VERTICA
by opentext™

Vertica

Distributed Query Execution

Vertica Query Execution Basics

- SQL query is written against tables

```
SELECT count(*) FROM fact;
```

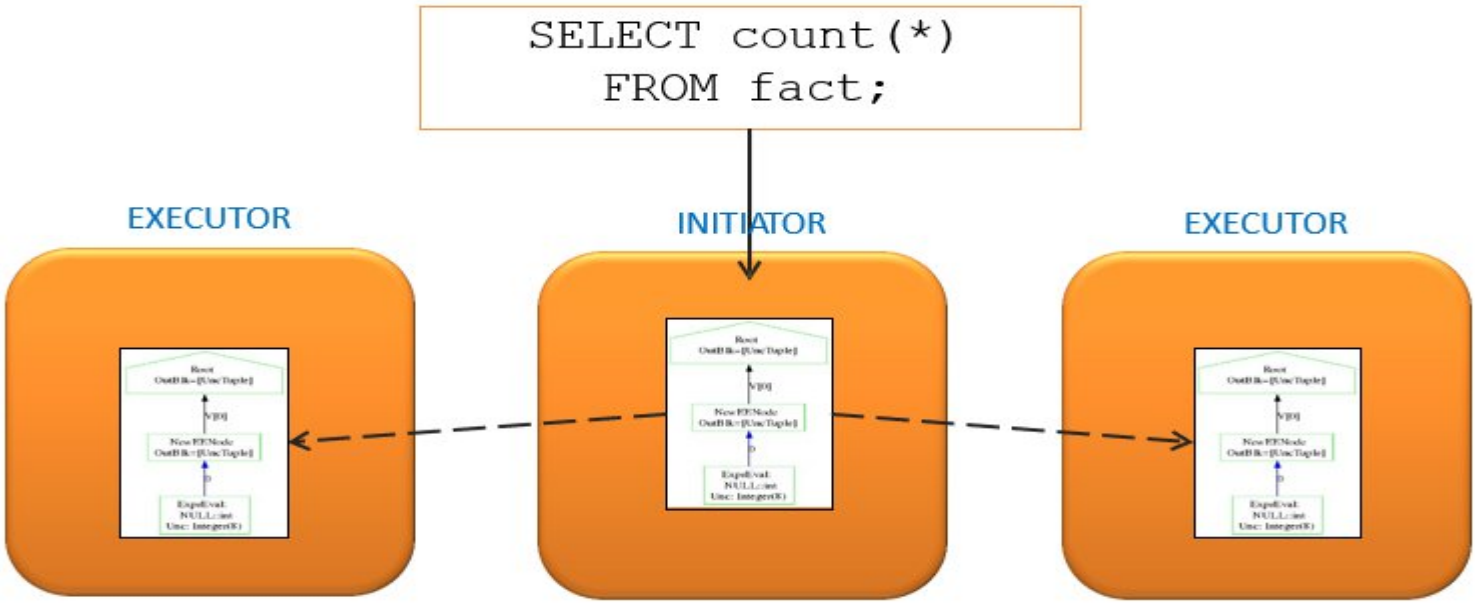
- Vertica translates the query to execute against projections

```
SELECT count(*) FROM fact_p1;
```

- The query Optimizer picks an optimal query plan
  - Picks the best projection(s) for the query
  - Picks the order in which to execute joins, query predicates, etc.
  - The query plan with the lowest cost is selected

