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- How we implement Explain
 - 在 Lexer 加入新的 Keyword “explain”
 - 在 Parser 加入檢查 Keyword “explain” 放入 QueryData
 - 在 QueryData 加入 explain 布林變數
 - 在 BasicQueryPlanner 將 Parsing 字串接起來, 並用 ExplainPlan 回傳 Plan
 - 實做 ExplainPlan 將 Parsing 字串做成 Record, 放入 Schema

- Use bench project to load the TPC-C testbed and show the EXPLAIN result for the following queries:

- A query accessing single table with WHERE

```
SQL> EXPLAIN SELECT d_id from district where d_id < 4
```

```
query-plan
```

```
-----  
->ProjectPlan: (#blks=2, #recs=3)  
    ->SelectPlan pred:(d_id<4.0) (#blks=2, #recs=0)  
        ->TablePlan on (district)(#blks= 2, #recs=10)  
  
Actual #recs: 3
```

- A query accessing multiple tables with WHERE

```
SQL> EXPLAIN SELECT COUNT(o_c_id) FROM customer, orders WHERE c_id = o_c_id GROUP BY o_c_id
```

```
query-plan
```

```
-----  
->ProjectPlan: (#blks=400103, #recs=869)  
    ->GroupByPlan: (#blks=400103, #recs=869)  
        ->SortPlan: (#blks=400103, #recs=869)  
            ->SelectPlan pred:(c_id=o_c_id) (#blks=450030296, #recs=800205)  
                ->ProductPlan (#blks= 450030296, #recs=900000000)  
                    ->TablePlan on (customer)(#blks= 15001, #recs=30000)  
                    ->TablePlan on (orders)(#blks= 296, #recs=30000)  
  
Actual #recs: 869
```

- A query with ORDER BY

```
SQL> EXPLAIN SELECT s_i_id from stock ORDER BY s_i_id ASC
```

```
query-plan
```

```
-----  
->ProjectPlan: (#blks=25001, #recs=100000)  
    ->SortPlan: (#blks=393, #recs=100000)  
        ->SelectPlan pred:() (#blks=25001, #recs=100000)  
            ->TablePlan on (stock)(#blks= 25001, #recs=100000)  
  
Actual #recs: 100000
```

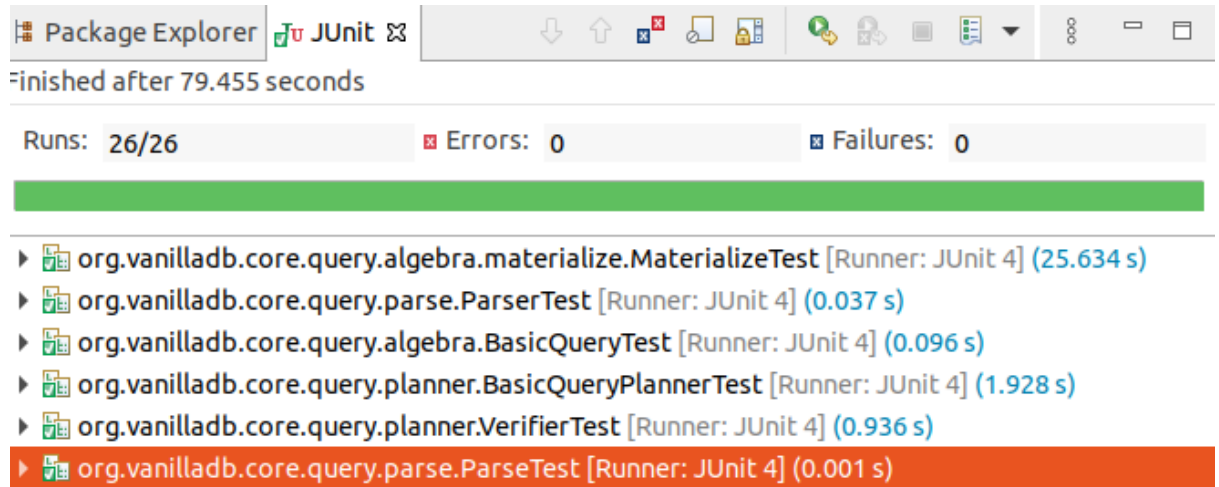
- A query with GROUP BY and at least one aggregation function

```
SQL> explain select avg(i_price) from order_line, item WHERE i_id = ol_i_id
```

```
query-plan
```

```
-----  
->ProjectPlan: (#blks=939806251, #recs=1)  
    ->GroupByPlan: (#blks=939806251, #recs=1)  
        ->SortPlan: (#blks=939806251, #recs=1)  
            ->SelectPlan pred:(i_id=ol_i_id) (#blks=939806251, #recs=1963835)  
                ->ProductPlan (#blks= 939806251, #recs=30070100000)  
                    ->TablePlan on (order_line)(#blks= 9398, #recs=300701)  
                    ->TablePlan on (item)(#blks= 6251, #recs=100000)  
  
Actual #recs: 1
```

- Anything worth mentioning
 - Finished JUnit Test



- Load Testbed 要一個小時，但問了一下其他組的人都沒那麼久...
- DB 有一次發生奇怪的 VanillaDB null pointer exception, restart 無法解決。最後重 clone 就沒問題了
- VanillaCore Walkthrough 的 slides 對這次作業很有幫助，覺得很棒。