CSCI317 Database Performance Tuning

Query Processing Plans

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Query Processing Plans

Outline

Syntax tree

Left/right deep syntax tree

`EXPLAIN PLAN` statement of SQL

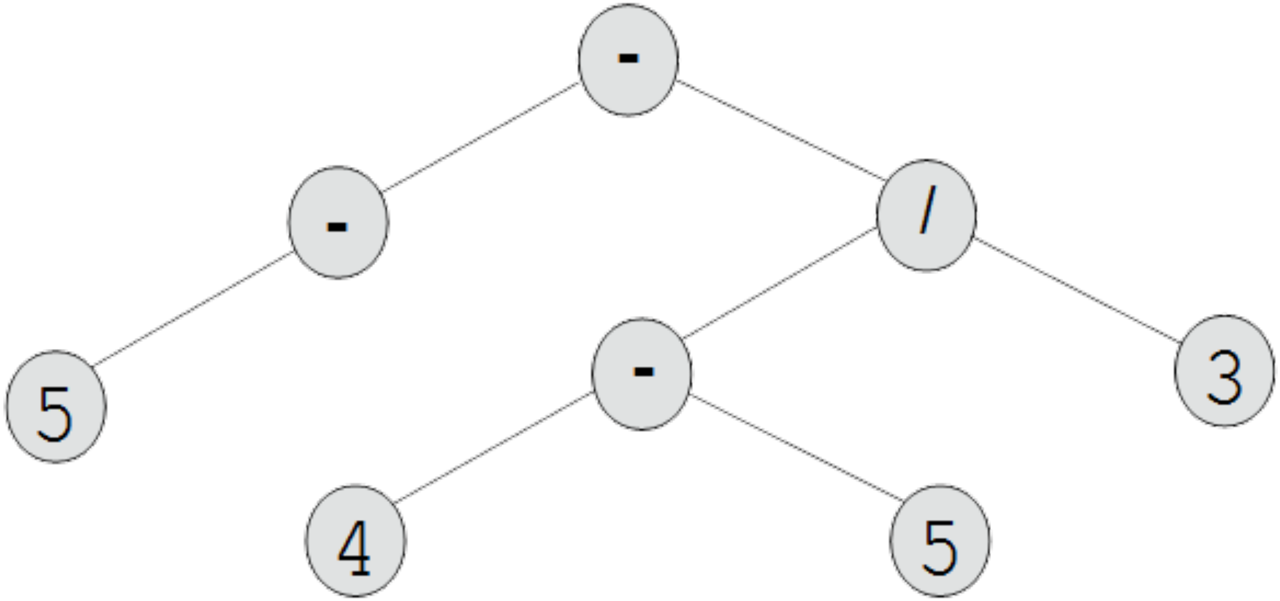
Interpretation of processing plans

Syntax tree

Syntax tree is a two dimensional visualization of an expression that consists of operations and arguments

