

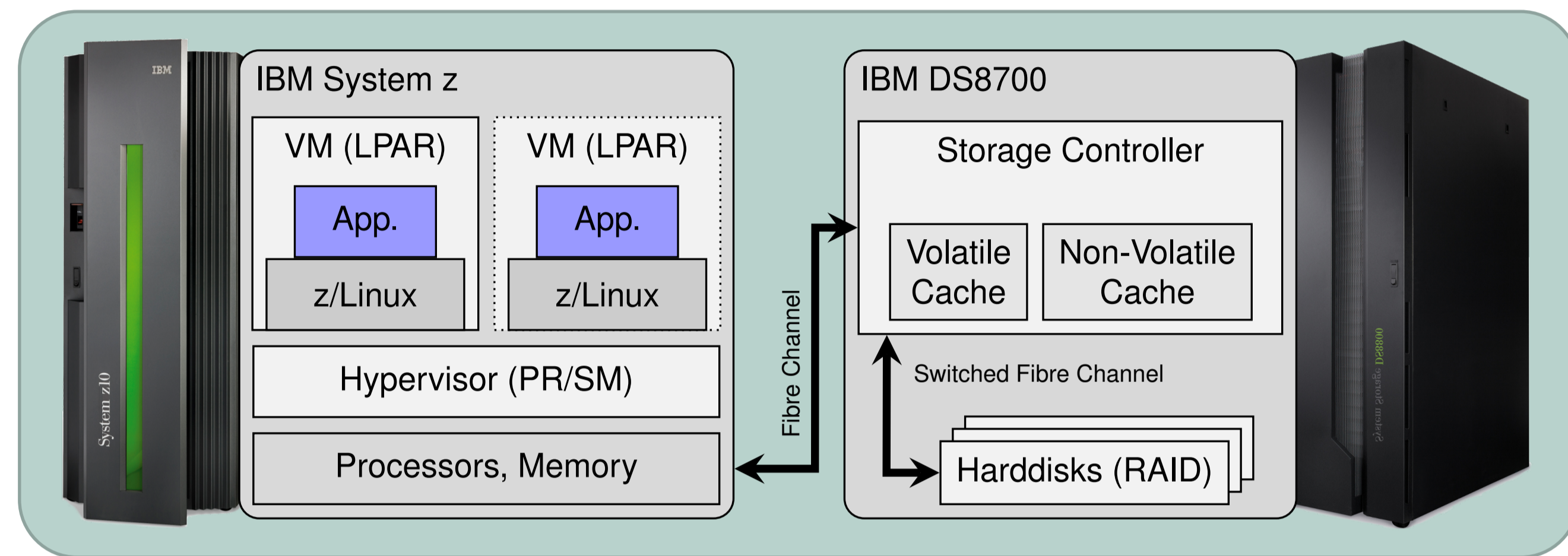
The Storage Performance Analyzer

Measuring, Monitoring, and Modeling of I/O Performance in Virtualized Environments

