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High-Performance Computing for Drought Prediction

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Goal

Conduct a detailed performance study of the DA-CRB system for improved drought prediction

Motivation

- Drought is a major threat to the economy and global food supply
- Existing drought prediction systems can be improved by integrating satellite data - but this requires much greater computational resources
- Creating an improved system will require careful attention to system architecture, dataflow and performance

Project Status

- Detailed performance study conducted of parallel DA-CRB system
- Prototype parallel DA-CRB system under development
- In progress: Perform 30-year simulation of Columbia river basin
- In progress: Collect further performance data on DA-CRB when run on a cluster
- In progress: Determine viability of accelerating PRMS with CUDA
- In progress: Develop improved, high-performance drought prediction system for use by hydrologic community

Contact

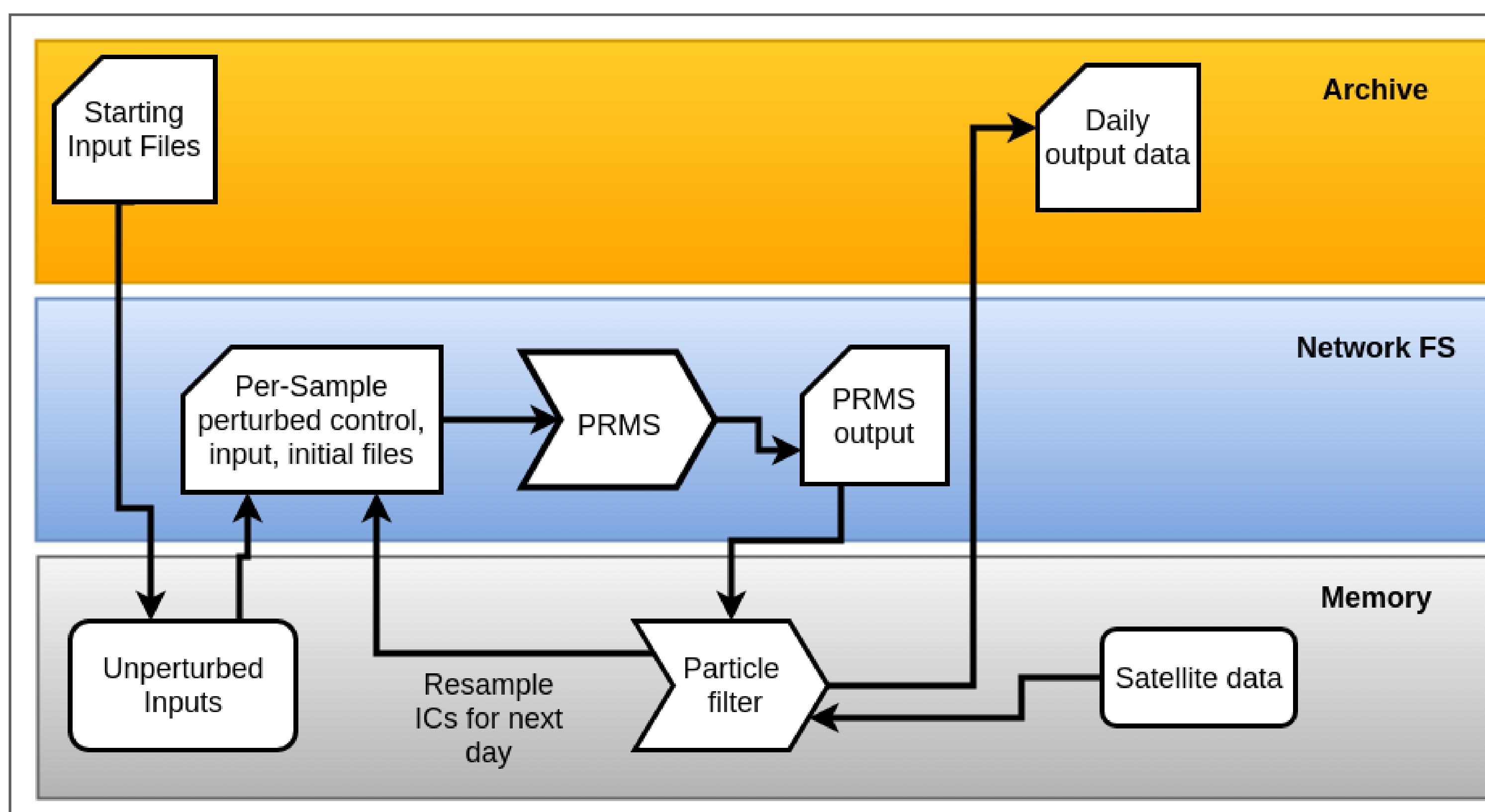
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Acknowledgments