Arithmetic expression

```
(-5 - (4 - 5)/3
```



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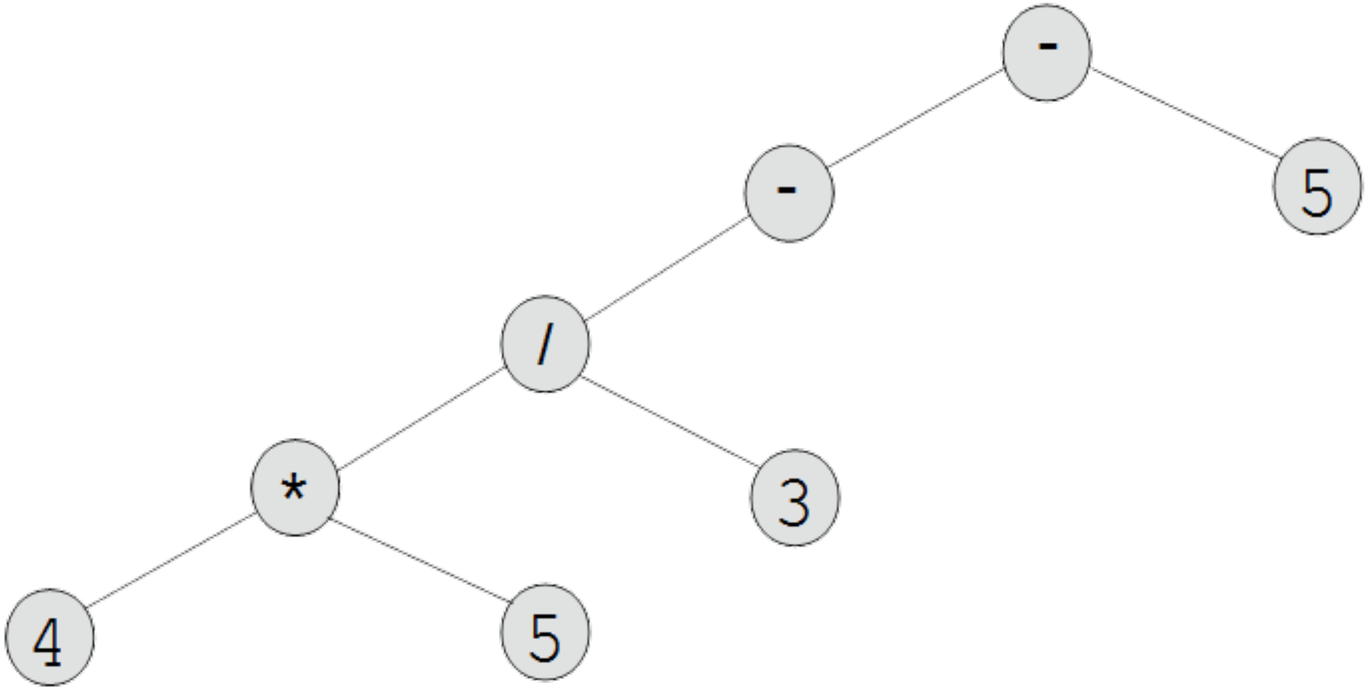
Left/right deep syntax tree

Left deep syntax tree is a syntax tree such that the right argument of each operation is an atomic value

