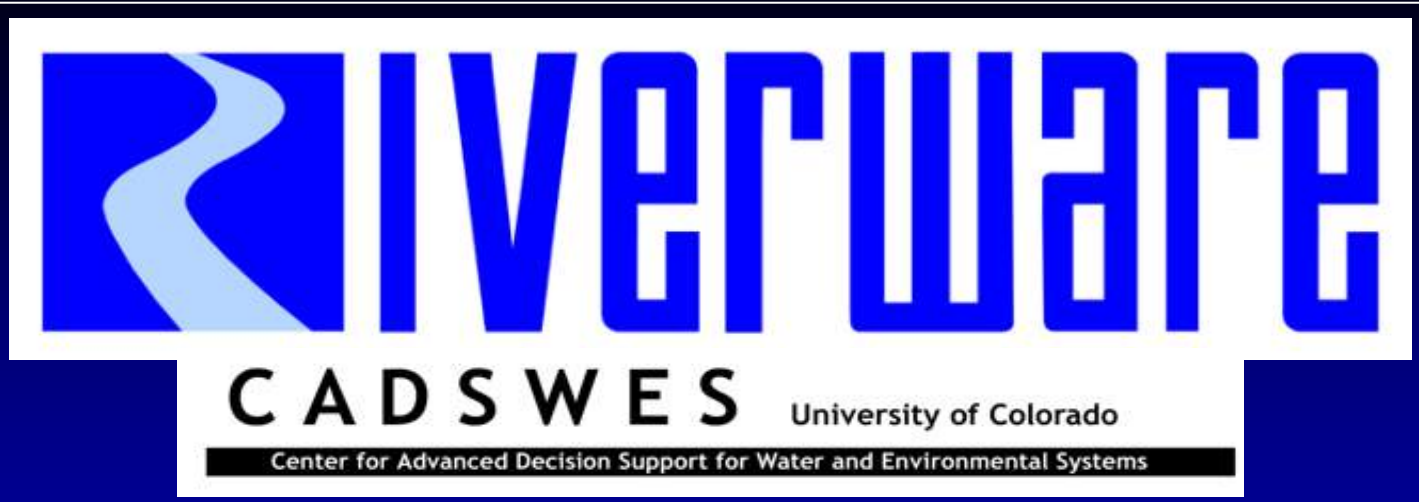
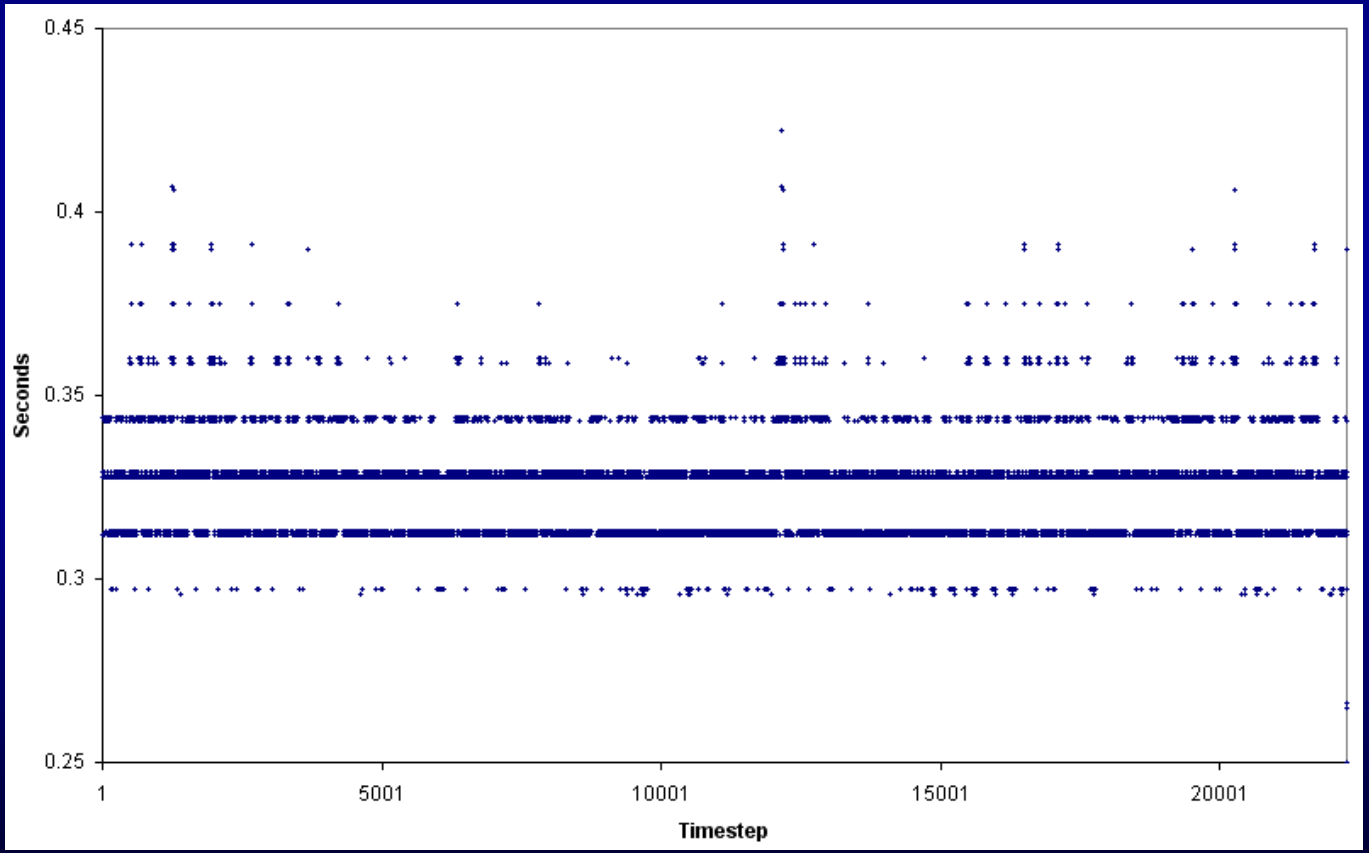