Qais Noorshams, Axel Busch, Samuel Kounev, Ralf Reussner

Motivation

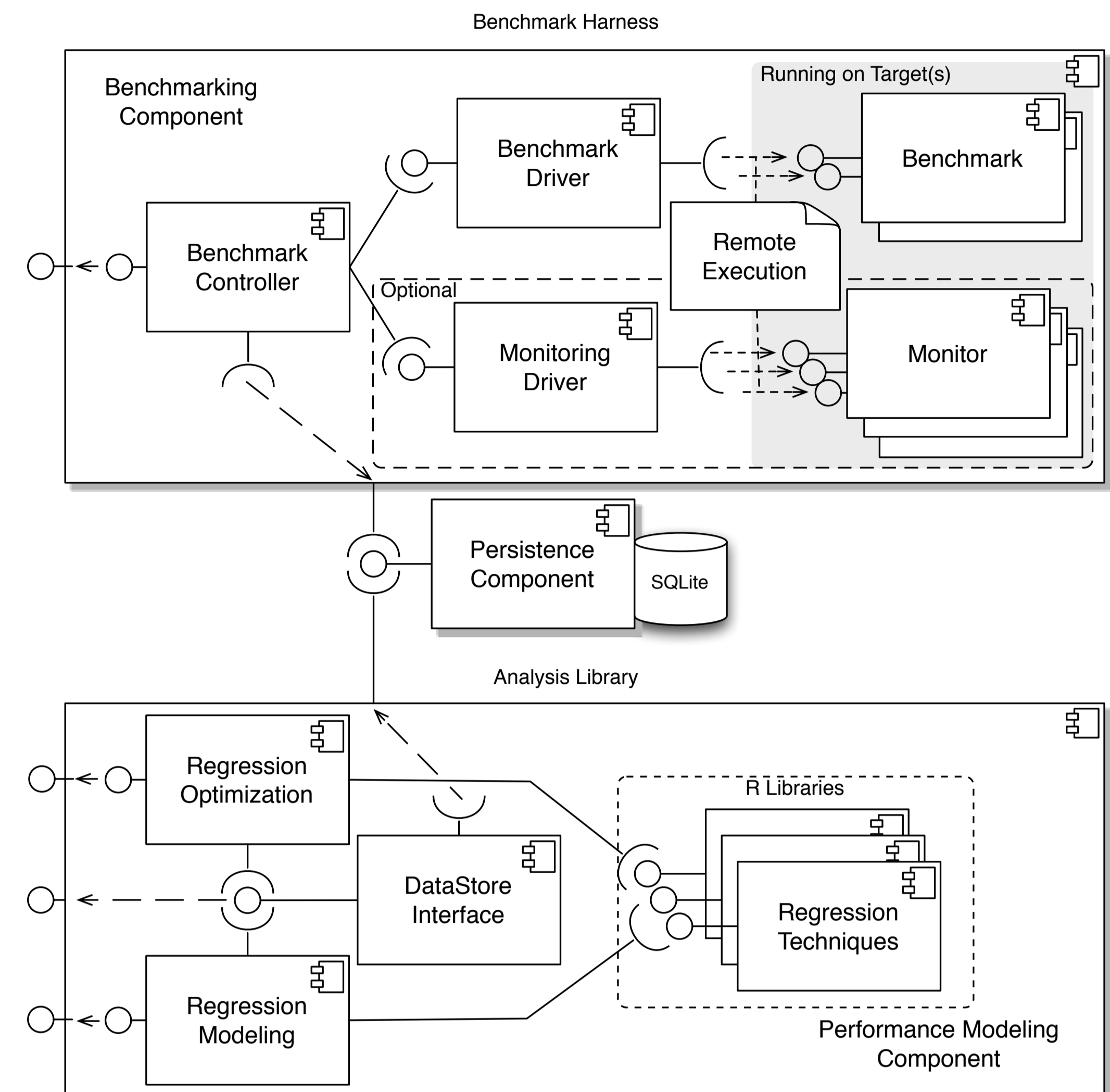
- Exponential growth of digital data and I/O resource demands
- Modern storage systems increasingly complex and dynamic
- Performance impact magnified in virtualized environments
 - Multi-layered, multi-tiered execution infrastructures
 - Workload consolidation increases resource demands
 - Complex performance interference effects among VMs



Storage Performance Analyzer (SPA)

- Systematic analysis of I/O performance in virtualized environments
- Peer-reviewed tool allowing analysis with high degree of automation
- Measuring, Monitoring, and Modeling of I/O Performance
 - Measuring performance with integrated I/O benchmarks
 - Monitoring of system environment during load tests
 - Modeling and analysis with statistical regression-based techniques

