# SQL в Greenplum

Задание выполнено в Greenplum single-node, развернутым в Docker.

1. В Docker перенесены разархивированные файлы с данными с обрезанным последним символом по инструкции.
2. Созданы таблицы из скриптов к ДЗ

**CREATE** **TABLE** customer (

C\_CUSTKEY **INT**,

C\_NAME **VARCHAR**(25),

C\_ADDRESS **VARCHAR**(40),

C\_NATIONKEY **INTEGER**,

C\_PHONE **CHAR**(15),

C\_ACCTBAL **DECIMAL**(15, 2),

C\_MKTSEGMENT **CHAR**(10),

C\_COMMENT **VARCHAR**(117)

) **WITH** (appendonly = **true**, orientation = **column**)

**DISTRIBUTED** **BY** (C\_CUSTKEY);

**CREATE** **TABLE** lineitem (

L\_ORDERKEY **BIGINT**,

L\_PARTKEY **INT**,

L\_SUPPKEY **INT**,

L\_LINENUMBER **INTEGER**,

L\_QUANTITY **DECIMAL**(15, 2),

L\_EXTENDEDPRICE **DECIMAL**(15, 2),

L\_DISCOUNT **DECIMAL**(15, 2),

L\_TAX **DECIMAL**(15, 2),

L\_RETURNFLAG **CHAR**(1),

L\_LINESTATUS **CHAR**(1),

L\_SHIPDATE **DATE**,

L\_COMMITDATE **DATE**,

L\_RECEIPTDATE **DATE**,

L\_SHIPINSTRUCT **CHAR**(25),

L\_SHIPMODE **CHAR**(10),

L\_COMMENT **VARCHAR**(44)

) **WITH** (

appendonly = **true**,

orientation = **column**,

compresstype = ZSTD

)

**DISTRIBUTED** **BY** (L\_ORDERKEY, L\_LINENUMBER)

**PARTITION** **BY** **RANGE** (L\_SHIPDATE)

(**start**('1992-01-01') **INCLUSIVE** **end** ('1998-12-31') **INCLUSIVE** **every** (30), **default** **partition** **others**);

**CREATE** **TABLE** nation (

N\_NATIONKEY **INTEGER**,

N\_NAME **CHAR**(25),

N\_REGIONKEY **INTEGER**,

N\_COMMENT **VARCHAR**(152)

) **WITH** (appendonly = **true**, orientation = **column**)

**DISTRIBUTED** **BY** (N\_NATIONKEY);

**CREATE** **TABLE** orders (

O\_ORDERKEY **BIGINT**,

O\_CUSTKEY **INT**,

O\_ORDERSTATUS **CHAR**(1),

O\_TOTALPRICE **DECIMAL**(15, 2),

O\_ORDERDATE **DATE**,

O\_ORDERPRIORITY **CHAR**(15),

O\_CLERK **CHAR**(15),

O\_SHIPPRIORITY **INTEGER**,

O\_COMMENT **VARCHAR**(79)

) **WITH** (

appendonly = **true**,

orientation = **column**,

compresstype = ZSTD

)

**DISTRIBUTED** **BY** (O\_ORDERKEY)

**PARTITION** **BY** **RANGE** (O\_ORDERDATE)

(**start**('1992-01-01') **INCLUSIVE** **end** ('1998-12-31') **INCLUSIVE** **every** (30), **default** **partition** **others**);

**CREATE** **TABLE** part (

P\_PARTKEY **INT**,

P\_NAME **VARCHAR**(55),

P\_MFGR **CHAR**(25),

P\_BRAND **CHAR**(10),

P\_TYPE **VARCHAR**(25),

P\_SIZE **INTEGER**,

P\_CONTAINER **CHAR**(10),

P\_RETAILPRICE **DECIMAL**(15, 2),

P\_COMMENT **VARCHAR**(23)

) **WITH** (appendonly = **true**, orientation = **column**)

**DISTRIBUTED** **BY** (P\_PARTKEY);

**CREATE** **TABLE** partsupp (

PS\_PARTKEY **INT**,

PS\_SUPPKEY **INT**,

PS\_AVAILQTY **INTEGER**,

PS\_SUPPLYCOST **DECIMAL**(15, 2),

PS\_COMMENT **VARCHAR**(199)

