Smooth Scan: Statistics-oblivious Access Paths

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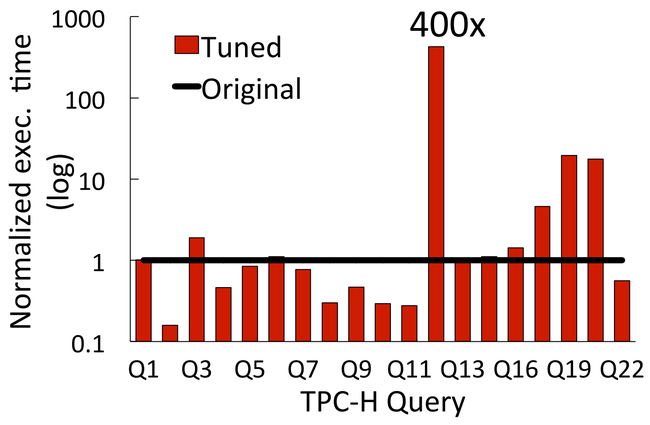
Need for Intra-Query Adaptivity

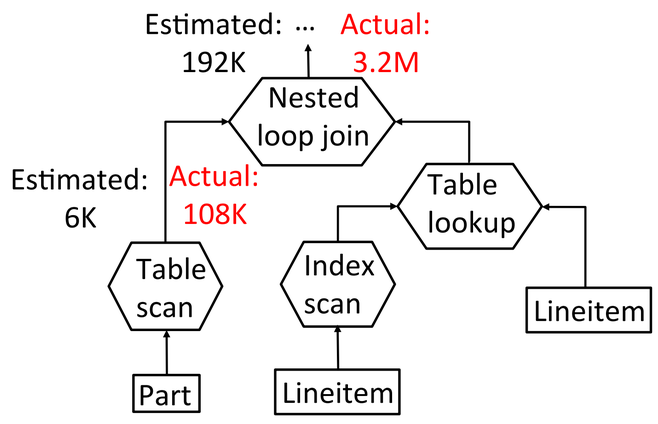
State of Affairs in Database Systems

Setting: TPC-H, SF10, DBMS-X, Tuning tool 5GB space



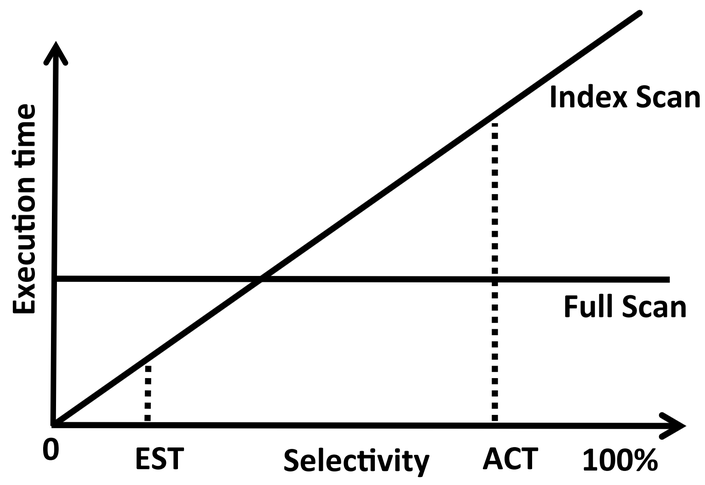
➢ Degradation due to sub-optimal access path choices

