universität innsbruck

Architektur und Implementierung von Datenbanksystemen

Task 4

Team 3 - Gründlinger Diana, Huber Marcel, Klotz Thomas, Targa Aaron, Thalmann Matthias

Content

- Available plan operators in PostgreSQL
- Equivalences of PostgreSQL operators and operators mentioned in the lecture
- Output of the explain command

Available plan operators

Categories of operators

- Scan Operators
- Join Operators
- Other Operators

Available plan operators

Scan Operators

- Sequential Scan (Table Scan)
- Index Scan (Index Scan)
- Index-Only Scan
- Bitmap Heap Scan
- Bitmap Index Scan (Index Seek)
- CTE Scan
- Custom Scan
- Foreign Scan
- Function Scan
- Subquery Scan
- Table Sample Scan
- Tid Scan
- Values Scan
- Work Table Scan

* equivalences to operators mentioned in the lecture are green

Available plan operators

Join Operators

- Hash Join
- Merge Join
- Nested Loop Join

* equivalences to operators mentioned in the lecture are green

Available plan operators

Other Operators

- Aggregate
- Append
- Bitmap And
- Bitmap Or
- Gather Merge
- Gather
- Group
- Hash
- Limit
- Lock Rows
- Materialize
- Merge Append
- Modify Table
- Project Set
- Recursive Union
- Result
- SetOp (Union, Intersect, Except)
- Sort
- Unique (Distinct)
- Window Aggregate

* equivalences to operators mentioned in the lecture are green

Available plan operators

Projection and Selection?

- Selection: part of scan operators

- Projection: not mentioned in execution plans

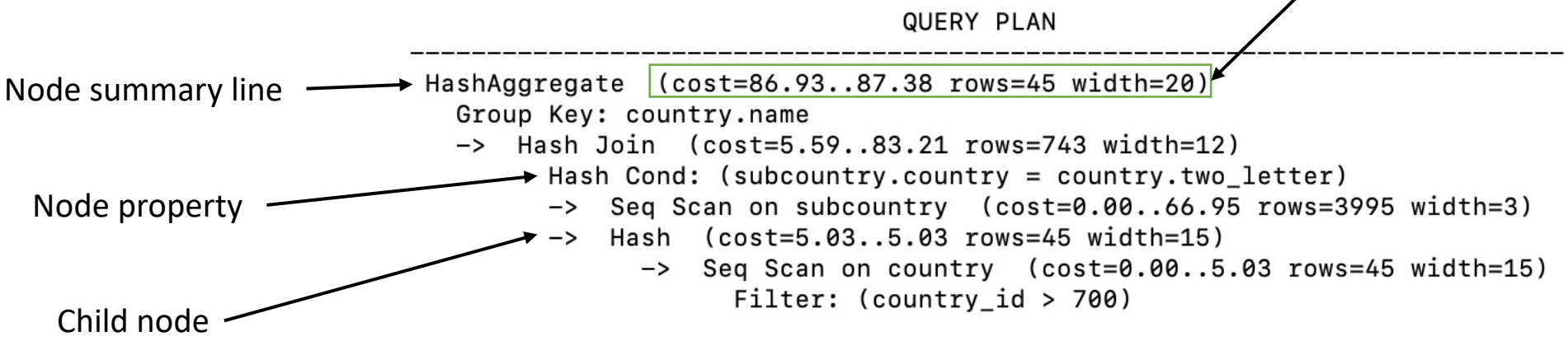
```
[db_ps_sheet01=# explain select name from country where country_id > 700;
                          QUERY PLAN
 ------------------------------------------------------
  Seq Scan on country  (cost=0.00..5.03 rows=45 width=12)
    Filter: (country_id > 700)
```

Explain output

```
explain select name, count(name) as nr_subcountries
from country join subcountry on country.two_letter =
subcountry.country
where country.country_id > 700
group by name;
```

estimations:

- Startup cost .. Total cost
- Number of output rows
- Average width of output row in bits



Explain output

Analyze

explain analyze

- executes query
- results in additional metrics

```
db_ps_sheet01=# explain analyze select name from country where country_id > 700;
                                                  QUERY PLAN
-------------------------------------------------------------------------------------------------------------
 Seq Scan on country  (cost=0.00..5.03 rows=45 width=12) (actual time=0.052..1.156 rows=46 loops=1)
   Filter: (country_id > 700)
   Rows Removed by Filter: 196
 Planning Time: 0.084 ms
 Execution Time: 2.504 ms
```

References

- https://www.postgresql.org/docs/current/using-explain.html [1]
- https://pganalyze.com/docs/explain/basics-of-postgres-query-planning [2]

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