pg_hint_plan

get the right plan without surprises

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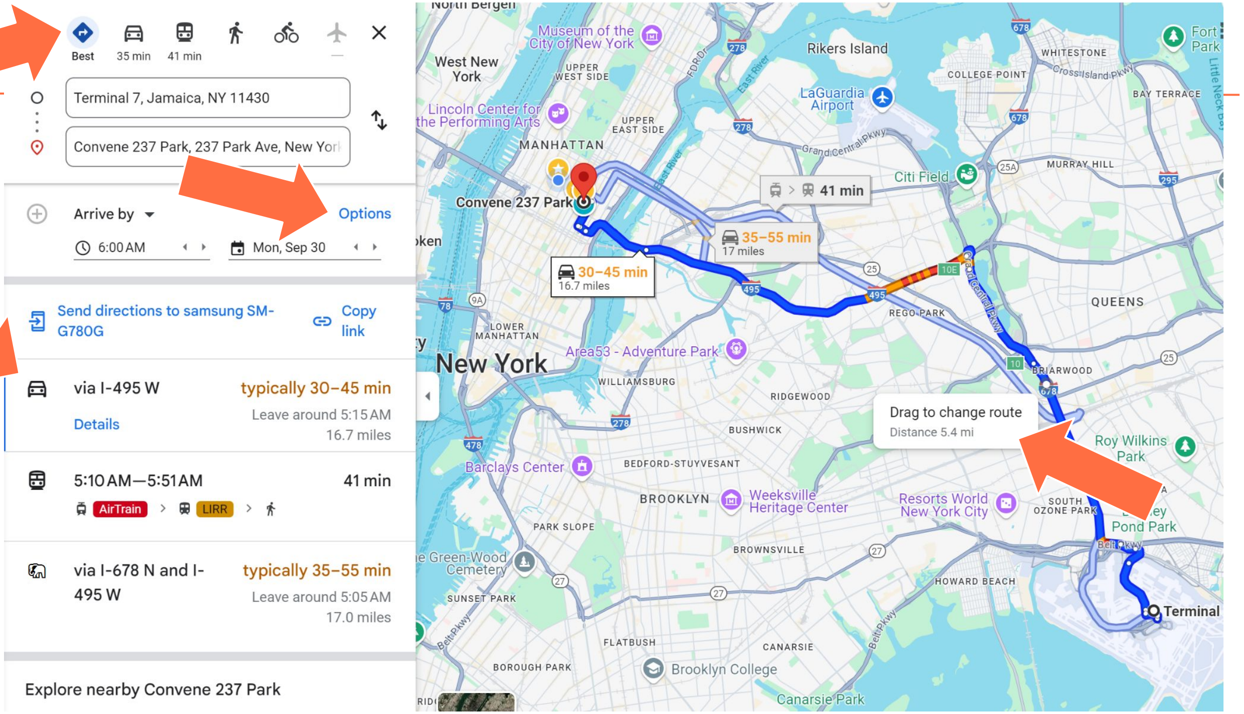
Hints... why?



Would it make sense to provide Google Maps without the choice of travel mode, route options, drag to change route?

Hints... why in SQL?

SQL is a declarative language

the query planner generates the procedural code to access data

👉 You may want to understand its choices

👉 You may want to workaround bad choices

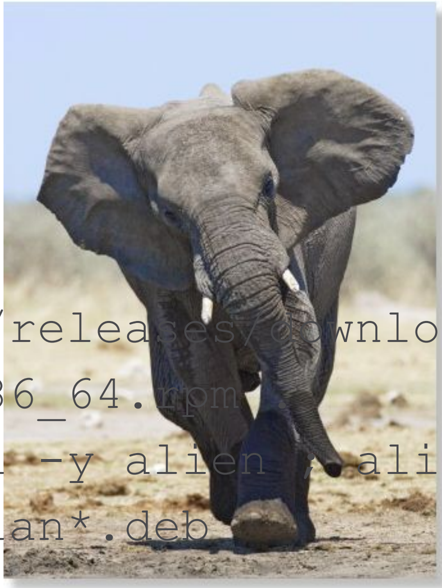
👉 You may know your data better, want stable plans...

Hints... how in PostgreSQL?

A harmless extension that has never been accepted in PG

Install pg_hint_plan (🙏 NTT OSS)

```
FROM docker.io/postgres:14
ADD
https://github.com/ossc-db/pg_hint_plan/releases/download/
/REL14_1_4_0/pg_hint_plan14-1.4-1.el8.x86_64.rpm .
RUN  apt-get update -y ; apt-get install -y alien ; alien
./pg_hint_plan*.rpm ; dpkg -i pg-hint-plan*.deb
```



Hints as directives in SQL comments

Because SQL is declarative, hints are not SQL -> comments

```
/*+
Leading ( (...) ) NestLoop(...) IndexScan(...)
Set(...) Rows(...) Parallel(...)
*/
select ... ; insert... ; prepare... ; explain ...
```