Improving Performance

RiverWare User Group Meeting
August 13-14, 2008

Time per timestep



Decreasing run times: what you can do

- Turn off diagnostics
- Close unused windows, other applications
- Check and configure system paging
- RBS: Analyze and improve your policy
- Run in batch mode
- Divide the model into multiple runs
- Buy hardware

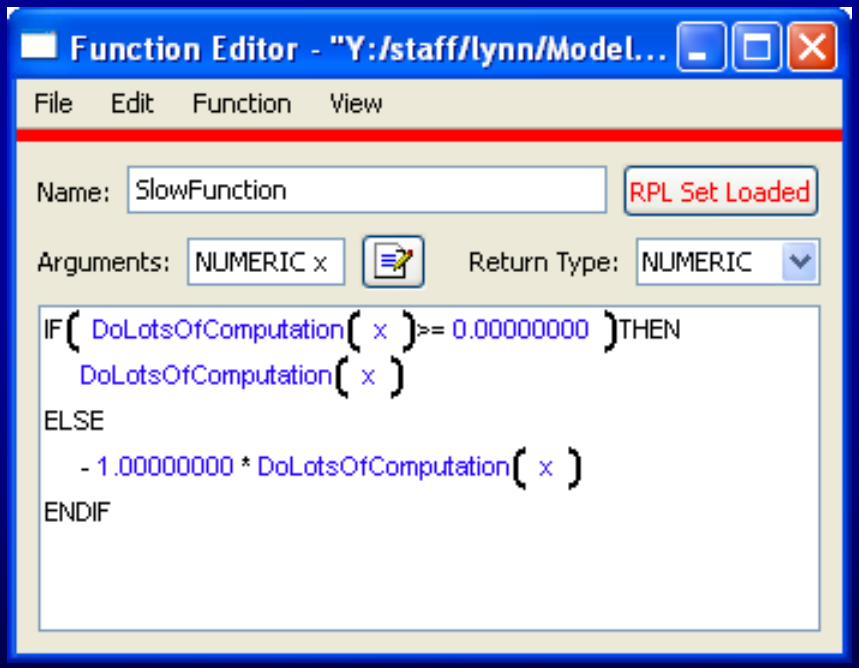
Improving the run time of a RBS policy

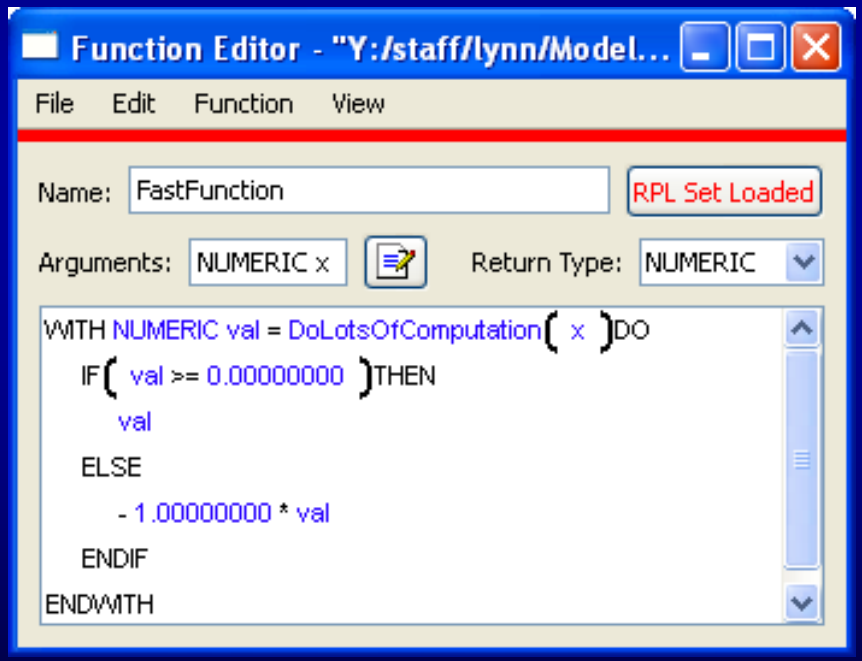
- Step 1: Analysis
  - RPL set analysis tool
  - RunTime() function
- Step 2: Modify policy
  - Focus on bottlenecks
  - Don’t sacrifice clarity
- Repeat as necessary

How to create efficient RPL expressions

- Prefer predefined functions
- Use functional decomposition
- Use WITH expressions
- Minimize LIST and STRING processing
- Use OBJECT and SLOT values
- Use functions with no arguments
- Use time invariant functions