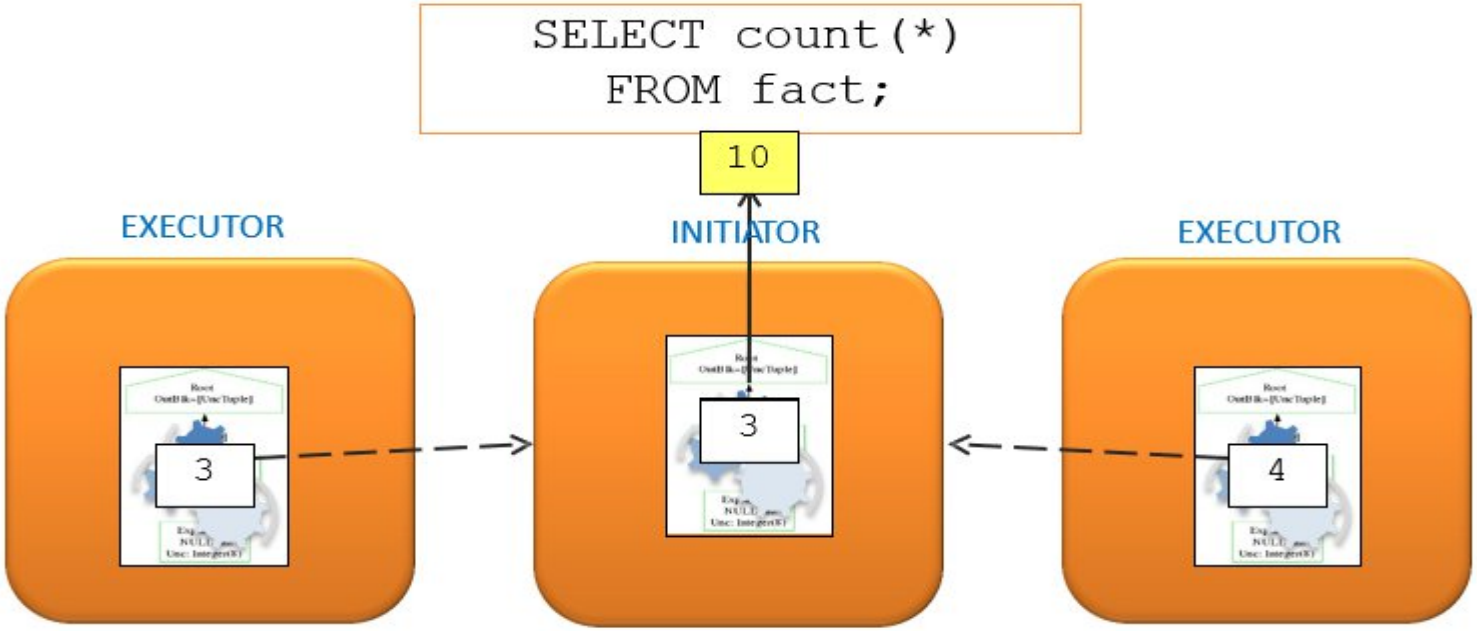
Query Execution Workflow

- Client connects to a node and issues a query
  - Node the client is connected to becomes the *initiator* node
  - Other nodes in the cluster are *executor nodes*
- Initiator node parses the query and picks an execution plan
- Initiator node distributes query plan to executor nodes



Query Execution Workflow

- All nodes execute the query plan locally
- Executor nodes send partial query results back to initiator node
- Initiator node aggregates results from all nodes
- Initiator node returns final result to the user



Query plans in Management Console

```
1 SELECT customer_name, customer_region, AVG(customer_age), COUNT(*) FROM CUSTOMER_DIMENSION
2 WHERE customer_gender = 'Male' AND customer_region IN ('East', 'Midwest')
3 GROUP BY customer_region, customer_name;
```