) **WITH** (appendonly = **true**, orientation = **column**)

**DISTRIBUTED** **BY** (PS\_PARTKEY, PS\_SUPPKEY);

**CREATE** **TABLE** region (

R\_REGIONKEY **INTEGER**,

R\_NAME **CHAR**(25),

R\_COMMENT **VARCHAR**(152)

) **WITH** (appendonly = **true**, orientation = **column**)

**DISTRIBUTED** **BY** (R\_REGIONKEY);

**CREATE** **TABLE** supplier (

S\_SUPPKEY **INT**,

S\_NAME **CHAR**(25),

S\_ADDRESS **VARCHAR**(40),

S\_NATIONKEY **INTEGER**,

S\_PHONE **CHAR**(15),

S\_ACCTBAL **DECIMAL**(15, 2),

S\_COMMENT **VARCHAR**(101)

) **WITH** (appendonly = **true**, orientation = **column**)

**DISTRIBUTED** **BY** (S\_SUPPKEY);

3. Из файлов, подготовленных на шаге 1 данные скопированы в таблицы через psql:

[gpadmin@64f3afcefe8b ~]$ ps

PID TTY TIME CMD

124 pts/1 00:00:00 bash

1281 pts/1 00:00:00 ps

[gpadmin@64f3afcefe8b ~]$ sudo find /tmp/ -name .s.PGSQL.5433

bash: sudo: command not found

[gpadmin@64f3afcefe8b ~]$ find /tmp/ -name .s.PGSQL.5433

[gpadmin@64f3afcefe8b ~]$ psql -h /tmp/ dbname

psql: FATAL: database "dbname" does not exist

[gpadmin@64f3afcefe8b ~]$ psql -h /tmp/ postgres

psql (9.4.26)

Type "help" for help.

postgres=# \copy customer from '/home/gpadmin/datasets/unzip\_datasets/customer.tbl' WITH (FORMAT csv, DELIMITER '|');

COPY 30000

postgres=# \copy lineitem from '/home/gpadmin/datasets/unzip\_datasets/lineitem.tbl' WITH (FORMAT csv, DELIMITER '|');

COPY 1199969

postgres=# \copy nation from '/home/gpadmin/datasets/unzip\_datasets/nation.tbl' WITH (FORMAT csv, DELIMITER '|');

COPY 25

postgres=# \copy orders from '/home/gpadmin/datasets/unzip\_datasets/orders.tbl' WITH (FORMAT csv, DELIMITER '|');

COPY 300000

postgres=# \copy part from '/home/gpadmin/datasets/unzip\_datasets/part.tbl' WITH (FORMAT csv, DELIMITER '|');

COPY 40000

postgres=# \copy partsupp from '/home/gpadmin/datasets/unzip\_datasets/partsupp.tbl' WITH (FORMAT csv, DELIMITER '|');