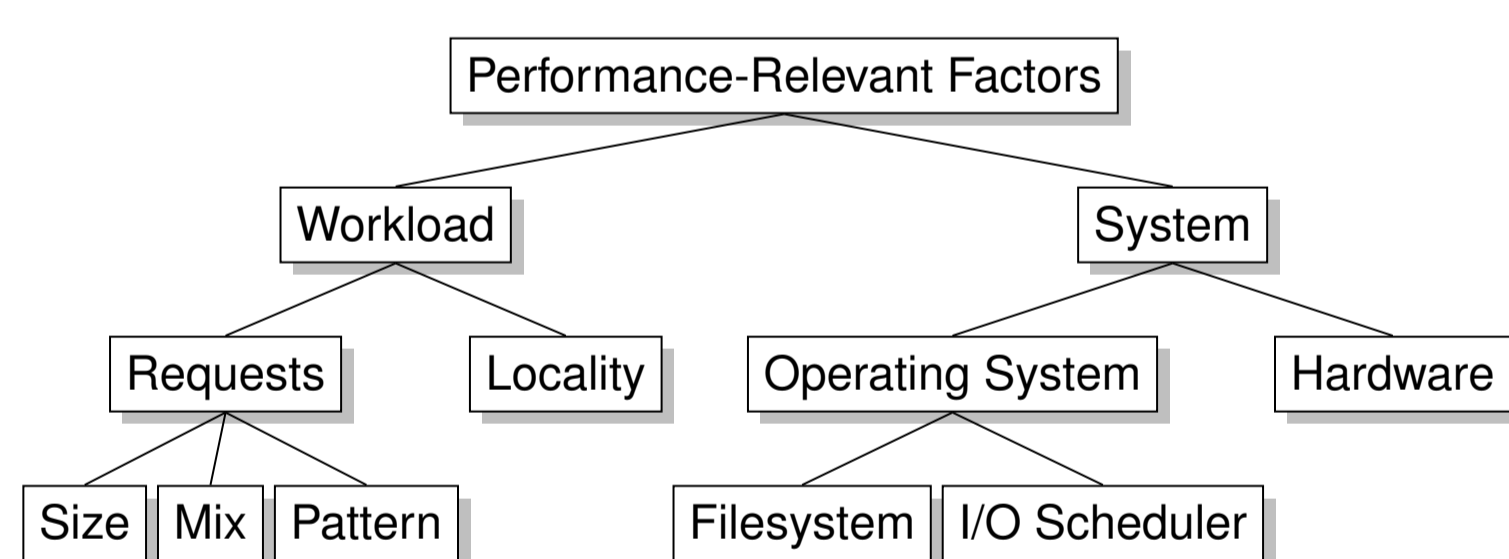
Tool Architecture



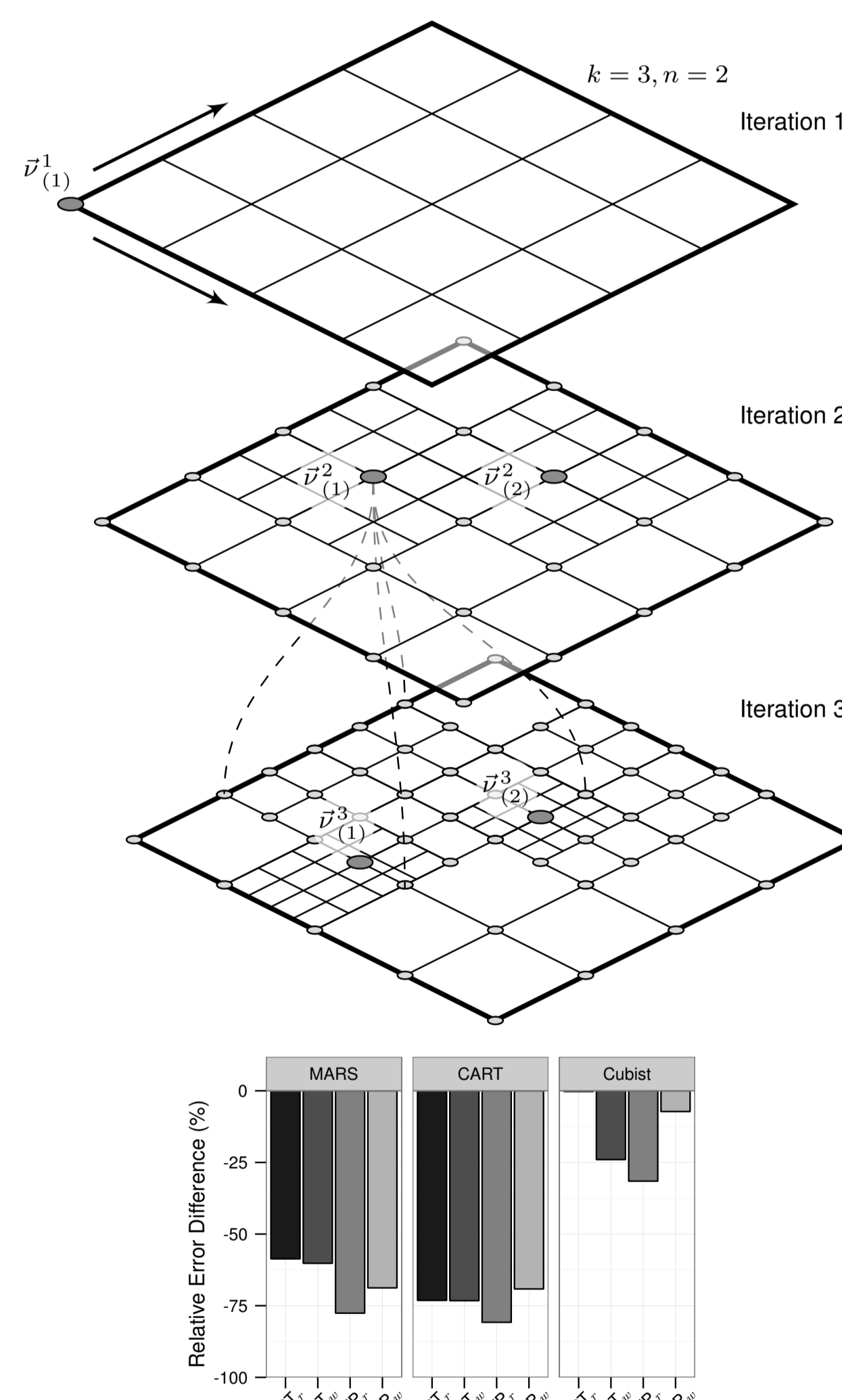
- Benchmark harness
 - Coordinates and controls the execution of benchmarks and monitors
- Tailored analysis library
 - Processes and evaluates the collected data and measurements
 - Integrated into statistics tool *R* (<http://www.r-project.org/>)

