

Experiences with Policy Development and Forecasting for the Midterm Probabilistic Model

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24 Month Study

- BOR's Monthly midterm operational forecast model for the CRB
- Inputs:
 - Unregulated inflows (RFC \sim 1 year, climatology after)
 - Releases manually input by individual dam operators
- Outputs:
 - Power, Evap, Elevation, Storage, etc.

Probabilistic Midterm Model

- Midterm operational forecast model for the CRB
- Probablistic version 24 month study
- New features

Modeling Operations

- Actual operations are a combination of many factors:
 - Law (EIS's)
 - Guidelines (Power Generation)
 - Daily Targets
 - Monthly or Seasonal Targets
 - Peak Flows
 - Base Flow
 - Extreme Events (Dam Safety Operations)
 - MANY More...

Example

Operator Notes

- Baseflows: steady release mid August to mid April (usually 1000-1200 cfs)
 - Flows are steady to protect fish (spawning, etc.) and to prevent flooding due to ice jamming
 - Set flow to put reservoir at March/April 6468ft target

Example

Rule Outline

Set December-March Baseflow

Execution Constraint: Month is December

Description: Set December-March outflow to steady value that will meet “April 1 Target Elevation”

- Compute change in volume given “April 1 Target Elevation” and current elevation
- Add volume gain from forecasts December-March (4 months)
- Compute max steady flow over December-March (4 months)

Example

RPL Rule

```
Fontenelle.Outflow[] =  
    ( ElevationToStorage(  
        %"Fontenelle", Fontenelle.Pool Elevation["@t"] ) -  
    ElevationToStorage(  
        %"Fontenelle", FontenelleData.April1Target[] ) +  
    SumFlowsToVolume(  
        Fontenelle.Inflow, @"t",@"t + 3" ) ) / 4.000 "month"
```

Execution Constraint

```
GetMonthAsString( @"t" ) IN { "December" }
```


Rules Development: From Management to Model

For Each Reservoir:

Meet
with
Operator

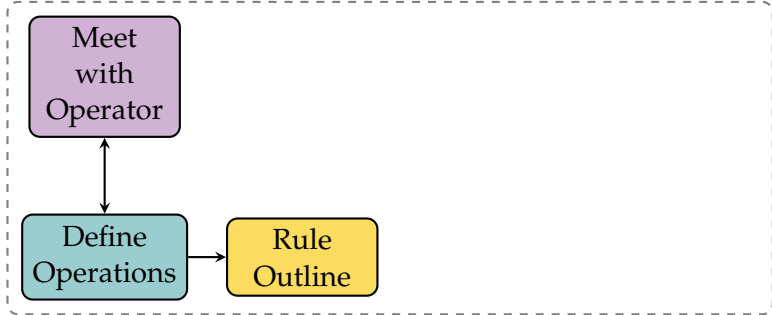
Rules Development: From Management to Model

For Each Reservoir:



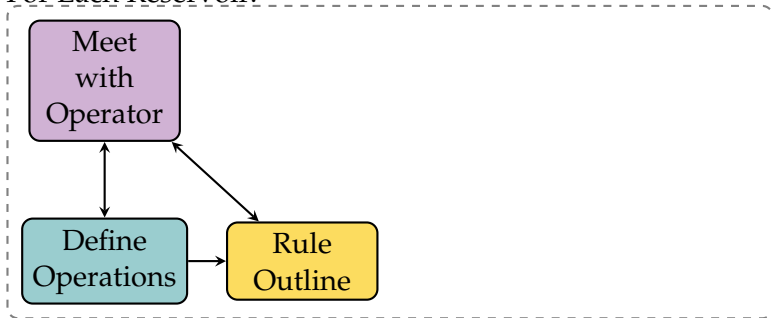
Rules Development: From Management to Model