Execute Query

SELECT customer

Query Results | Query Plan | Query Profile

Expand All | Collapse All

```
+-SELECT LIMIT 10K [Cost: 3K, Rows: 10K (NO STATISTICS)] (PATH ID: 0)
Output Only: 10000 tuples
Execute on: Query Initiator
  +---> GROUPBY HASH (GLOBAL RESEGMENT GROUPS) (LOCAL RESEGMENT GROUPS) [Cost: 3K, Rows: 10K (NO STATISTICS)] (PATH ID: 1)
  Aggregates: sum_float(CUSTOMER_DIMENSION.customer_age), count(CUSTOMER_DIMENSION.customer_age), count(*)
  Group By: CUSTOMER_DIMENSION.customer_region, CUSTOMER_DIMENSION.customer_name
  Output Only: 10000 tuples
  Execute on: All Nodes
    +---> STORAGE ACCESS for CUSTOMER_DIMENSION [Cost: 895, Rows: 10K (NO STATISTICS)] (PATH ID: 2)
    Projection: public.customer_dimension_b0
    Materialize: CUSTOMER_DIMENSION.customer_region, CUSTOMER_DIMENSION.customer_name, CUSTOMER_DIMENSION.customer_age
    Filter: (CUSTOMER_DIMENSION.customer_gender = 'Male')
    Filter: (CUSTOMER_DIMENSION.customer_region = ANY (ARRAY['East', 'Midwest']))
    Execute on: All Nodes
```

Feedback

Query plans in vsql

Sample query:

dbadmin@node1:~

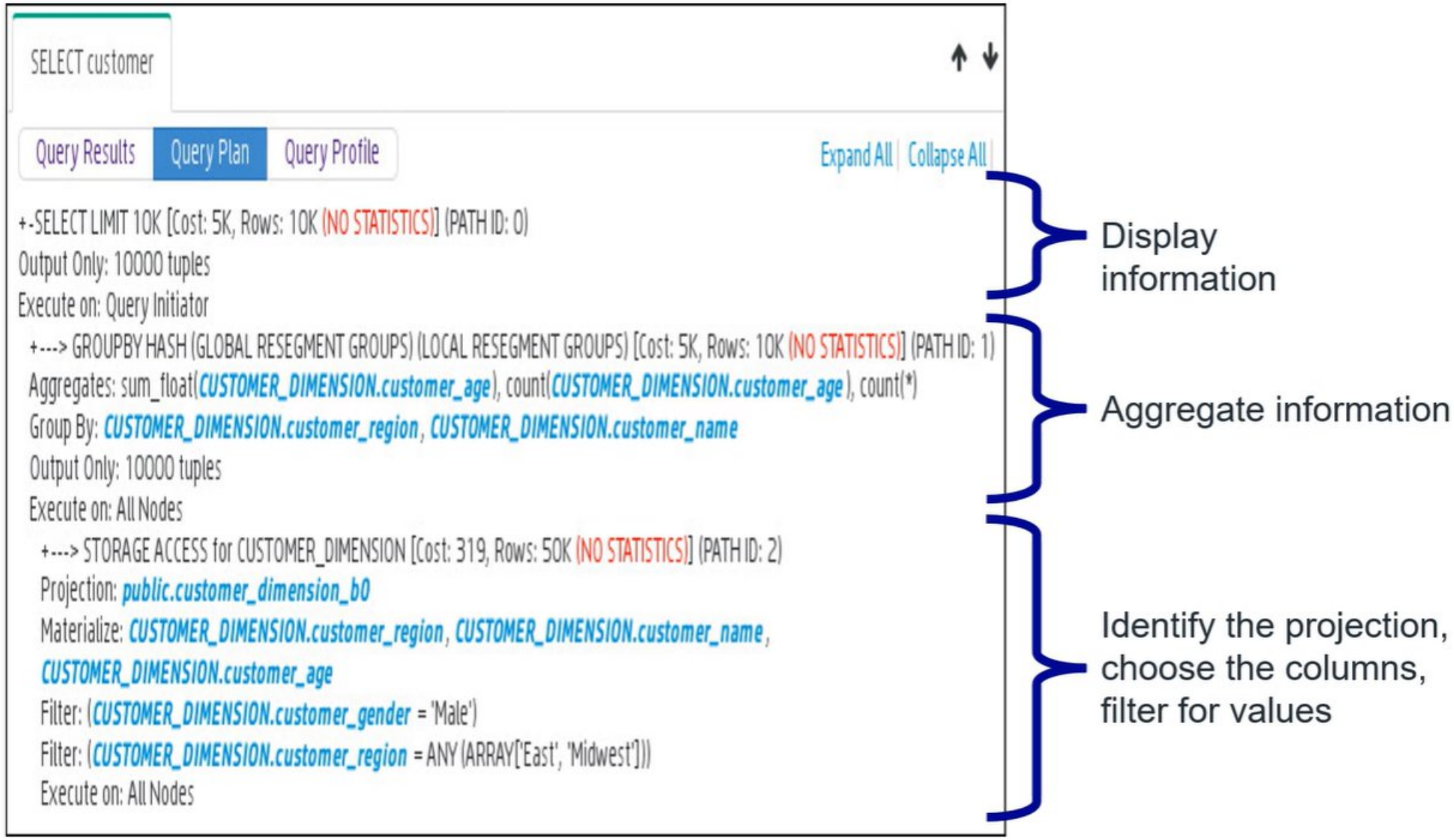
```
dbadmin=> explain
dbadmin-> select customer_name, customer_region, avg(customer_age), count(*)
dbadmin-> from customer_dimension
dbadmin-> where customer_gender = 'Male' and customer_region in ('East', 'Midwest')
dbadmin-> group by customer_region, customer_name;
```