Case Studies and Application Scenarios

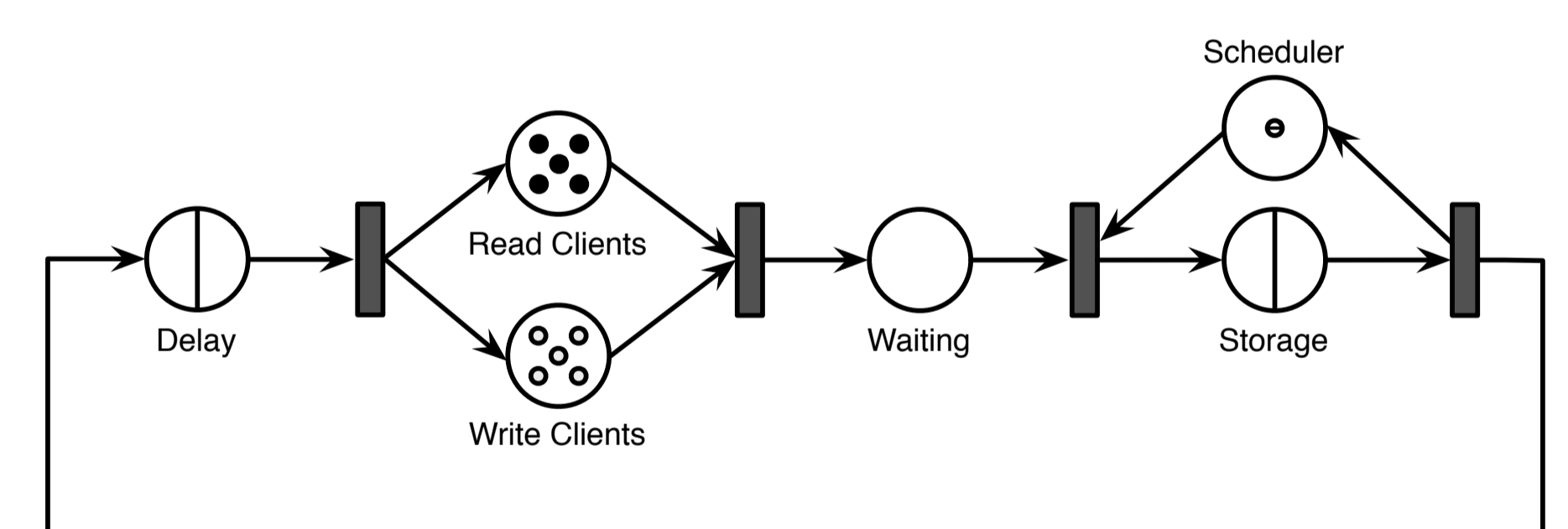
- Evaluating performance-relevant factors and workload analysis [1,7]



