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Grand Challenges in Testing Data-intensive Computing Systems

DBTest Workshop 2010
Testing is:
- Ensuring that the system is built as designed
- Ensuring customer requirements are met
- Finding bugs
- Quantifying, tuning and deciding engineering tradeoffs
- Providing insurance
- Providing information: learning

Data management systems:
- Broad term: includes any of SQL Server, Stream Insight, SAP, Big Table, Hadoop, etc.
Data management & Testing

Data management field
- More than 30 years of research and development
- Built on strong foundations
- Enormous body of published work by academia and industry
- Today anyone can build a RDBMS, *the “text-book” has been written!*
  - MySQL, Postgress, and other code bases in the academia are available

The field of testing data management systems
- Test engineering is an immature discipline
- Very little information is shared
- The state of the art is yet to be defined

*It’s time to start writing the text-book on testing data management systems!*
What makes testing challenging

- **Size and Cost**
  - Testing at realistic scale and size is hard
  - Testing the size and richness of the programming surface
  - The cost of testing an increment of the feature-set is often a function of the entire feature-set
  - Test code bases are becoming large, hard to manage
  - Test *immortal test case* problem!

- **Understanding coverage**
  - Knowing when you have done enough testing is hard
  - Code coverage is not enough; you need state, workload, scenario coverage

- **Complexity**
  - Testing is multidisciplinary: language compiler, optimization, operating system, etc.
  - Complexity increases with appliances, distributed systems, the Cloud
Areas in need of solutions 1/2

1) Workloads/benchmarks
   - Standard benchmarks are: performance oriented, simple, linear
   - We need large, mixed workloads with un-steady states and built-in failures
   - Methodology and metrics for workload characterization
   - Important: this is what most researchers rely on to evaluate their ideas

3) Test architecture and test reuse
   - What are the abstract primitives that would apply to testing most systems?
     - A standard blueprint for testing data management systems?
     - A standard suite of test methodologies?
   - The industry is moving towards “multiple engines”

4) Large data
   - Data expansion and data reduction
Areas in need of solutions 2/2

1) Query optimization quality
   - Defining metrics for QO quality is hard
   - Also, measuring quality over time and over code changes
   - How can you compare optimizers of two competitive systems?
   - Proving query results correctness for complex queries over large data

2) The Cloud
   - Distributed data processing/storage at a large scale
   - Failure: from unlikely to certain
   - Failure conditions: harder to reproduce
   - Testing needs to takes place “in production” too
   - SLA testing
Thank you!