Cause for sub-optimal plans



➢ Cardinality misestimates

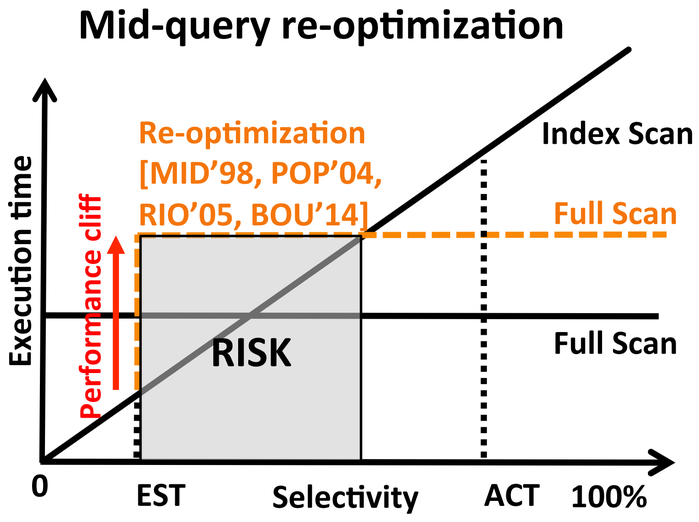
Access path selection problem



➢ Statistics: unreliable advisor

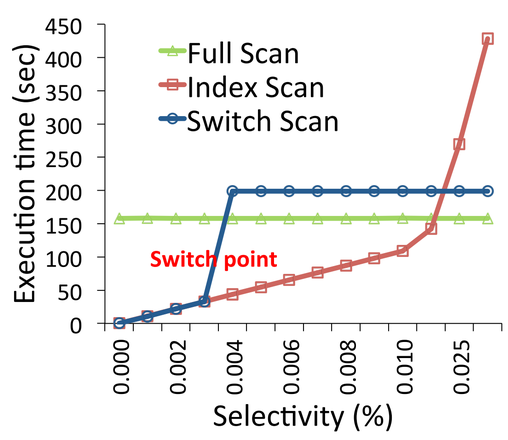
Adaptivity in Access Path Operators

Mid-query re-optimization



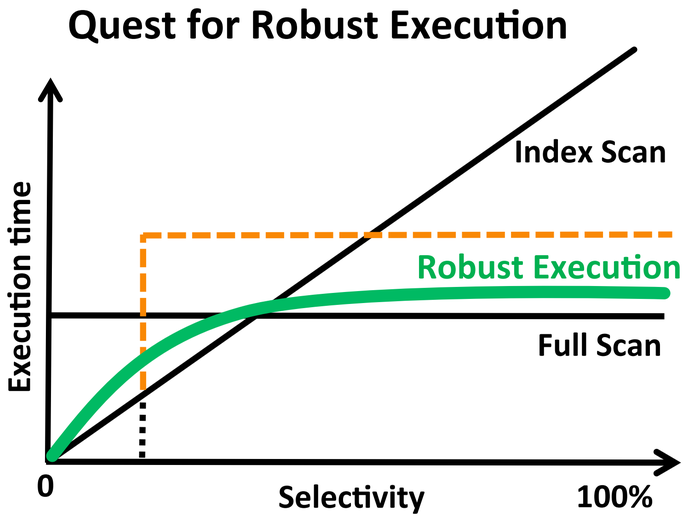
➢ Re-optimization risky

Re-optimization in action



➢ Violate user expectation

Quest for Robust Execution



➢ Near-optimal for all inputs

Smooth Scan in Nutshell

Statistics-oblivious access paths

SMOOTH SCAN

Ignore optimizer's estimates

Learn result distribution at run-time

Adapt as you go

DESIGN GOALS

Avoid **performance cliffs & risk**

Continuous, gradual and **smooth adaptation**

➢ Adaptive, but smooth

Adaptivity with Smooth Scan

INSIGHT: **Morph** between Index and Sequential Scan

HOW?

1. Index Access
2. Entire Page Probe
3. Gradual Flattening Access

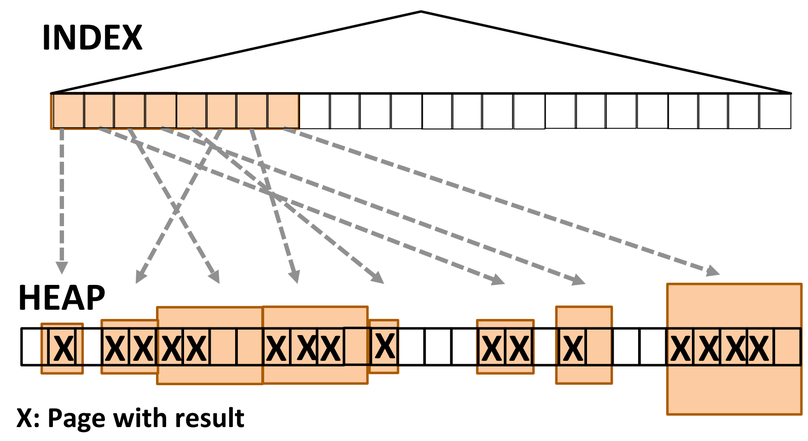
WHEN?

Selectivity increase -> Mode Increase

Selectivity decrease -> Mode Decrease

➢ Data driven adaptation

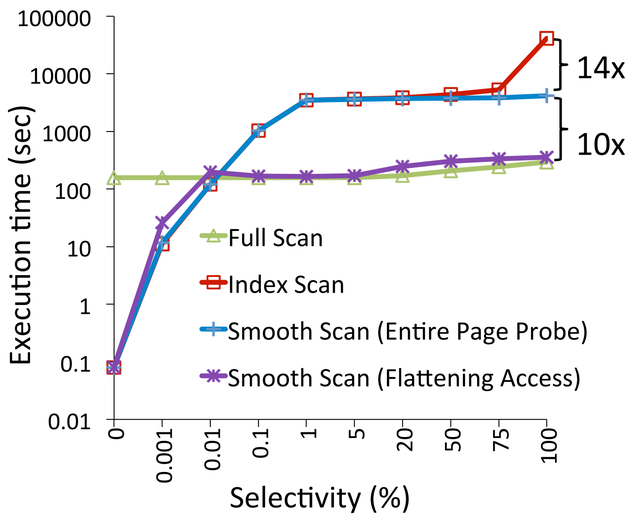
Region Snooping = Data driven adaptation



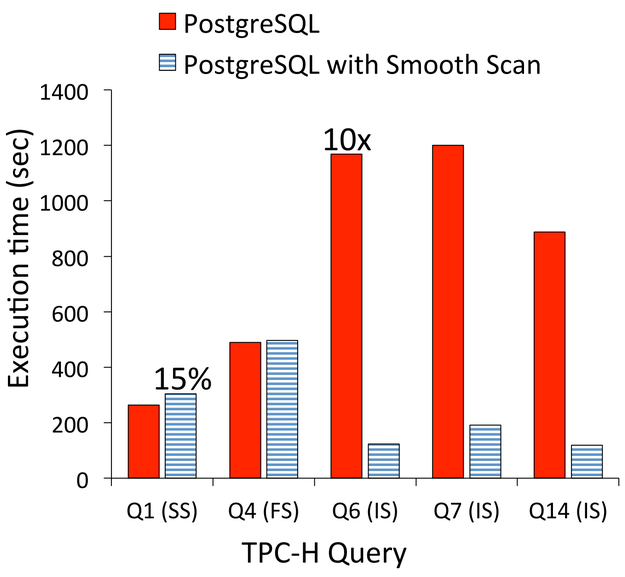
➢ Avoid repeated access ➢ Less random I/O

Smooth Scan in Action

Setting: 400M tuples, 25GB, Index(c2)
Query: select * from R where c2 < X%;



Setting: TPC-H, SF 10, PostgreSQL with Smooth Scan



Smooth Scan Summary

Operator morphing from one form to another

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Data driven **adaptation**

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Robust query execution

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DATA-INTENSIVE APPLICATIONS AND SYSTEMS