WiSeDB: A Learning-based Workload Management Advisor for Cloud Databases

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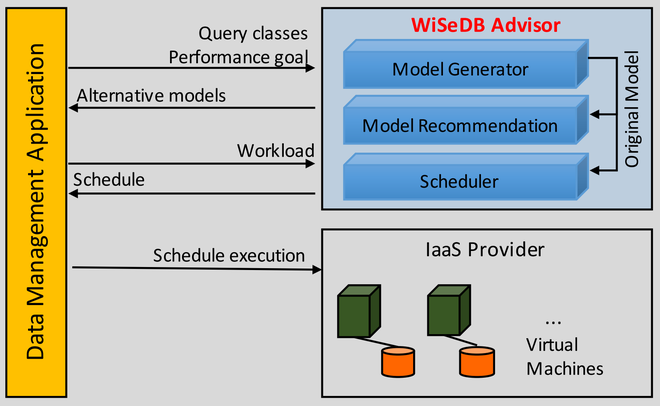
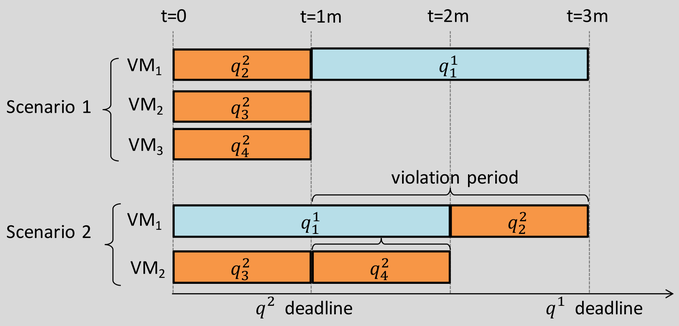
WiSeDB



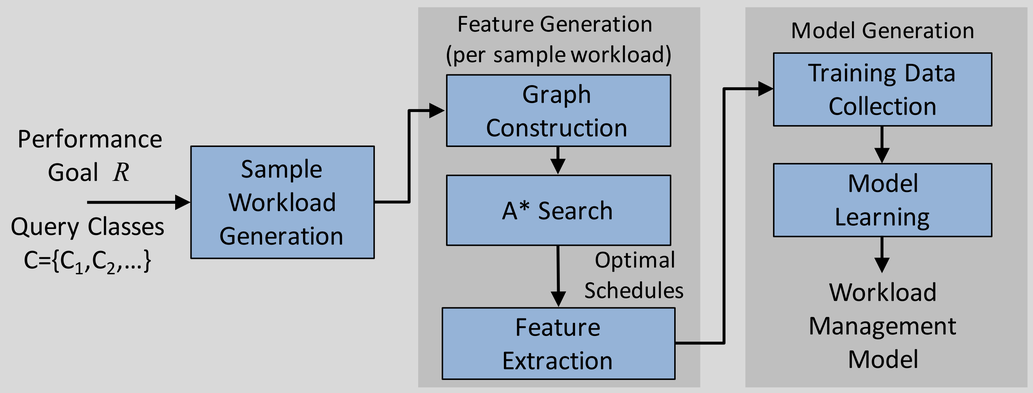
- **Learning-based approach** that ``learns'' close-to-optimal heuristics specific to workload and SLA from extracted features
- **End-to-end solution** for query placement, query scheduling and resource provisioning
- **Cost-aware workload manager** to help cloud DBs meet **custom** SLAs

Motivation



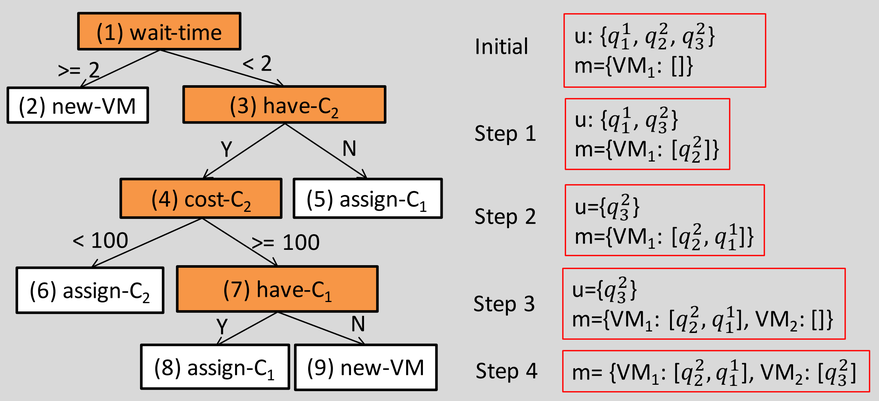
- Custom goals need custom solutions
  - Hand-crafting heuristics is tedious, ineffective, and non-adaptable
- State-of-the-art deals with isolated workload management challenges
  - e.g., scheduling, placement, provisioning