Left deep arithmetic expression

```
(-((4 * 5) / 3)) - 5
```

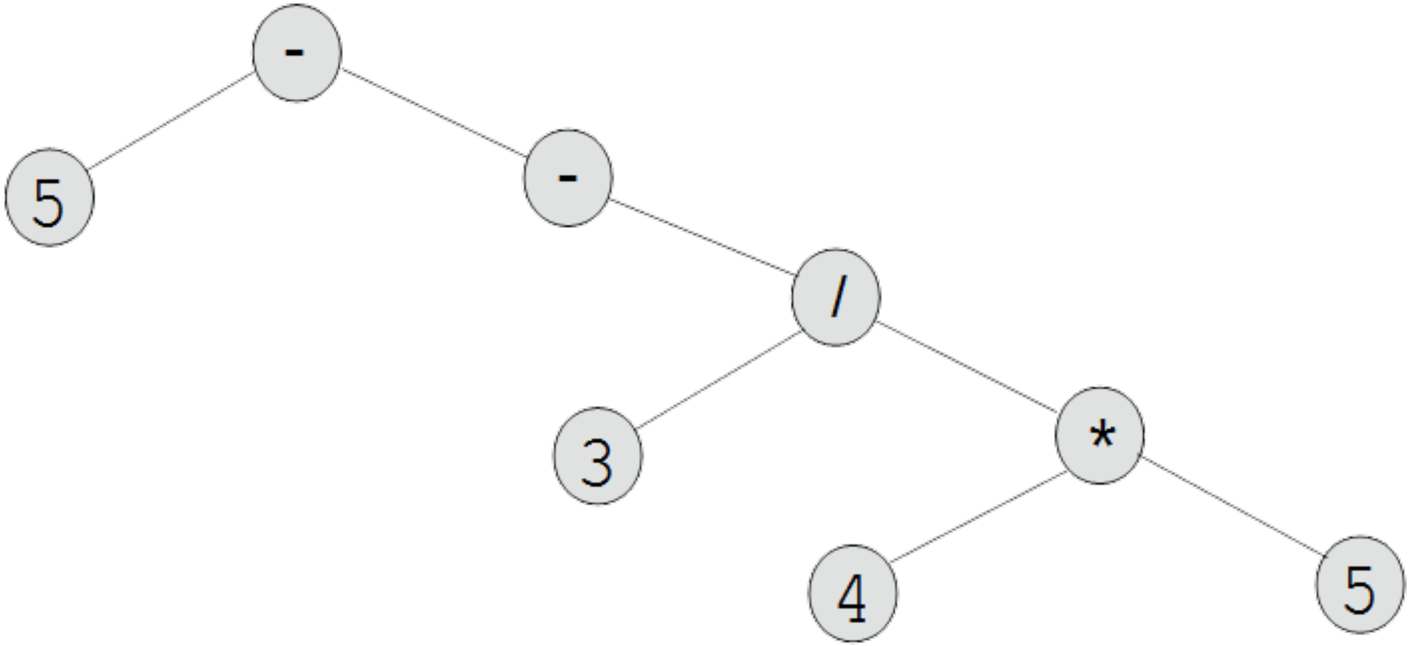


Left/right deep syntax tree

Right deep syntax tree is a syntax tree such that the left argument of each operation is an atomic value

```
5 − ( − (3 / ( 4 ∗ 5 )))
```

Right deep arithmetic expression

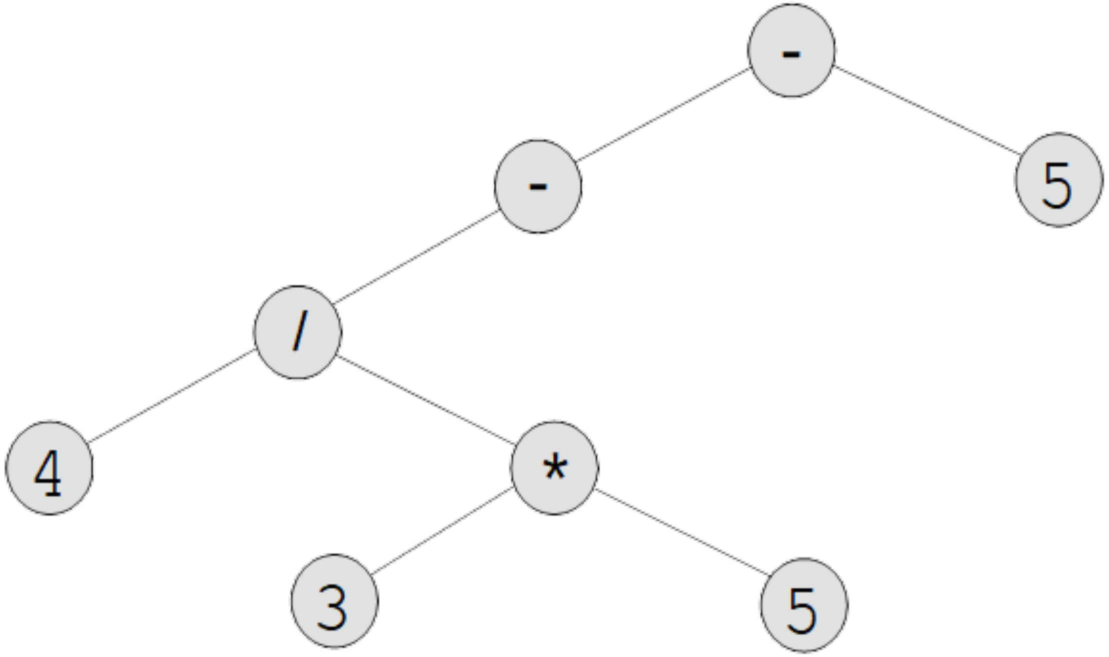


Left/right deep syntax tree

Left/right deep syntax tree is a syntax tree such that the right/left argument of each operation is an atomic value

Left/right deep arithmetic expressin

```
(-(4 / ( 3 * 5 ))) - 5
```



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EXPLAIN PLAN statement of SQL

EXPLAIN PLAN statement of SQL lists a query processing plan created by a query optimizer for a given SQL statement

EXPLAIN PLAN statement

```
EXPLAIN PLAN FOR
SELECT *
FROM NATION;
```

Displaying processing plan

```
SELECT * FROM TABLE(DBMS_XPLAN.DISPLAY);
or
@showplan
```