COPY 160000

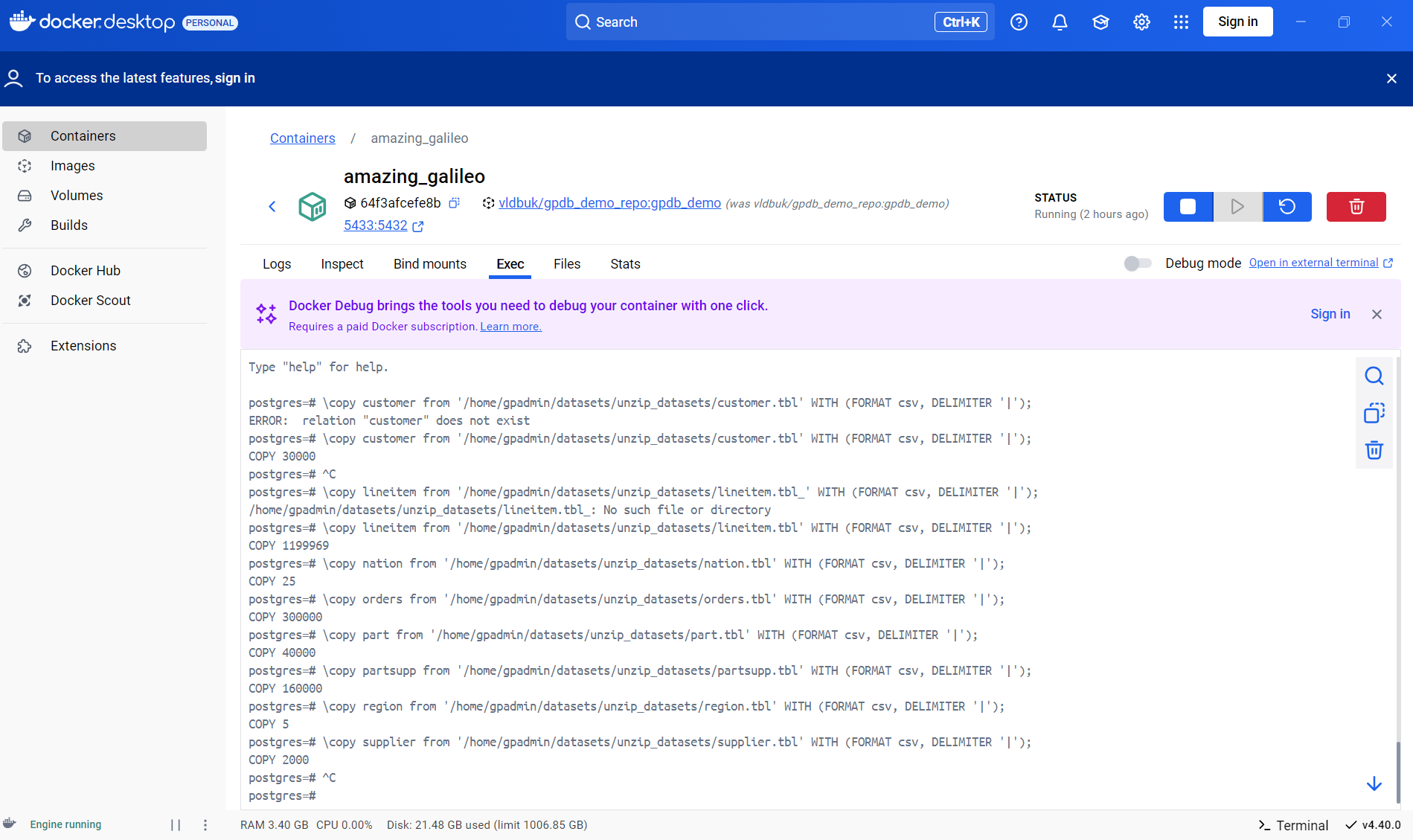
postgres=# \copy region from '/home/gpadmin/datasets/unzip\_datasets/region.tbl' WITH (FORMAT csv, DELIMITER '|');

COPY 5

postgres=# \copy supplier from '/home/gpadmin/datasets/unzip\_datasets/supplier.tbl' WITH (FORMAT csv, DELIMITER '|');

COPY 2000

postgres=#



4. Запрос с партиционированием по дате заказа (o\_orderdate) - выбрано 14 секции из 87

**explain** **analyse**

**select** o\_orderkey

,o\_orderdate

, o\_custkey

, o\_orderstatus

, l\_suppkey

, l\_linenumber

, l\_quantity

, c\_name

**from** public.orders o

**join** public.lineitem l **on** l.l\_orderkey = o.o\_orderkey

**join** public.customer c **on** c.c\_custkey = o.o\_custkey

**where** o\_orderdate>= '1998-01-01'::**date**

Gather Motion 4:1 (slice4; segments: 4) (cost=0.00..1295.44 rows=1 width=52) (actual time=278.122..312.826 rows=108272 loops=1)

-> Hash Join (cost=0.00..1295.44 rows=1 width=52) (actual time=277.541..300.043 rows=27411 loops=1)

Hash Cond: (orders.o\_orderkey = lineitem.l\_orderkey)

Extra Text: (seg3) Hash chain length 4.6 avg, 23 max, using 65268 of 262144 buckets.

-> Redistribute Motion 4:4 (slice2; segments: 4) (cost=0.00..864.44 rows=1 width=36) (actual time=0.015..1.167 rows=6804 loops=1)

Hash Key: orders.o\_orderkey

-> Hash Join (cost=0.00..864.44 rows=1 width=36) (actual time=20.815..25.525 rows=6924 loops=1)

Hash Cond: (customer.c\_custkey = orders.o\_custkey)

Extra Text: (seg1) Hash chain length 1.9 avg, 8 max, using 3599 of 262144 buckets.