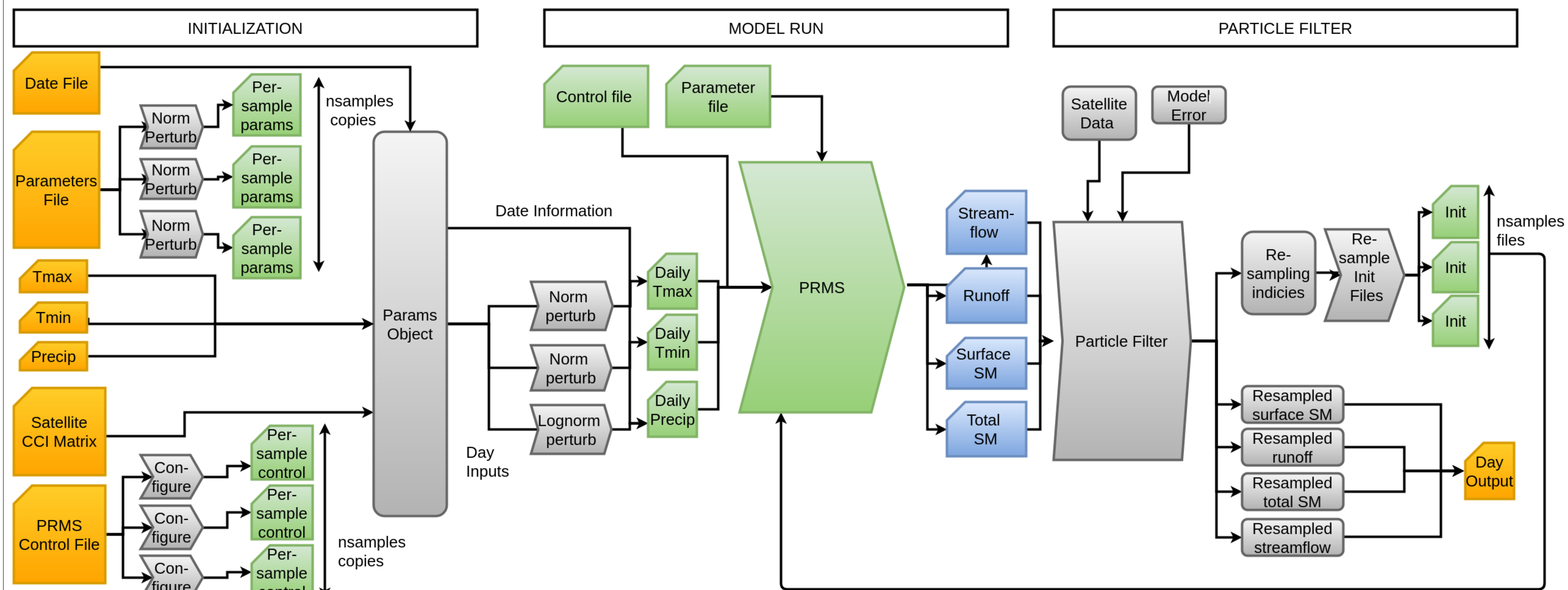
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Prototype Data Flow