Generated query plan:

dbadmin@node1:~

```
Access Path:
+-GROUPBY HASH (GLOBAL RESEGMENT GROUPS) (LOCAL RESEGMENT GROUPS) [Cost: 3K, Rows: 10K (NO STATISTICS)] (PATH ID: 1)
|  Aggregates: sum_float(customer_dimension.customer_age), count(customer_dimension.customer_age), count(*)
|  Group By: customer_dimension.customer_region, customer_dimension.customer_name
|  Execute on: All Nodes
| +---> STORAGE ACCESS for customer_dimension [Cost: 895, Rows: 10K (NO STATISTICS)] (PATH ID: 2)
| |      Projection: public.customer_dimension_b0
| |      Materialize: customer_dimension.customer_region, customer_dimension.customer_name, customer_dimension.customer_age
| |      Filter: (customer_dimension.customer_gender = 'Male')
| |      Filter: (customer_dimension.customer_region = ANY (ARRAY['East', 'Midwest']))
| |      Execute on: All Nodes
```

Reading an execution plan



Timing a query: Management Console

```
1 SELECT customer_name, customer_region, AVG(customer_age), COUNT(*) FROM CUSTOMER_DIMENSION
2 WHERE customer_gender = 'Male' AND customer_region IN ('East', 'Midwest')
3 GROUP BY customer_region, customer_name;
```