-> Seq Scan on customer (cost=0.00..431.71 rows=7500 width=23) (actual time=0.065..0.865 rows=7530 loops=1)

-> Hash (cost=431.00..431.00 rows=1 width=17) (actual time=20.489..20.489 rows=6924 loops=1)

-> Redistribute Motion 4:4 (slice1; segments: 4) (cost=0.00..431.00 rows=1 width=17) (actual time=3.088..18.861 rows=6924 loops=1)

Hash Key: orders.o\_custkey

-> Sequence (cost=0.00..431.00 rows=1 width=17) (actual time=0.549..4.974 rows=6804 loops=1)

-> Partition Selector for orders (dynamic scan id: 1) (cost=10.00..100.00 rows=25 width=4) (never executed)

Partitions selected: 14 (out of 87)

-> Dynamic Seq Scan on orders (dynamic scan id: 1) (cost=0.00..431.00 rows=1 width=17) (actual time=0.544..4.560 rows=6804 loops=1)

Filter: (o\_orderdate >= '1998-01-01'::date)

Partitions scanned: Avg 14.0 (out of 87) x 4 workers. Max 14 parts (seg0).

-> Hash (cost=431.00..431.00 rows=1 width=24) (actual time=276.723..276.723 rows=301217 loops=1)

-> Redistribute Motion 4:4 (slice3; segments: 4) (cost=0.00..431.00 rows=1 width=24) (actual time=10.887..209.057 rows=301217 loops=1)

Hash Key: lineitem.l\_orderkey

-> Sequence (cost=0.00..431.00 rows=1 width=24) (actual time=1.160..131.435 rows=300895 loops=1)

-> Partition Selector for lineitem (dynamic scan id: 2) (cost=10.00..100.00 rows=25 width=4) (never executed)

Partitions selected: 87 (out of 87)

-> Dynamic Seq Scan on lineitem (dynamic scan id: 2) (cost=0.00..431.00 rows=1 width=24) (actual time=1.146..89.248 rows=300895 loops=1)

Partitions scanned: Avg 87.0 (out of 87) x 4 workers. Max 87 parts (seg0).

Planning time: 19.874 ms

(slice0) Executor memory: 504K bytes.

(slice1) Executor memory: 6202K bytes avg x 4 workers, 6202K bytes max (seg0).

(slice2) Executor memory: 3400K bytes avg x 4 workers, 3400K bytes max (seg0). Work\_mem: 325K bytes max.

(slice3) Executor memory: 45132K bytes avg x 4 workers, 45153K bytes max (seg3).

(slice4) Executor memory: 26744K bytes avg x 4 workers, 26744K bytes max (seg0). Work\_mem: 14120K bytes max.

Memory used: 128000kB

Optimizer: Pivotal Optimizer (GPORCA)

Execution time: 317.536 ms

5. Запрос без партиционирования по l\_shipmode

**explain** **analyse**

**select** o\_orderkey

,o\_orderdate

, o\_custkey

, o\_orderstatus

, l\_suppkey

, l\_linenumber

, l\_quantity

, c\_name

**from** public.orders o

**join** public.lineitem l **on** l.l\_orderkey = o.o\_orderkey

**join** public.customer c **on** c.c\_custkey = o.o\_custkey

**where** l\_shipmode = 'TRUCK'

Gather Motion 4:1 (slice4; segments: 4) (cost=0.00..1295.44 rows=1 width=52) (actual time=158.691..234.654 rows=167382 loops=1)

-> Hash Join (cost=0.00..1295.44 rows=1 width=52) (actual time=158.380..213.232 rows=42240 loops=1)

Hash Cond: (orders.o\_orderkey = lineitem.l\_orderkey)

Extra Text: (seg3) Hash chain length 1.4 avg, 7 max, using 30162 of 262144 buckets.

-> Redistribute Motion 4:4 (slice2; segments: 4) (cost=0.00..864.44 rows=1 width=36) (actual time=0.014..25.827 rows=75163 loops=1)

Hash Key: orders.o\_orderkey

-> Hash Join (cost=0.00..864.44 rows=1 width=36) (actual time=145.586..177.140 rows=76456 loops=1)

Hash Cond: (customer.c\_custkey = orders.o\_custkey)

Extra Text: (seg1) Hash chain length 15.3 avg, 48 max, using 5010 of 262144 buckets.

