**DARWIN: An Evolutionary Database Management System**
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**Motivation**

One size does **not** fit all

Custom solutions are needed for optimal performance

Solutions need to be tuned

Bootstrapping new systems is expensive and time-consuming

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**The Problems of Traditional Auto-tuning**

Variety of optimization goals, such as:

- Throughput
- Avg. Latency
- Energy-efficiency

- Traditional auto-tuning techniques rely on heuristics to prune the search space → heuristics are based on assumptions and can be inaccurate
- For optimal performance, heuristics would have to be defined that can approximate every combination of modules, hardware, runtime environments and optimization goals

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**DARWIN-Vision**

“Adaptivity Across Architecture Borders”

- Automatic synthesis of custom-tailored architectures
- Continuous adaption ensures that the system provides near optimal performance at all times
- DARWIN can potentially change any component of the system, representing different architectures such as key-value-stores or column-stores
- Tuning uses genetic algorithms and does not rely on pre-defined, error-prone heuristics

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**Data System Evolution**

**DARWIN-Architecture**

- **EVOLUTIONARY OPTIMIZER**
  - Query Scheduler
  - Query Plan Generation
  - Statistics

- **EXECUTION ENGINE**
  - Candidate Population
  - Access Methods & Operators

- **STORAGE ENGINE**
  - Cold Data (Untouched)
  - Hot Data

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