Benchmarking testing for TNLJ, BNLJ, SMJ

Test Plan:

Precondition:
1.Only three tables: Sailors, Reserves, and Boats

Queries: 1. SELECT * FROM Sailors, Reserves WHERE Sailors.A = Reserves.G;
2.SELECT * FROM Sailors, Reserves, Boats WHERE Sailors.A = Reserves.G AND Reserves.H = Boats.D;
3. SELECT * FROM Sailors, Reserves, Boats WHERE Sailors.A = Reserves.G AND Reserves.H = Boats.D AND Sailors.B < 150;

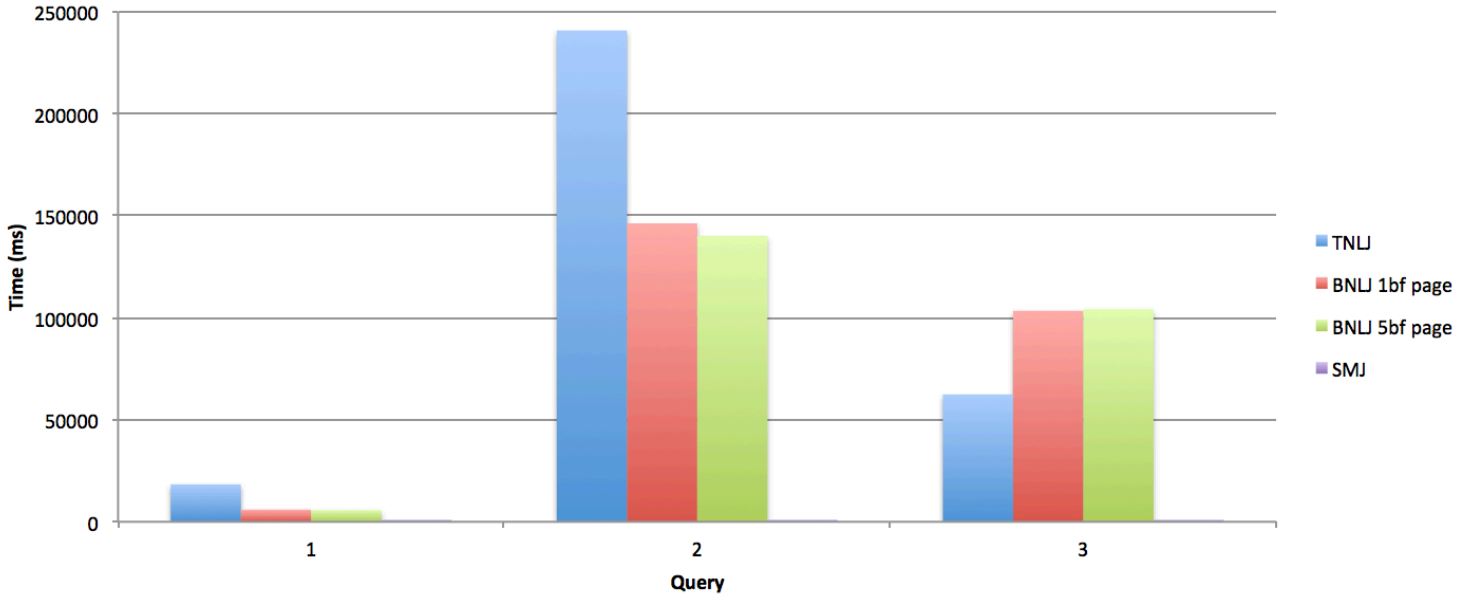
large samples

1. Table Name: Sailors, Reserves, Boats
2. Schema: Sailors.A, Sailors.B, Sailors.C/ Boats.D,Boats.E,Boats.F,Reserves G,Reserves F
3. Number of buffer used for the SMJ: 1 buffer page or 5 buffer page

Case 0: Benchmarking data

```
Boats:      Tuples: 5000    Range: 500
Sailor:     Tuples: 6000    Range: 600
Reserves:   Tuples: 6000    Range: 700
```

Result Pass



Benchmarking data: directory: benchmarking/large3				
Table information: Boats: Tuples: 5000 Range: 500 Sailor: Tuples: 6000 Range: 600 Reserves: Tuples: 6000 Range: 600				
Method\Query	Query 7	Query 8	Query 9	Query 10
TNLJ	8	18377	240868	62429
BNLJ 1bf page	8	5983	146297	103444
BNLJ 5bf page	8	5749	140157	104204
SMJ	7	97	601	9

Observation

Based on the graph, we can see sortmerge join greatly reduce the execution time. Block nested loop join is able to reduce the execution time when the join condition comtains multiple equal condition. We also found the time comsumption for BNLJ with 1 buffer page and 5 bffer page are very close. The reseaon is that saving the outer relation in buffer pages reduces total passes of inner relation. However, if the block size exceeds the memory capacity, extra disk I/Os are needed to fetch different portions of the block. Thus there is a compromise between maximizing outer block size and minimizaing inner page passes.

Case 1: large range

```
Boats:      Tuples: 5000    Range: 1000
Sailor:     Tuples: 6000    Range: 2000
Reserves:   Tuples: 2000    Range: 500
```

Time Consumption: see excel file
Result: Pass

Case 2: small range

```
Boats:      Tuples: 5000    Range: 100
Sailor:     Tuples: 6000    Range: 200
Reserves:   Tuples: 2000    Range: 300
```

Time Consumption: see excel file
Result: Pass