A fragment of processing plan

```
PLAN_TABLE_OUTPUT
--------------------------------------------------------------------------
Plan hash value: 79620726
--------------------------------------------------------------------------
| Id | Operation         | Name   | Rows | Bytes | Cost (%CPU)| Time     |
--------------------------------------------------------------------------
| 0  | SELECT STATEMENT  |        |   25 |  2475 |      9 (0) | 00:00:01 |
| 1  |  TABLE ACCESS FULL| NATION |   25 |  2475 |      9 (0) | 00:00:01 |
--------------------------------------------------------------------------
```

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A fragment of processing plan

```
PLAN_TABLE_OUTPUT
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--------------------------------------------------------------------------
```
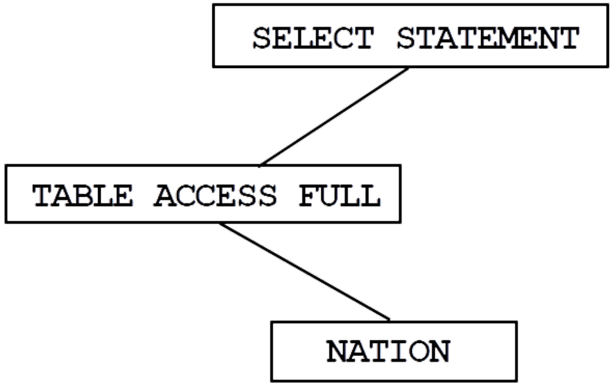



EXPLAIN PLAN statement of SQL

EXPLAIN PLAN statement

```
EXPLAIN PLAN FOR
SELECT *
FROM LINEITEM
WHERE L_ORDERKEY = 7;
```

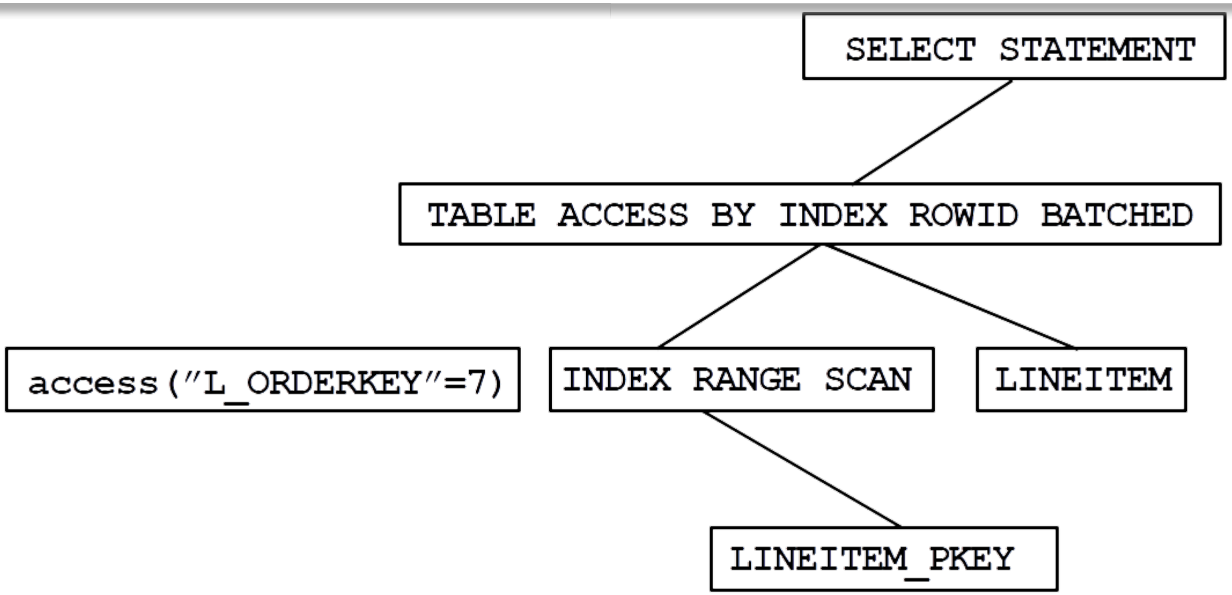
Processing plan

```
----------------------------------------------------------------------------------------------------
| Id | Operation                            | Name          | Rows | Bytes | Cost (%CPU)|   Time   |
----------------------------------------------------------------------------------------------------
|  0 | SELECT STATEMENT                     |               |    4 |   500 |      4 (0) | 00:00:01 |
|  1 |  TABLE ACCESS BY INDEX ROWID BATCHED | LINEITEM      |    4 |   500 |      4 (0) | 00:00:01 |
|* 2 |   INDEX RANGE SCAN                   | LINEITEM_PKEY |    4 |       |      3 (0) | 00:00:01 |
----------------------------------------------------------------------------------------------------
Predicate Information (identified by operation id):
PLAN_TABLE_OUTPUT
2 - access("L_ORDERKEY"=7)
```