-> Seq Scan on customer (cost=0.00..431.71 rows=7500 width=23) (actual time=0.063..1.057 rows=7530 loops=1)

-> Hash (cost=431.00..431.00 rows=1 width=17) (actual time=145.285..145.285 rows=76456 loops=1)

-> Redistribute Motion 4:4 (slice1; segments: 4) (cost=0.00..431.00 rows=1 width=17) (actual time=0.031..120.329 rows=76456 loops=1)

Hash Key: orders.o\_custkey

-> Sequence (cost=0.00..431.00 rows=1 width=17) (actual time=0.799..105.405 rows=75163 loops=1)

-> Partition Selector for orders (dynamic scan id: 1) (cost=10.00..100.00 rows=25 width=4) (never executed)

Partitions selected: 87 (out of 87)

-> Dynamic Seq Scan on orders (dynamic scan id: 1) (cost=0.00..431.00 rows=1 width=17) (actual time=0.786..100.648 rows=75163 loops=1)

Partitions scanned: Avg 87.0 (out of 87) x 4 workers. Max 87 parts (seg0).

-> Hash (cost=431.00..431.00 rows=1 width=24) (actual time=157.957..157.957 rows=42240 loops=1)

-> Redistribute Motion 4:4 (slice3; segments: 4) (cost=0.00..431.00 rows=1 width=24) (actual time=18.115..148.762 rows=42240 loops=1)

Hash Key: lineitem.l\_orderkey

-> Result (cost=0.00..431.00 rows=1 width=24) (actual time=0.640..118.300 rows=42004 loops=1)

-> Sequence (cost=0.00..431.00 rows=1 width=32) (actual time=0.639..114.754 rows=42004 loops=1)

-> Partition Selector for lineitem (dynamic scan id: 2) (cost=10.00..100.00 rows=25 width=4) (never executed)

Partitions selected: 83 (out of 83)

-> Dynamic Seq Scan on lineitem (dynamic scan id: 2) (cost=0.00..431.00 rows=1 width=32) (actual time=0.630..112.175 rows=42004 loops=1)

Filter: (l\_shipmode = 'TRUCK'::bpchar)

Partitions scanned: Avg 83.0 (out of 83) x 4 workers. Max 83 parts (seg0).

Planning time: 15.702 ms

(slice0) Executor memory: 512K bytes.

(slice1) Executor memory: 39018K bytes avg x 4 workers, 39024K bytes max (seg2).

(slice2) Executor memory: 10568K bytes avg x 4 workers, 10568K bytes max (seg0). Work\_mem: 3584K bytes max.

(slice3) Executor memory: 53889K bytes avg x 4 workers, 53910K bytes max (seg3).

(slice4) Executor memory: 6264K bytes avg x 4 workers, 6264K bytes max (seg0). Work\_mem: 1980K bytes max.

Memory used: 128000kB

Optimizer: Pivotal Optimizer (GPORCA)

Execution time: 242.159 ms

6. Создана таблица с партиционированием по списку **CREATE** **TABLE** lineitem2 (

L\_ORDERKEY **BIGINT**,

L\_PARTKEY **INT**,

L\_SUPPKEY **INT**,

L\_LINENUMBER **INTEGER**,

L\_QUANTITY **DECIMAL**(15, 2),

L\_EXTENDEDPRICE **DECIMAL**(15, 2),

L\_DISCOUNT **DECIMAL**(15, 2),

L\_TAX **DECIMAL**(15, 2),

L\_RETURNFLAG **CHAR**(1),

L\_LINESTATUS **CHAR**(1),

L\_SHIPDATE **DATE**,

L\_COMMITDATE **DATE**,

L\_RECEIPTDATE **DATE**,

L\_SHIPINSTRUCT **CHAR**(25),

L\_SHIPMODE **CHAR**(10),

L\_COMMENT **VARCHAR**(44)

) **WITH** (

appendonly = **true**,

orientation = **column**,

compresstype = ZSTD

)