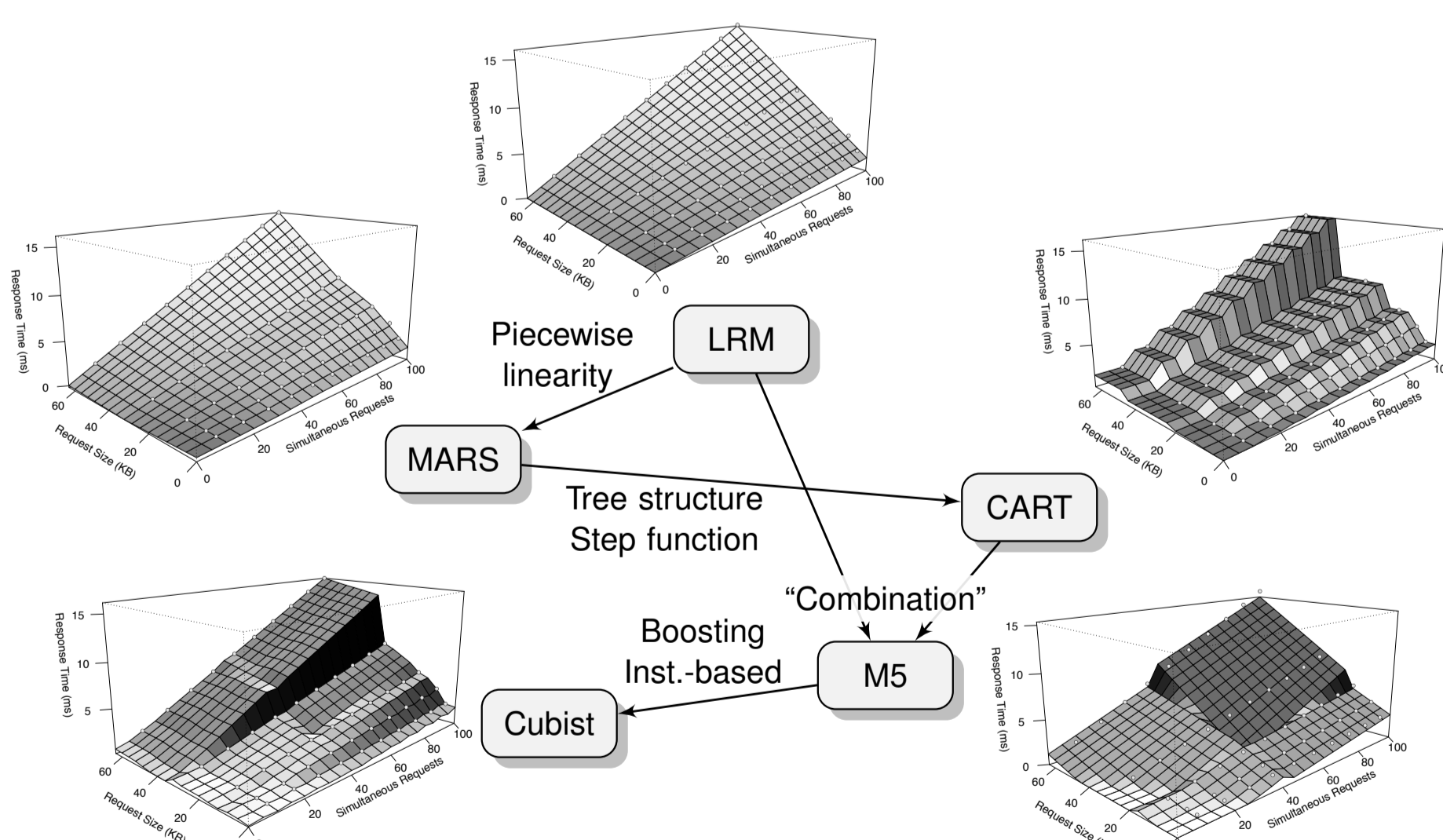
- Optimizing regression models [2,4]