Interpretation of processing plan

Processing plan

```
----------------------------------------------------------------------------------------------------
| Id | Operation                          | Name          | Rows | Bytes | Cost (%CPU)|   Time    |
----------------------------------------------------------------------------------------------------
|  0 | SELECT STATEMENT                   |               |    4 |   500 |       4 (0) | 00:00:01 |
|  1 |  TABLE ACCESS BY INDEX ROWID BATCHED | LINEITEM      |    4 |   500 |       4 (0) | 00:00:01 |
|* 2 |   INDEX RANGE SCAN                 | LINEITEM_PKEY |    4 |       |       3 (0) | 00:00:01 |
----------------------------------------------------------------------------------------------------
Predicate Information (identified by operation id):
PLAN_TABLE_OUTPUT
2 - access("L_ORDERKEY"=7)
```



EXPLAIN PLAN statement of SQL

EXPLAIN PLAN statement

```
EXPLAIN PLAN FOR
SELECT *
FROM NATION JOIN REGION
            ON N_REGIONKEY = R_REGIONKEY;
```

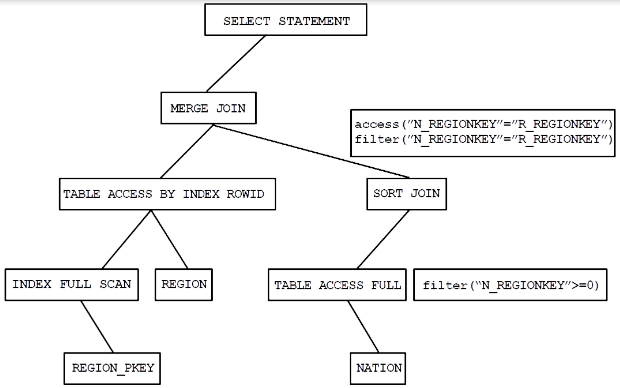
Processing plan

```
------------------------------------------------------------------------------------------
| Id | Operation                     | Name        | Rows | Bytes | Cost (%CPU)|   Time   |
------------------------------------------------------------------------------------------
|  0 | SELECT STATEMENT              |             |   25 | 4900  |    11 (0)  | 00:00:01 |
|  1 |  MERGE JOIN                   |             |   25 | 4900  |    11 (0)  | 00:00:01 |
|  2 |   TABLE ACCESS BY INDEX ROWID | REGION      |    5 | 485   |     2 (0)  | 00:00:01 |
|  3 |    INDEX FULL SCAN            | REGION_PKEY|    5 |       |     1 (0)  | 00:00:01 |
|* 4 |   SORT JOIN                   |             |   25 | 2475  |     9 (0)  | 00:00:01 |
|* 5 |    TABLE ACCESS FULL          | NATION      |   25 | 2475  |     9 (0)  | 00:00:01 |
------------------------------------------------------------------------------------------
Predicate Information (identified by operation id):
---------------------------------------------------
4 - access("N_REGIONKEY"="R_REGIONKEY")
filter("N_REGIONKEY"="R_REGIONKEY")
5 - filter("N_REGIONKEY">=0)
```