Architecture of Python Prototype

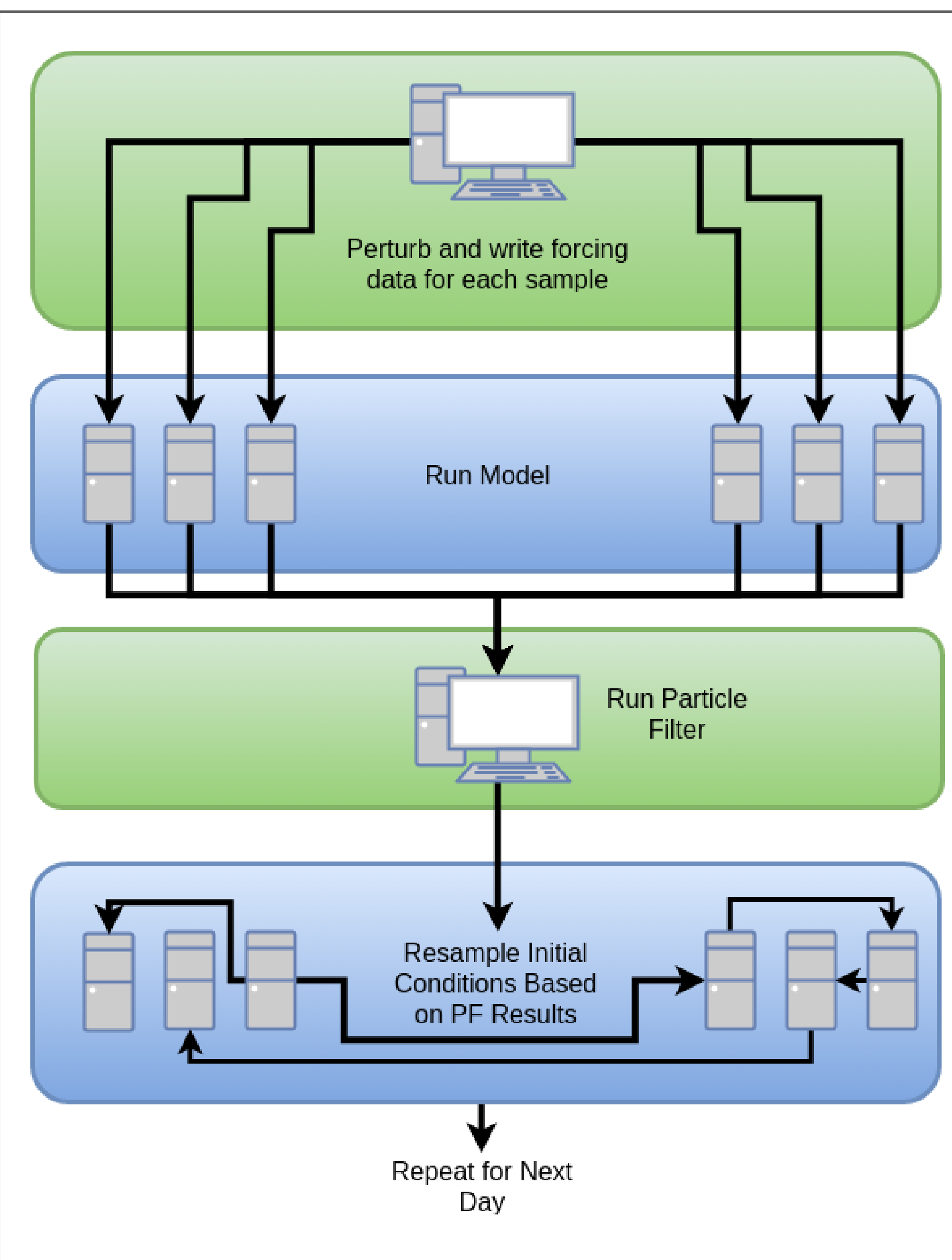


Key Insight:

PRMS simulation runs are embarrassingly parallel

However, dataflow bottlenecks must be addressed - particularly when writing out forcing data

Prototype Parallelization Approach



- **Key Idea:** Use a particle filter (PF-SIR) algorithm to integrate satellite measurements with hydrologic simulation
- **Problem:** Increased problem size requires performance study to refactor existing code
- **Our Approach:** Investigate opportunities for parallelism
- **Key Finding:** Sample model runs can be parallelized, but forcing data writeout is a bottleneck

Multithreaded Performance