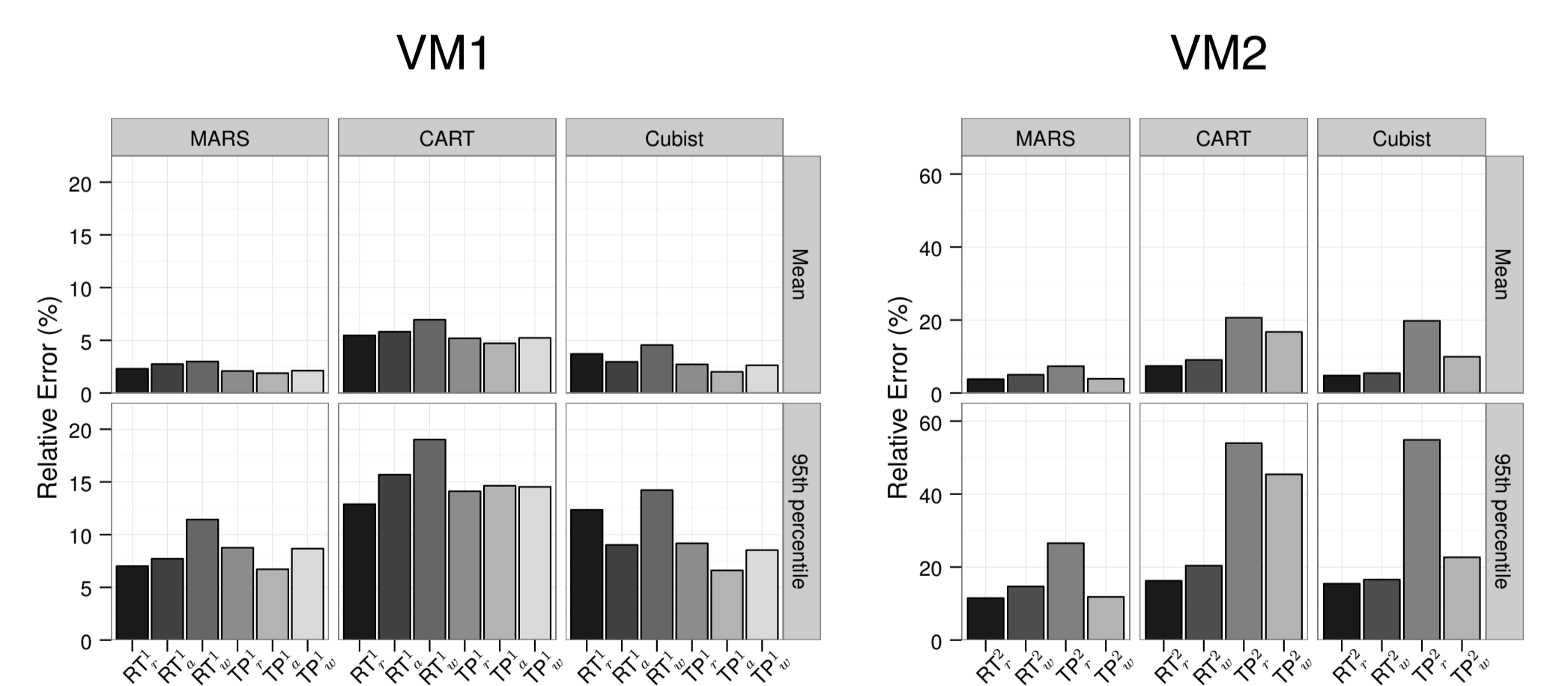
- Creating queueing theory-based models [3,5]



- Creating statistical regression-based models [2,4,6]



- Predicting I/O performance and interference [2-6]



Download

- SPA Project Website**
<http://storageperformanceanalyzer.github.io/SPA/>
 - Sources and prepared drops for common platforms
 - Documentation and examples
- SPEC RG Tool Repository**
<http://research.spec.org/tools/>
 - Peer-reviewed tools



References

- Qais Noorshams, Samuel Kounev, and Ralf Reussner. *Experimental Evaluation of the Performance-Influencing Factors of Virtualized Storage Systems*. In EPEW 2012, Munich, Germany. Springer Berlin Heidelberg.
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- Qais Noorshams, Roland Reeb, Andreas Rentschler, Samuel Kounev, and Ralf Reussner. *Enriching Software Architecture Models with Statistical Models for Performance Prediction in Modern Storage Environments*. In CBSE 2014, Marcq-en-Bareuil, France. ACM, New York, NY, USA.
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