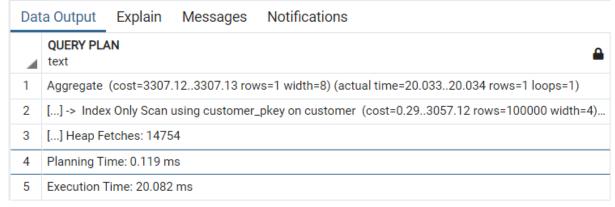
### ex1:

1.

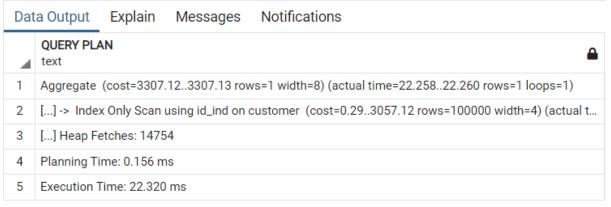
### without indexes:

1 explain analyze select count(id) from customer;



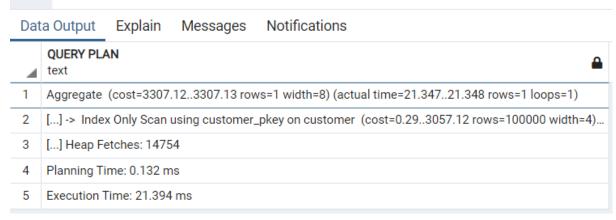
# b\_tree id index:

1 explain analyze select count(id) from customer;



hash id index:

1 explain analyze select count(id) from customer;



# Cost does not change in this example.

#### 2.

## without indexes:

1 explain analyze select id from customer where id = 4 or id = 47;

Data	Output Explain Messages Notifications
4	QUERY PLAN text
1	Bitmap Heap Scan on customer (cost=8.6016.48 rows=2 width=4) (actual time=0.0160.018 rows=2 loops=1)
2	[] Recheck Cond: ((id = 4) OR (id = 47))
3	[] Heap Blocks: exact=2
4	[] -> BitmapOr (cost=8.608.60 rows=2 width=0) (actual time=0.0120.012 rows=0 loops=1)
5	[] -> Bitmap Index Scan on customer_pkey (cost=0.004.30 rows=1 width=0) (actual time=0.0090.009 row
6	[] Index Cond: (id = 4)
7	[] -> Bitmap Index Scan on customer_pkey (cost=0.004.30 rows=1 width=0) (actual time=0.0030.003 row
8	[] Index Cond: (id = 47)
9	Planning Time: 0.067 ms
10	Execution Time: 0.037 ms

# b\_tree name index:

explain analyze select id from customer where id = 4 or id = 47;

Data Output Explain Messages Notifications **QUERY PLAN** text 4 Bitmap Heap Scan on customer (cost=8.60..16.48 rows=2 width=4) (actual time=0.040..0.042 rows=2 loops=1) 1 [...] Recheck Cond: ((id = 15235) OR (id = 35665)) 3 [...] Heap Blocks: exact=2 [...] -> BitmapOr (cost=8.60..8.60 rows=2 width=0) (actual time=0.035..0.036 rows=0 loops=1) [...] -> Bitmap Index Scan on idind (cost=0.00..4.30 rows=1 width=0) (actual time=0.028..0.028 rows=1 loops=... 5 [...] Index Cond: (id = 15235) [...] -> Bitmap Index Scan on idind (cost=0.00..4.30 rows=1 width=0) (actual time=0.006..0.006 rows=1 loops=... 7 [...] Index Cond: (id = 35665) 8 9 Planning Time: 0.130 ms Execution Time: 0.069 ms

### hash name index:

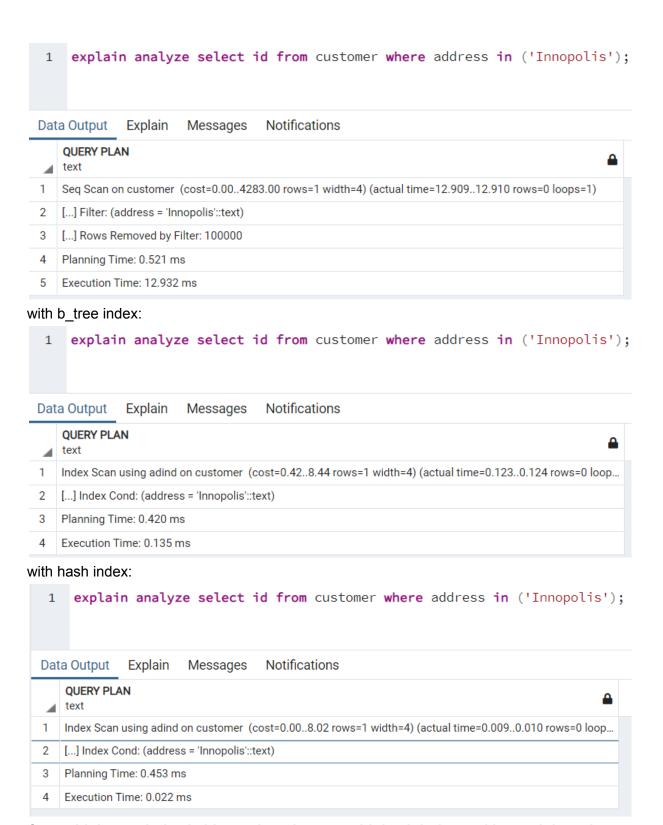
explain analyze select id from customer where id = 4 or id = 47;

Data Output Explain Messages Notifications **QUERY PLAN** text 1 Bitmap Heap Scan on customer (cost=8.02..15.89 rows=2 width=4) (actual time=0.595..0.597 rows=2 loops=1) [...] Recheck Cond: ((id = 4) OR (id = 47)) [...] Heap Blocks: exact=2 3 [...] -> BitmapOr (cost=8.02..8.02 rows=2 width=0) (actual time=0.583..0.583 rows=0 loops=1) 4 [...] -> Bitmap Index Scan on idind (cost=0.00..4.01 rows=1 width=0) (actual time=0.566..0.567 rows=1 loops=... 5 [...] Index Cond: (id = 4) 6 7 [...] -> Bitmap Index Scan on idind (cost=0.00..4.01 rows=1 width=0) (actual time=0.013..0.013 rows=1 loops=... [...] Index Cond: (id = 47) 8 9 Planning Time: 0.921 ms Execution Time: 0.642 ms 10

Cost without indexes is the same as the cost with b\_tree index, but cost with hash index is less than the others.

3.

without indexes:



Cost with b\_tree index is bigger than the cost with hash index and is much less than the cost without indexes.