Effective use of WITH expressions





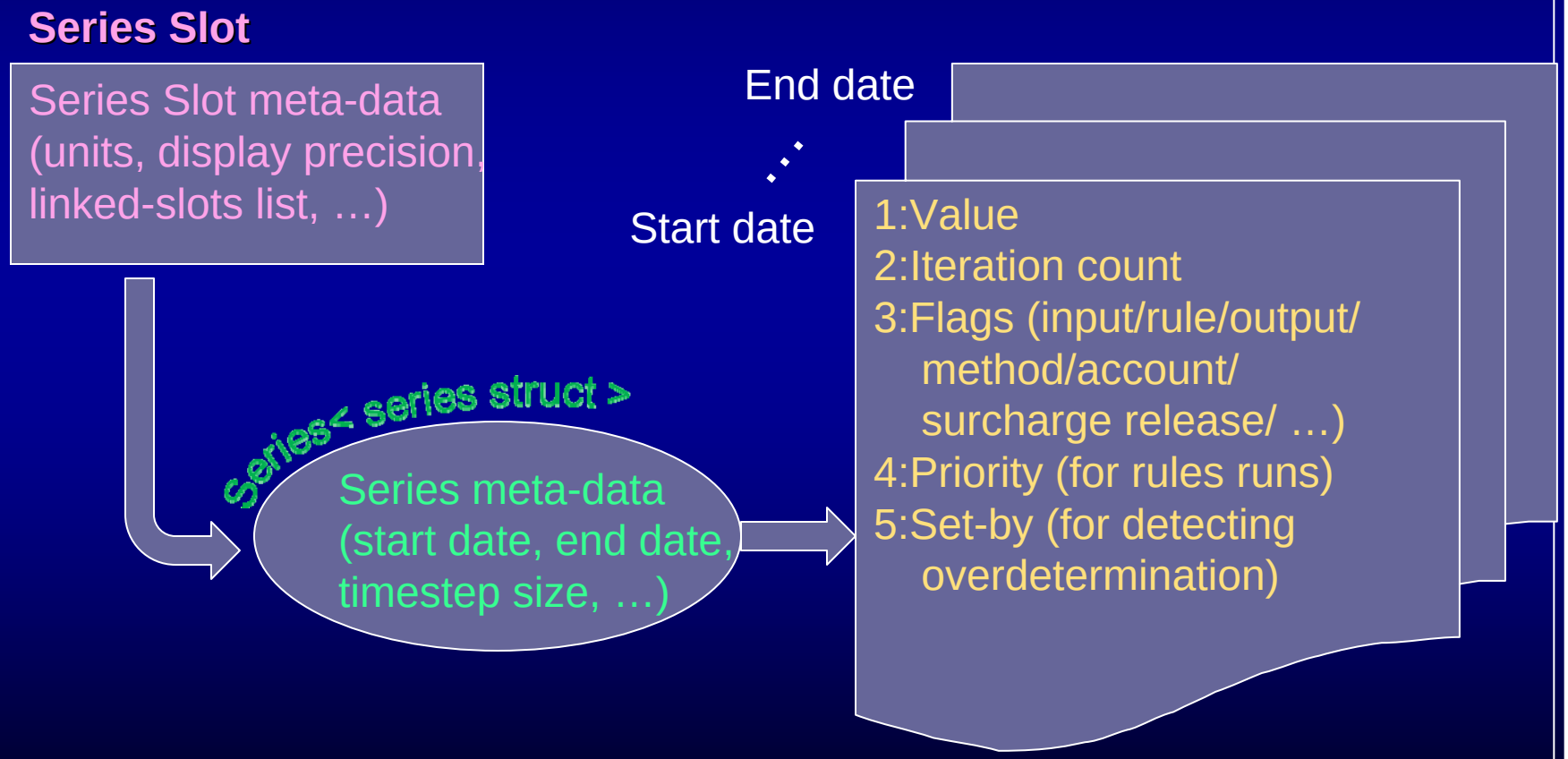
Decreasing run times: what CADSWES can do

- Focused performance studies
  - Arkansas River (35%)
  - URGWOM (20%)
  - Tennessee Valley (95%)
- Create new RPL predefined functions
- Redesign software components

