OASIS

the most powerful and flexible software available for modeling the operations of water resources systems

Hazen and Sawyer uses advanced optimization and simulation techniques to improve long-term planning and short-term operations. OASIS allows us to help our clients find better, more workable solutions in a timely and cost-effective way.

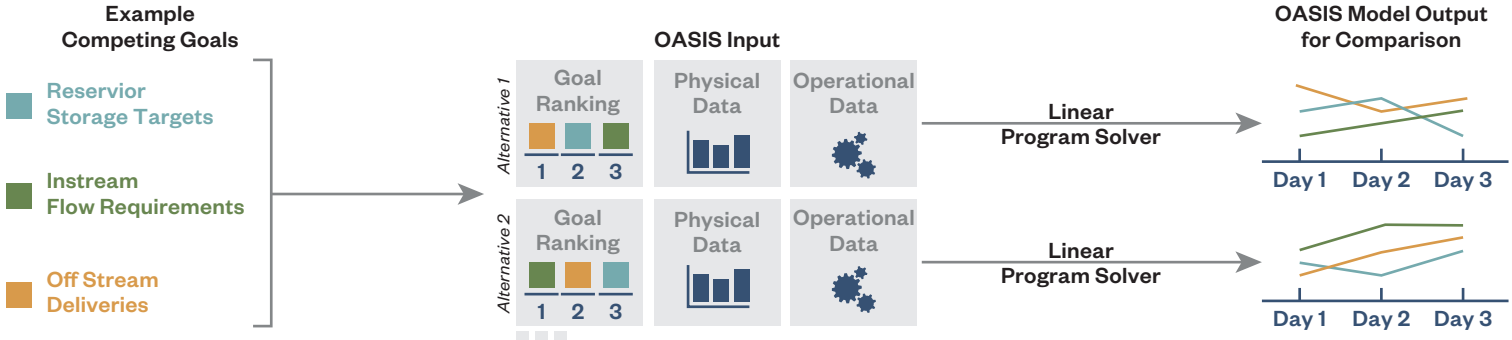
The software makes it easy to analyze operating rules that can yield large savings for managers faced with system expansion decisions or operating compliance. The very same software can be used as a planning model and decision-support model to ensure that the rules are properly implemented. OASIS can be customized to suit clients' needs and is supported with training and free upgrades.

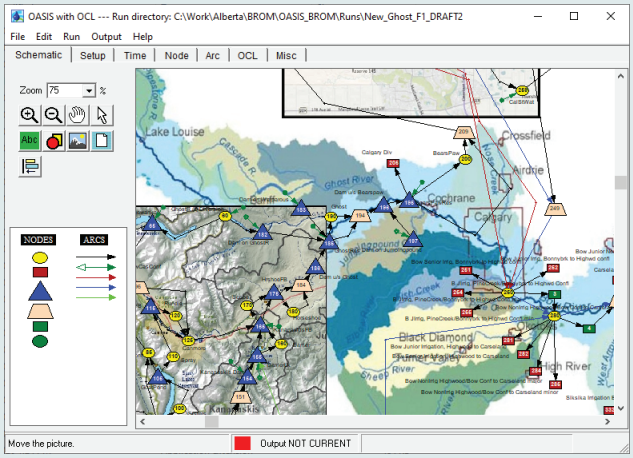
OASIS has application in

- River Basin Management
- Water Supply
- Hydropower
- Conflict Resolution

Mimics Operators' Intuition

A linear program solver is the engine hidden inside of OASIS. Because OASIS uses linear programming to simulate routing decisions, all operating rules are represented as either goals or constraints. A constraint is a rule that OASIS must obey, while a goal is a rule that OASIS tries to meet. Goals may be in competition with each other, and a system might not be able to satisfy some or all of the goals. Goal-seeking behavior is an efficient modeling approach which also corresponds to the way real-world operators and planners work. Other software requires these competing goals to be modeled with a complex set of "if-then" type rules. The OASIS approach greatly simplifies the task by cutting down on the need for "if-then" rules, while still allowing you the freedom to use them where they are appropriate.





The OASIS GUI allows you to build and work with the model by clicking on the schematic, which shows how each part of the system connects to the whole.

Includes a Graphic User Interface

Changing input, running the model, and viewing output are all done through a graphic user interface (GUI). Hazen and Sawyer can customize the GUI to reflect the specific needs of your application.

Reports Performance Measures

OASIS includes powerful post-processor programs that select, process, and display results in the form you need to judge the performance of the system. The GUI allows you to select any number of performance measures to be instantly generated after a model run is complete.

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Provides Enormous Flexibility

OASIS is designed to be extremely flexible whether you are building a new model or modifying an existing one. You won't have to deal with complicated source code changes as with other models. OASIS will save you time and money.

Input data can be entered in many forms:

- Constants
- Time-series values
- Time patterns (values that cycle every year)
- Rule-based input

With OASIS you have the option of using pre-specified rule forms AND the freedom to write new rules. You can modify the form of the rule as well as the parameter values. For example, the code below sets a minimum flow requirement depending on storage in the reservoir and time of year.

```
// RESERVOIR_OPS.OCL

// Sets the Little River Reservoir minimum release,
// which is based on storage remaining and time of year.
// Reduce release as drought season develops.

Set LittleRiverMinRelease : min_flow1200.1205

{   // 0.6 cfs (or 1.2 acre-feet) when storage is below 70%
    condition : storage1200 / max_stor1200 * 100 < 70
    value     : convert_units {0.6, cfs, af}

    // 2 cfs from Jun - Nov
    condition : month >= 6 and month <= 11
    value     : convert_units {2.0, cfs, af}

    // 6 cfs from Dec - May
    condition : default
    value     : convert_units {6.0, cfs, af}
}
```

OCL: The Key to OASIS

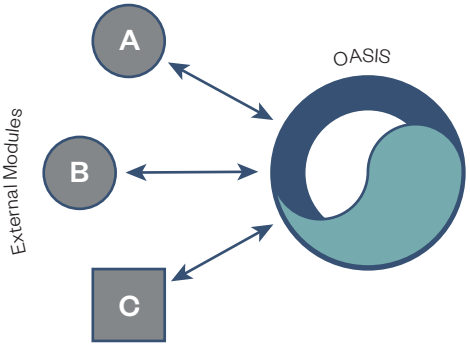
OCL, short for Operations Control Language, is a patented language for describing water system operating rules. OCL allows you to enter operating rules that are as simple or complex as the real-world rules that govern the system you are modeling.

The rules you write in OCL look like the rules that planners, operators, and policy makers use. For example, an agreement between water users might require that the diversion at point A, plus the diversion at point B, must be less than 70% of the flow at point C. In OCL, you would write the following constraint, which is readily recognizable as the mathematical form of that rule:

```
Constraint:
{ dDivert_A + dDivert_B < 0.70 * dFlow_C }
```

Runs In Parallel with Other Models

OASIS is able to send and receive data to and from other programs while the programs or "external modules" are running. External modules can be created from scratch or existing programs can be integrated. Some tasks suitable for external modules are: groundwater flow, water quality, contaminant transport, habitat availability, rainfall-runoff, and agricultural return flow. This approach allows different specialists to develop and maintain each module. Without OASIS, different models would have to run in series, often requiring an awkward iterative process. With minimal programming, OCL can even be used to control operations in external modules.



Brings Transparency to Modeling

OASIS input and output are stored in standard database formats. Because all OASIS results are stored in a database, there are no secrets about how the system is represented. Post processing provides tremendous flexibility in viewing results.