Execute Query

SELECT customer

Query Results | Query Plan | Query Profile

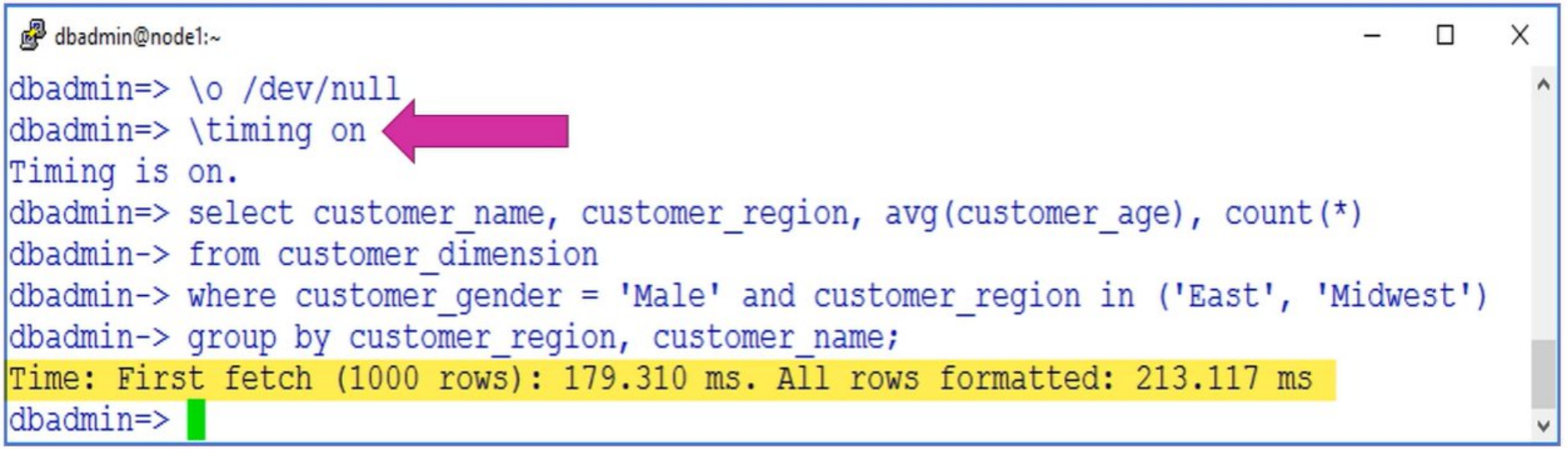
Export Data | Auto-Resize all columns | Search query results

customer_name	customer_region	AVG	COUNT
Steve Q. Garcia	East	35	1
Duncan N. Goldberg	East	22	1
Matt H. Moore	East	60	1
Dean P. Greenwood	East	37	1
David J. Lang	East	29	1
David L. Winkler	East	61	1