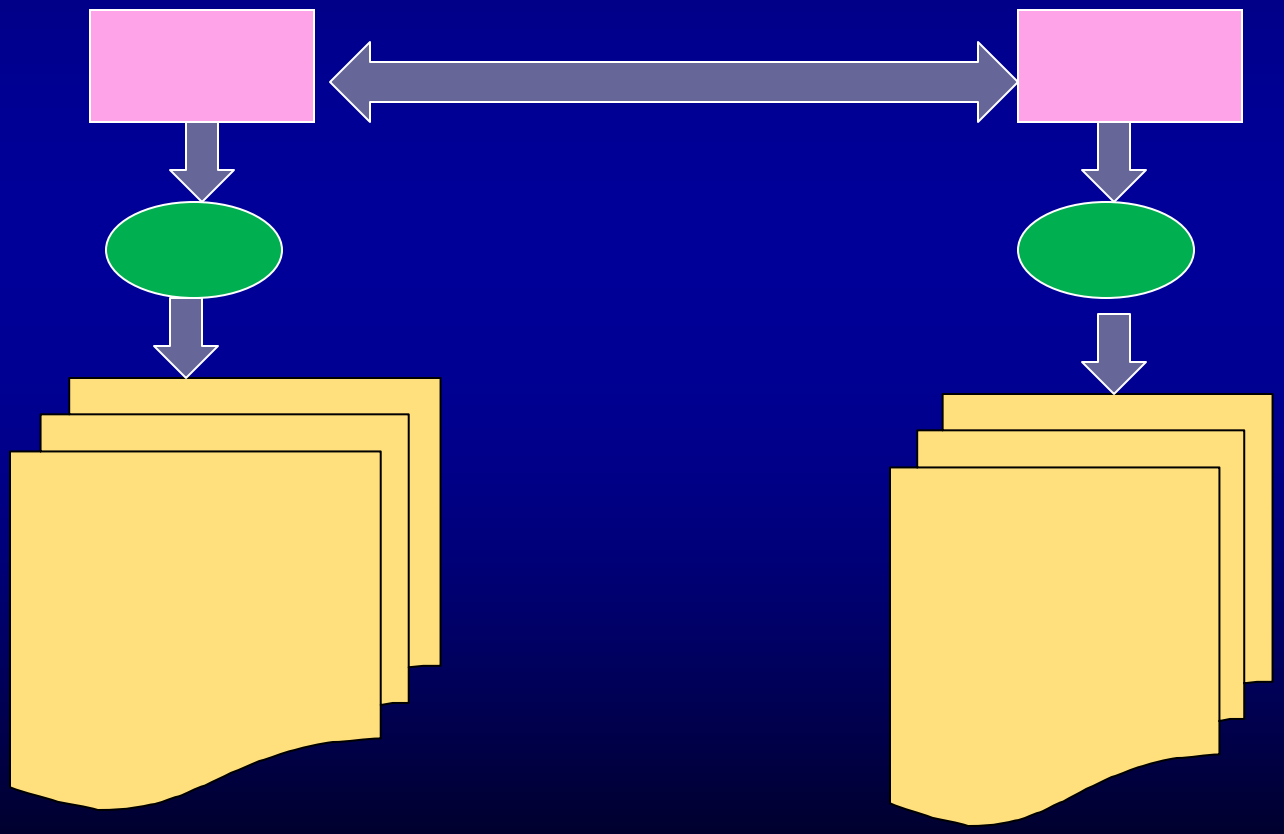
Re-implementation of Series Slots

- Purpose: to reduce the memory needs