Interpretation of processing plan

Processing plan

```
-----------------------------------------------------------------------------------------
| Id | Operation                    | Name       | Rows | Bytes | Cost (%CPU)|   Time   |
-----------------------------------------------------------------------------------------
|  0 | SELECT STATEMENT             |            |   25 | 4900  |    11 (0)  | 00:00:01 |
|  1 |  MERGE JOIN                  |            |   25 | 4900  |    11 (0)  | 00:00:01 |
|  2 |   TABLE ACCESS BY INDEX ROWID | REGION     |    5 | 485   |     2 (0)  | 00:00:01 |
|  3 |    INDEX FULL SCAN           | REGION_PKEY|    5 |       |     1 (0)  | 00:00:01 |
|* 4 |   SORT JOIN                  |            |   25 | 2475  |     9 (0)  | 00:00:01 |
|* 5 |    TABLE ACCESS FULL         | NATION     |   25 | 2475  |     9 (0)  | 00:00:01 |
-----------------------------------------------------------------------------------------
Predicate Information (identified by operation id):
---------------------------------------------------
4 - access("N_REGIONKEY"="R_REGIONKEY")
filter("N_REGIONKEY"="R_REGIONKEY")
5 - filter("N_REGIONKEY">=0)
```



EXPLAIN PLAN statement of SQL

EXPLAIN PLAN statement

```
EXPLAIN PLAN FOR
SELECT *
FROM LINEITEM JOIN ORDERS
ON L_ORDERKEY = O_ORDERKEY;
```

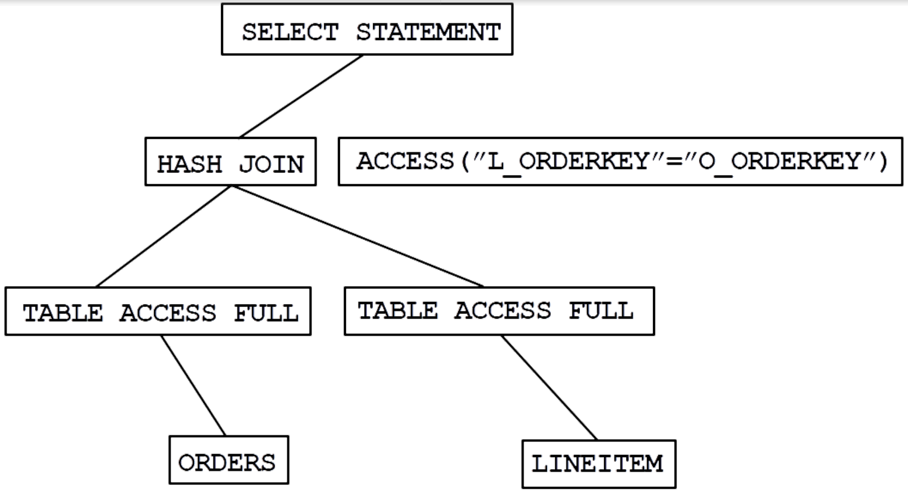
Processing plan

```
-------------------------------------------------------------------------------------
| Id | Operation          | Name     | Rows  | Bytes |TempSpc| Cost (%CPU)| Time     |
-------------------------------------------------------------------------------------
|  0 | SELECT STATEMENT   |          | 1776K |  396M |       |  24979 (1) | 00:00:01 |
|* 1 |  HASH JOIN         |          | 1776K |  396M |   51M |  24979 (1) | 00:00:01 |
|  2 |   TABLE ACCESS FULL|  ORDERS  |  450K |   46M |       |   1950 (1) | 00:00:01 |
|  3 |   TABLE ACCESS FULL| LINEITEM | 1800K |  214M |       |   8788 (1) | 00:00:01 |
-------------------------------------------------------------------------------------
Predicate Information (identified by operation id):
---------------------------------------------------
1 - access("L_ORDERKEY"="O_ORDERKEY")
```

Interpretation of a plan

Processing plan

```
-----------------------------------------------------------------------------------------
| Id | Operation            | Name     | Rows  | Bytes |TempSpc| Cost (%CPU)| Time     |
-----------------------------------------------------------------------------------------
|  0 | SELECT STATEMENT     |          | 1776K |  396M |       |  24979 (1) | 00:00:01 |
|* 1 |  HASH JOIN           |          | 1776K |  396M |   51M |  24979 (1) | 00:00:01 |
|  2 |   TABLE ACCESS FULL|  ORDERS |  450K |   46M |       |   1950 (1) | 00:00:01 |
|  3 |   TABLE ACCESS FULL| LINEITEM| 1800K |  214M |       |   8788 (1) | 00:00:01 |
-----------------------------------------------------------------------------------------
Predicate Information (identified by operation id):
---------------------------------------------------
1 - access("L_ORDERKEY"="O_ORDERKEY")
```



References

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