**DISTRIBUTED** **BY** (L\_ORDERKEY)

**PARTITION** **BY** **LIST** (l\_shipmode)

(**PARTITION** truck **VALUES** ('TRUCK '),

**PARTITION** fob **VALUES** ('FOB '),

**DEFAULT** **PARTITION** other);

Выполнен запрос аналогичный п.5, только c партиционированием по l\_shipmode. Из плана запрсоса видно, что была использована партиция (l\_shipmode = 'TRUCK'::bpchar)

**explain** **analyse**

**select** o\_orderkey

,o\_orderdate

, o\_custkey

, o\_orderstatus

, l\_suppkey

, l\_linenumber

, l\_quantity

, c\_name

**from** public.orders o

**join** public.lineitem2 l **on** l.l\_orderkey = o.o\_orderkey

**join** public.customer c **on** c.c\_custkey = o.o\_custkey

**where** l\_shipmode = 'TRUCK'

Gather Motion 4:1 (slice3; segments: 4) (cost=0.00..1295.45 rows=1 width=52) (actual time=157.511..245.204 rows=163037 loops=1)

-> Hash Join (cost=0.00..1295.44 rows=1 width=52) (actual time=156.010..224.774 rows=41153 loops=1)

Hash Cond: (orders.o\_orderkey = lineitem2.l\_orderkey)

Extra Text: (seg3) Hash chain length 1.5 avg, 7 max, using 27757 of 131072 buckets.

-> Redistribute Motion 4:4 (slice2; segments: 4) (cost=0.00..864.44 rows=1 width=36) (actual time=124.372..155.311 rows=75163 loops=1)

Hash Key: orders.o\_orderkey

-> Hash Join (cost=0.00..864.44 rows=1 width=36) (actual time=149.150..184.941 rows=76456 loops=1)

Hash Cond: (customer.c\_custkey = orders.o\_custkey)

Extra Text: (seg1) Hash chain length 15.3 avg, 48 max, using 5010 of 262144 buckets.

-> Seq Scan on customer (cost=0.00..431.71 rows=7500 width=23) (actual time=0.119..1.518 rows=7530 loops=1)

-> Hash (cost=431.00..431.00 rows=1 width=17) (actual time=148.235..148.235 rows=76456 loops=1)

-> Redistribute Motion 4:4 (slice1; segments: 4) (cost=0.00..431.00 rows=1 width=17) (actual time=0.027..130.784 rows=76456 loops=1)

Hash Key: orders.o\_custkey

-> Sequence (cost=0.00..431.00 rows=1 width=17) (actual time=0.817..119.038 rows=75163 loops=1)

-> Partition Selector for orders (dynamic scan id: 1) (cost=10.00..100.00 rows=25 width=4) (never executed)

Partitions selected: 87 (out of 87)

-> Dynamic Seq Scan on orders (dynamic scan id: 1) (cost=0.00..431.00 rows=1 width=17) (actual time=0.800..113.143 rows=75163 loops=1)

Partitions scanned: Avg 87.0 (out of 87) x 4 workers. Max 87 parts (seg0).

-> Hash (cost=431.00..431.00 rows=1 width=32) (actual time=49.865..49.865 rows=41153 loops=1)

-> Sequence (cost=0.00..431.00 rows=1 width=32) (actual time=0.890..15.924 rows=41153 loops=1)

-> Partition Selector for lineitem2 (dynamic scan id: 2) (cost=10.00..100.00 rows=25 width=4) (never executed)

Partitions selected: 1 (out of 3)

-> Dynamic Seq Scan on lineitem2 (dynamic scan id: 2) (cost=0.00..431.00 rows=1 width=32) (actual time=0.885..12.863 rows=41153 loops=1)

Filter: (l\_shipmode = 'TRUCK'::bpchar)

Partitions scanned: Avg 1.0 (out of 3) x 4 workers. Max 1 parts (seg0).

Planning time: 18.153 ms

(slice0) Executor memory: 504K bytes.

(slice1) Executor memory: 39018K bytes avg x 4 workers, 39024K bytes max (seg2).

(slice2) Executor memory: 10568K bytes avg x 4 workers, 10568K bytes max (seg0). Work\_mem: 3584K bytes max.

(slice3) Executor memory: 6000K bytes avg x 4 workers, 6000K bytes max (seg0). Work\_mem: 2573K bytes max.

Memory used: 128000kB

Optimizer: Pivotal Optimizer (GPORCA)

Execution time: 253.076 ms