of large models.

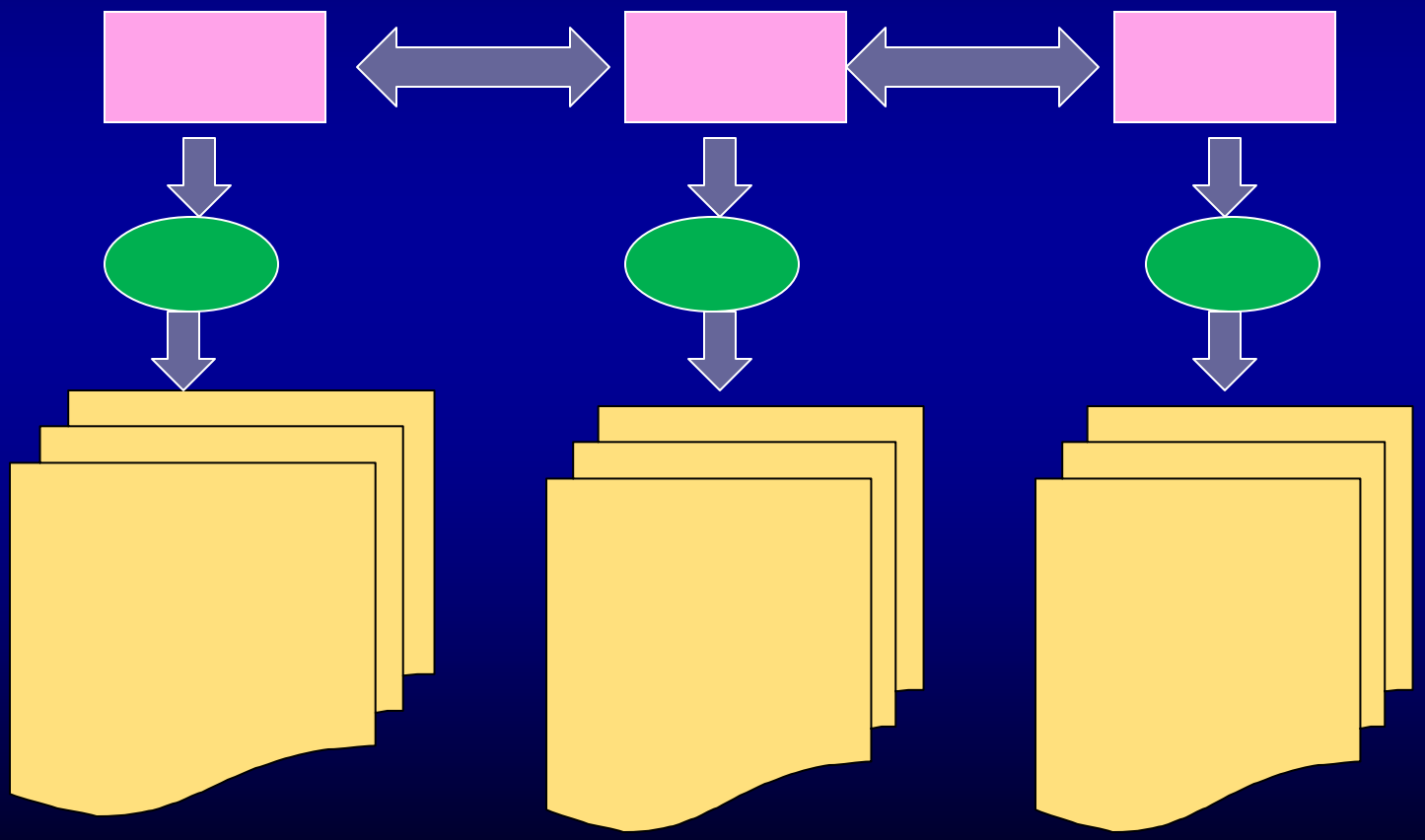
Original Implementation (4.9 and earlier releases)