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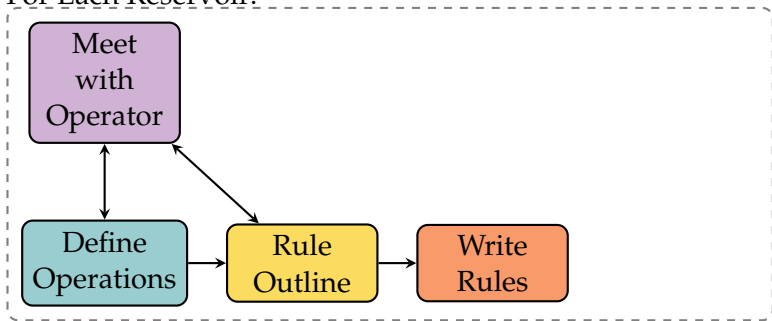
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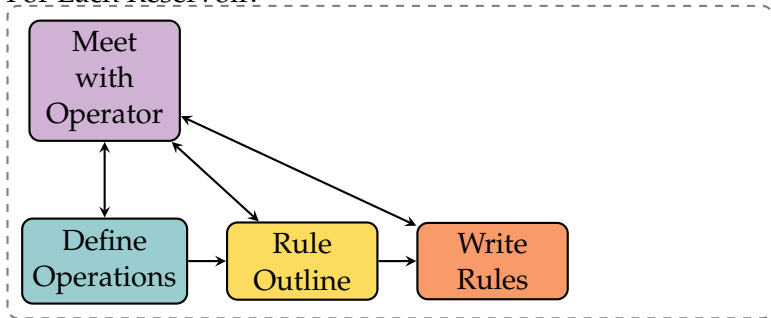
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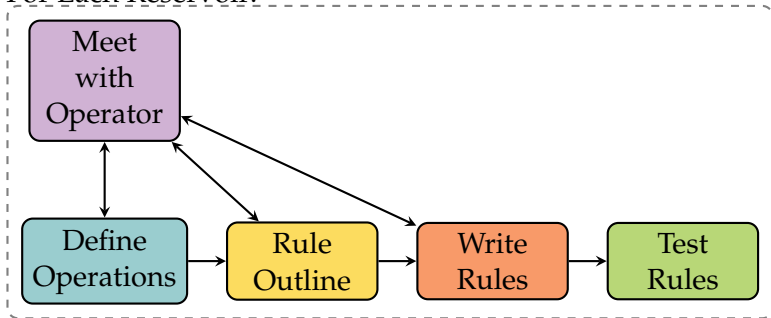
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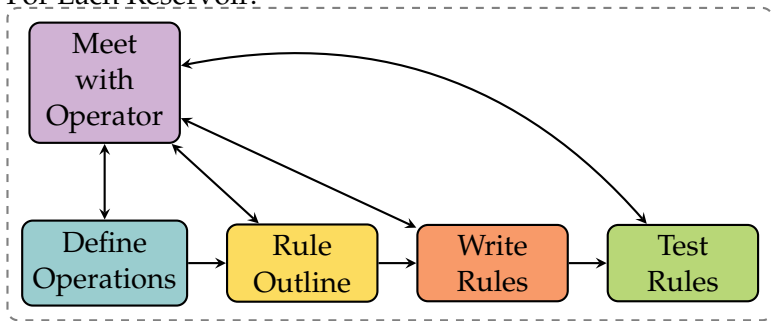
Rules Development: From Management to Model

For Each Reservoir:



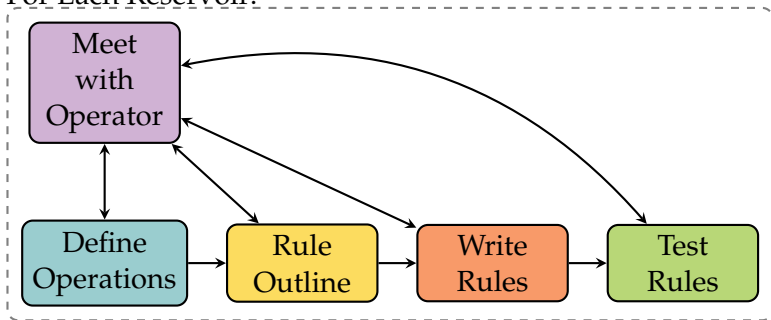
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For Each Reservoir:



Rules Development: From Management to Model

For Each Reservoir:



Implications

- Self-documenting process
- Testing gets harder as more reservoirs are added
- Many operations don't translate perfectly to a monthly model
- Rules must be very robust for different model start dates and hydrologic conditions
 - Lots of checking which month it is!
- ...3,2,1 rule ordering is crucial

Conclusions

- Fontenelle Rules written
- Flaming Gorge Rules in progress
- Aspinall and Navajo are on the horizon