Framework Overview



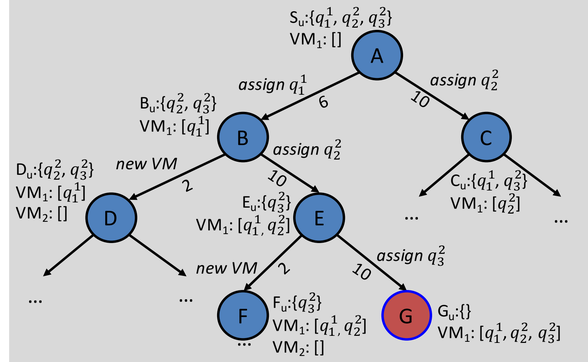
1. Generate many small **sample workloads** from user's query classes (types of possible queries)
2. Find the **optimal (cost-wise) schedule** for these workloads under the user's SLA (brute force)
3. Collect workloads and optimal schedules into a large **training set** by **extracting features** from the optimal answers
4. Generate a **decision tree model**
5. The decision tree can be used to **schedule arbitrary workloads**

Workload Management



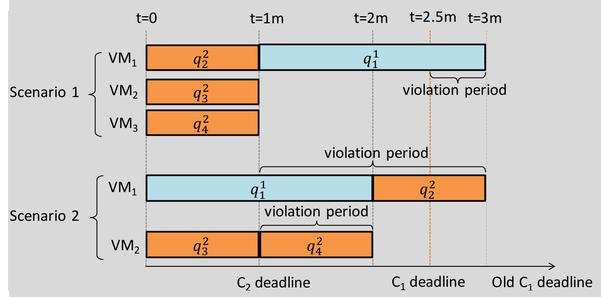
- Decision trees **navigate the graph** step-by-step, resulting in a schedule
- **Learns heuristics** tailored to the user's workload

Scheduling Graph



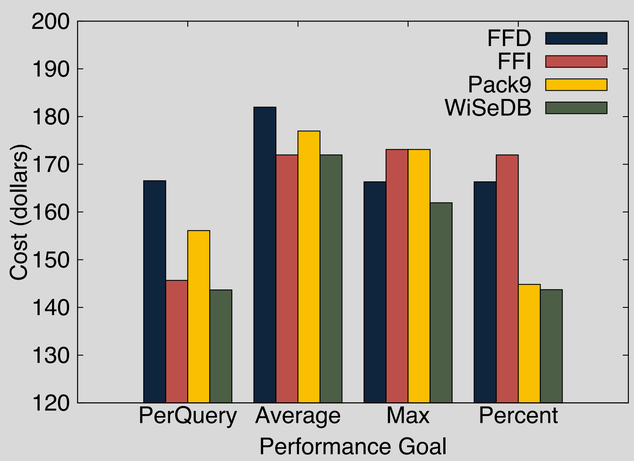
- Represent query scheduling as a **path-finding** problem
- Edges represent **decisions**, weights are the **costs**
- Optimal schedule is the **shortest path** through the graph

Adaptive Modeling

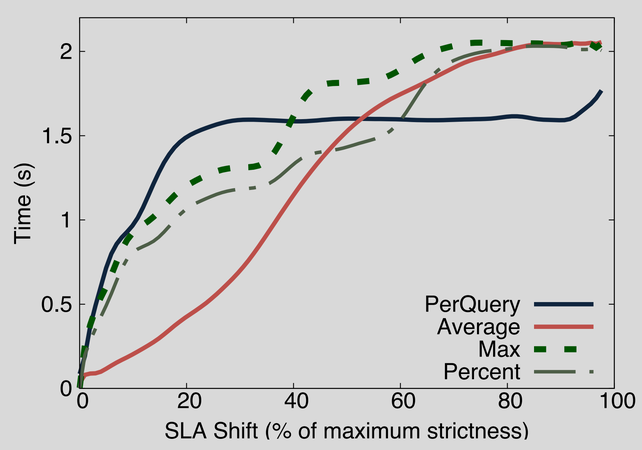


- Enable users to **explore cost/performance tradeoffs**
- Take a model for one SLA and quickly create a model for a **shifted** SLA
- If edge weights strictly increase, we can apply **Adaptive A***
- Model shift time <<< model train time

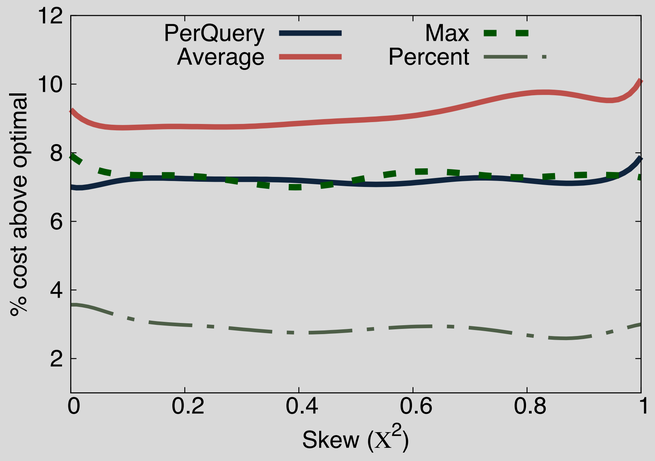
Results



- WiSeDB **outperforms ideal heuristics** for diverse performance goals



- WiSeDB can **shift SLAs** very quickly, enabling performance/cost exploration



- WiSeDB maintains its performance with heavily **skewed workloads**

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