Linked Simulation Series Slots



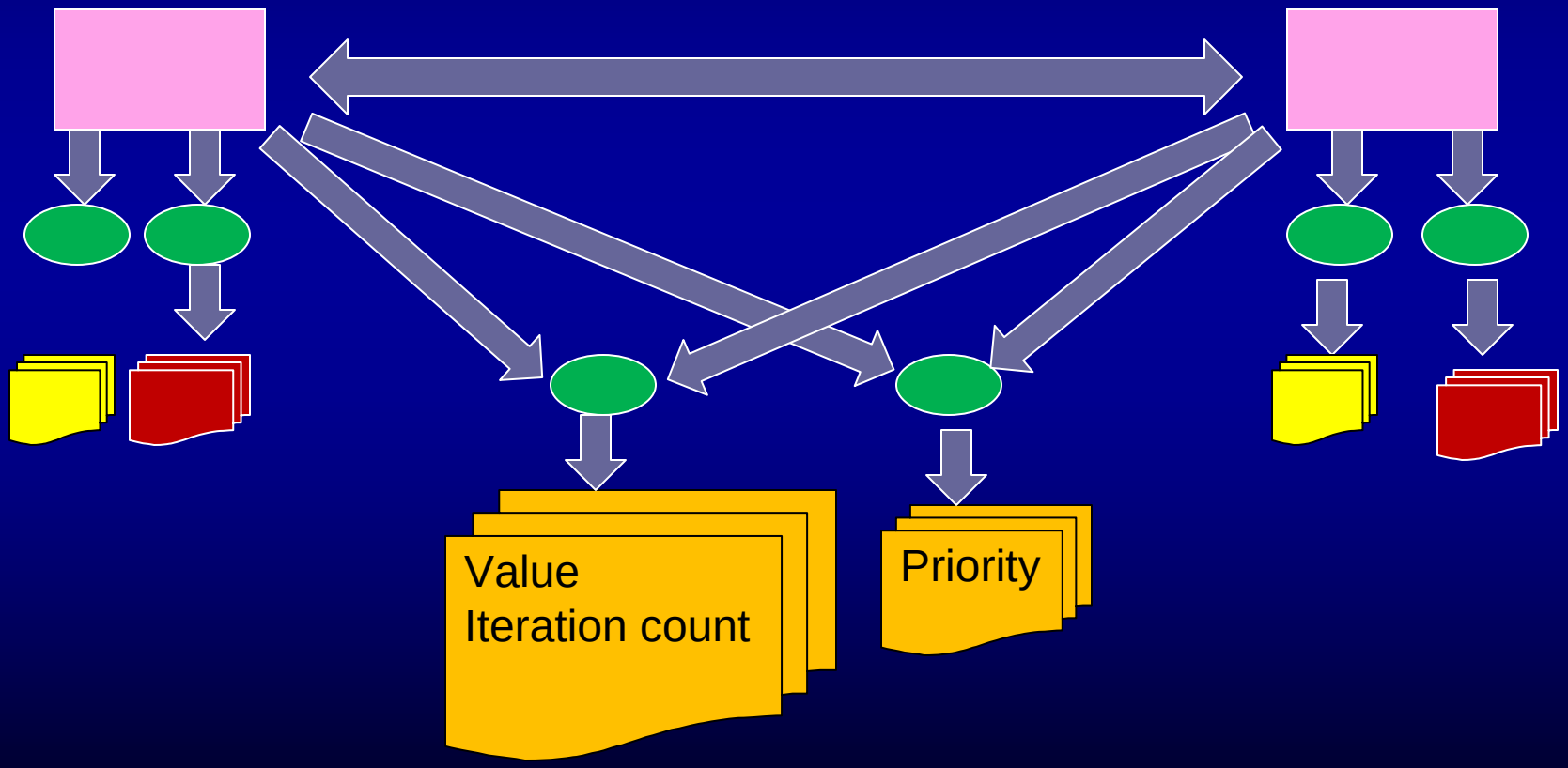
Linked Accounting Series Slots



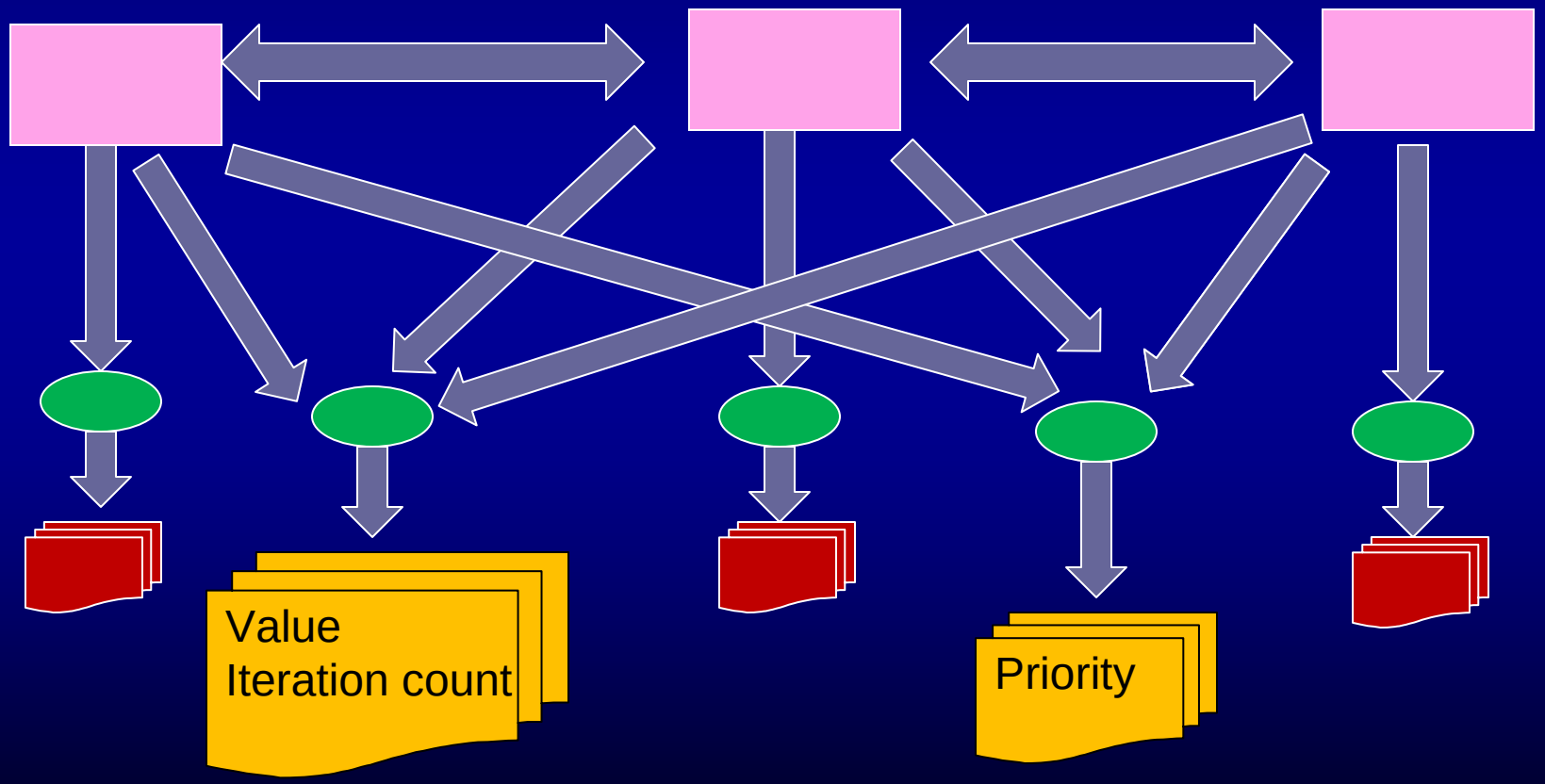
Data & Meta-data

- Can be shared between linked slots:
  - Value
  - Iteration Count
  - Priority
- Private – cannot be shared:
  - Set-by information (to detect over-determination), not needed for account slots
  - Flags (e.g. Method vs Propagated)

Linked Slots on Simulation Objects: 2-way sharing

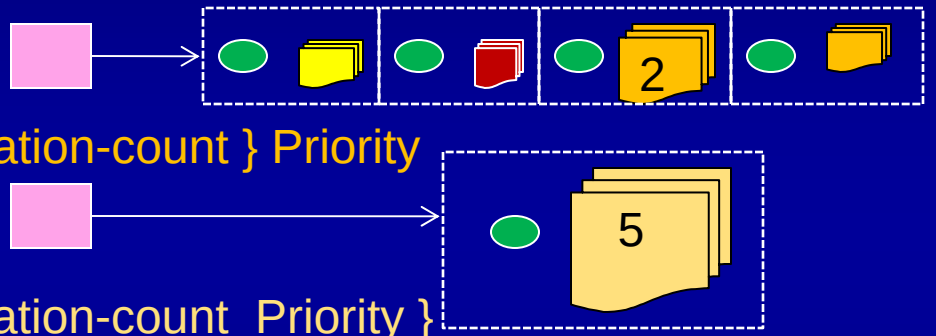


Linked Slots on Accounts: 3-way sharing



Series Data & Meta-data

- Simulation Object Slots
  - Linkable
    - Set-by Flags {Value, Iteration-count } Priority
  - Not Linkable
    - { Set-by Flags Value Iteration-count Priority }
- Account Slots
  - Linkable
    - Flags {Value, Iteration-count } Priority
  - Not Linkable
    - { Flags Value Iteration-count Priority }



Phased Implementation

- ✓ Accounting-slots-sharing case first (simpler in its details than simulation-slots-sharing case)
- ✓ Eliminate Set-by series on accounting slots
- ✓ Share the sharable series on linked accounting slots
- ➢ Insert implementation class between SeriesSlot and Series<>
- ➢ Make non-linkable accounting slots use smaller structure (no set-by)
- ➢ Apply multiple series to linkable simulation object slots

Observations for work completed so far … (more to come)

- Process size change (Solaris) +.2% to -27%
- Run time change (Windows) 0% to +11% (expected space/time trade-off; should be reduced with up-coming work)

New Model File Format

- Old: series { datum, flags }
- New: series { datum } , series { flags }
  - Uses run-length encoding of each series
  - Compression rate is model-dependent:
    - Few-timestep model files may get larger
    - Many-timestep model files get smaller
      - Observed: 29% - 92% reduction in un-gzipped model size
      - 38% - 90% reduction in model-load time, gzipped or not