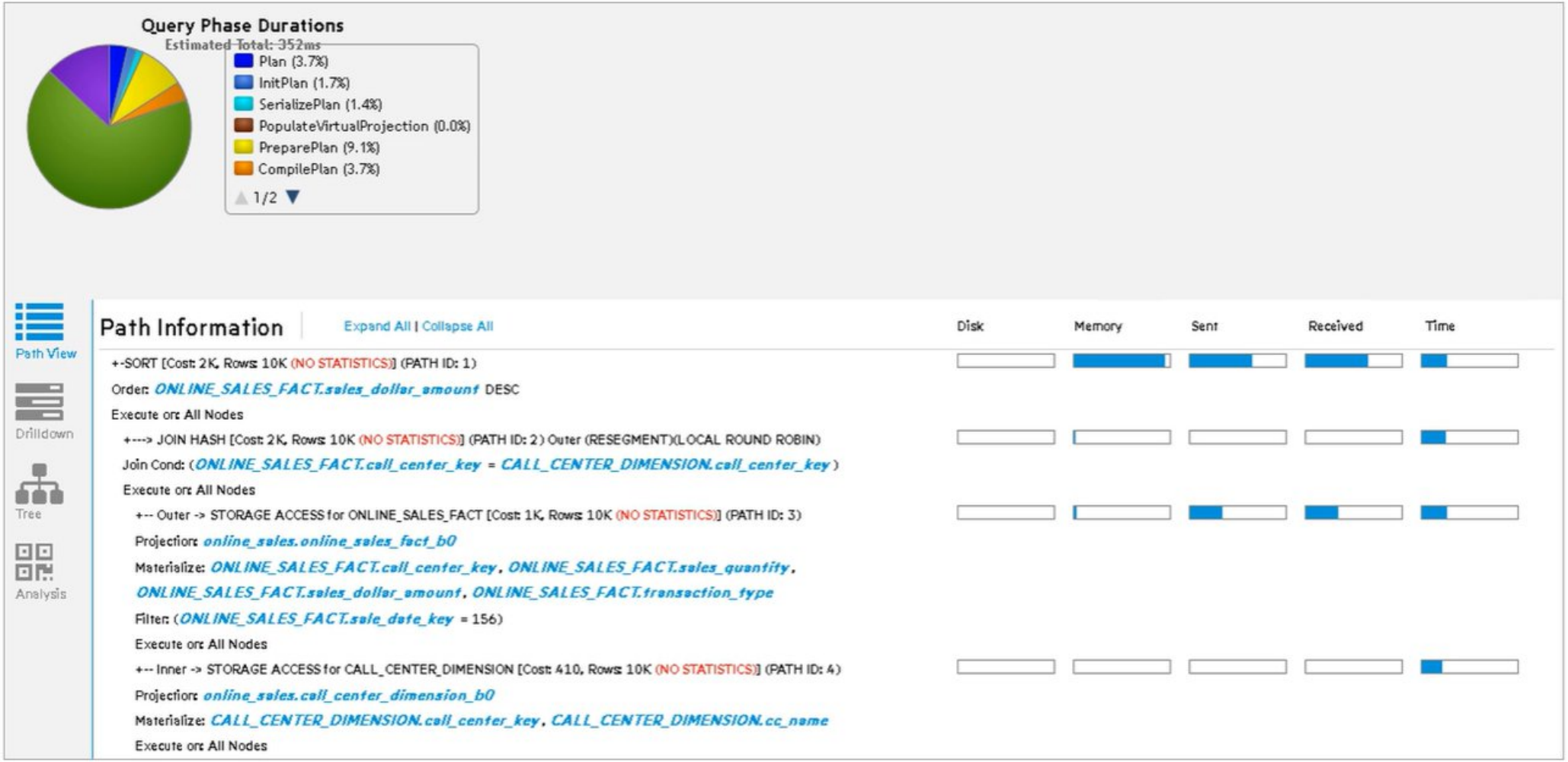
5033 rows | Execution time: 0.235s

Feedback

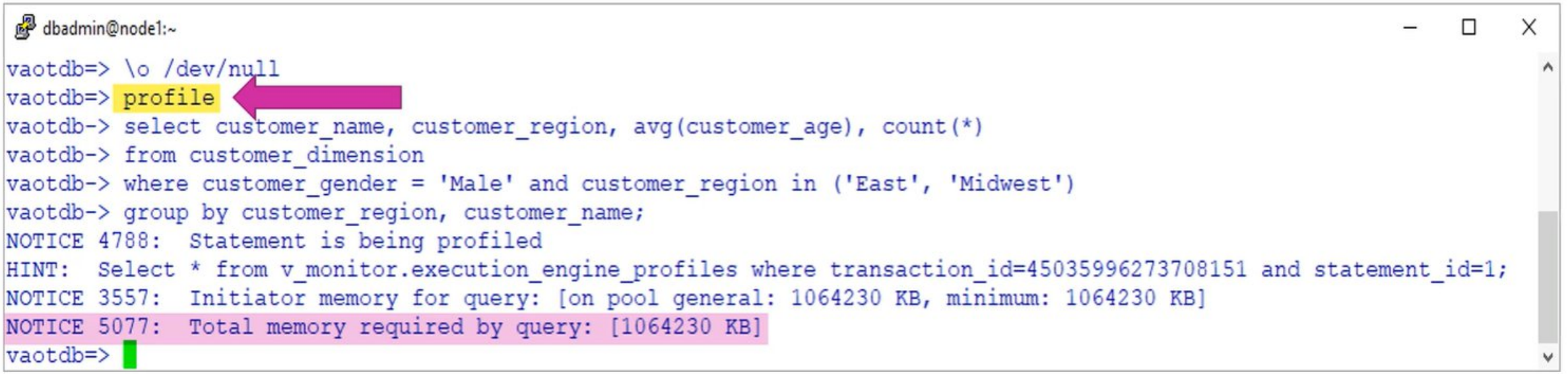
Timing a query: vsql



Query profiling: Management Console



Query profiling: vsql



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Thank you