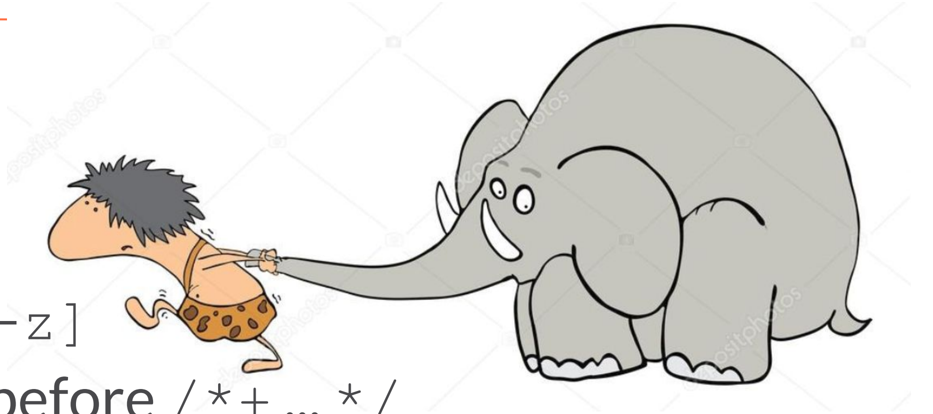
Easy, if you understand that you rarely need a single hint

Where to put /*+ ... */

At the beginning of a command

`[0-9 \t\n,_()A-Za-z]`

are the only characters allowed before `/*+ ... */`



- Syntax errors stop parsing, no nested comment, no `--`
- In the PREPARE, not the EXECUTE
- ⚠️ with multi-statement commands $\underbrace{\texttt{; ; ;}}_{\text{in SQL}}$ $\underbrace{\texttt{\textbackslash; \textbackslash; \textbackslash;}}_{\text{in psql}}$

Hints reference tables and subqueries by their aliases

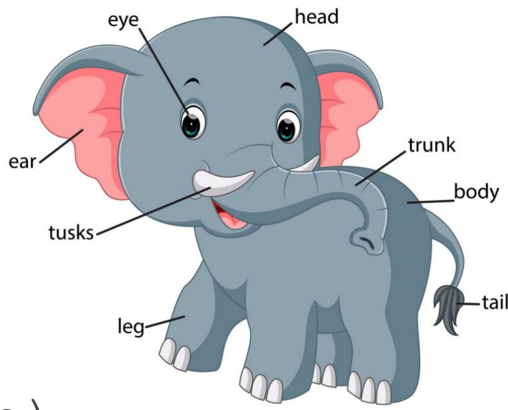
Many hints have a reference to tables

- by their alias (visible in execution plan)
- case sensitive (even with no quotes)
- Lists are not ordered:

```
HashJoin(a b c) = HashJoin(c a b)
```

- Nested Pairs are ordered:

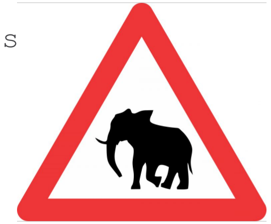
```
Leading(  (a(b c))  )!= Leading(  ((a b)c))  )
```



Hints reference indexes by their name (be careful if you rename them!)

A bad name ignore all indexes

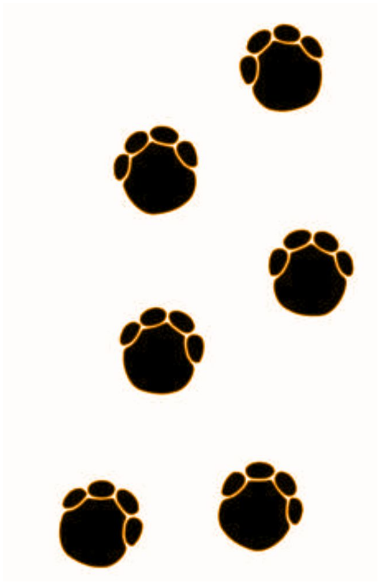
```
postgres=# /*+ IndexScan (accounts accounts_email) */ explain select * from accounts
          where user_id=7;
                                    QUERY PLAN
-------------------------------------------------------------------------------
 Seq Scan on accounts  (cost=10000000000.00..10000000011.25 rows=1 width=520)

postgres=# /*+ IndexScan (accounts) */ explain select * from accounts where user_id=7;
                                       QUERY PLAN
-------------------------------------------------------------------------------------
 Index Scan using accounts_email_idx on accounts  (cost=0.14..8.16 rows=1 width=520)

postgres=# /*+ */ explain select * from accounts where user_id=7;
                                          QUERY PLAN
------------------------------------------------------------------------------------------
 Index Only Scan using accounts_email_idx on accounts  (cost=0.14..8.16 rows=1 width=520)
```



Troubleshooting: errors and log

By default:

```
INFO:  pg_hint_plan: hint syntax error
```



More info in the log (`on` or `verbose`):

```
set pg_hint_plan.debug_print=verbose;
```

To the client (`pg_hint_plan.message_level` defaults to log):

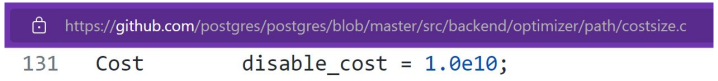
```
set client_min_messages = log;
```

What does a hint

Hints do not force anything

It can sets high cost for the unwanted access paths

Is evaluated during the query planning process



https://github.com/postgres/postgres/blob/master/src/backend/optimizer/path/costsize.c

```
Cost        disable_cost = 1.0e10;
```

Demo:

Join order

Join direction

Scan method

Setting parameters

Cardinality correction

https://dbfiddle.uk/LN9srSHI

an hint on full hinting

For *n* table **aliases** in your (sub-)query

- *n*-1 nested pair of `(outer inner)` in `Leading()`
- for each pair: `NestLoop()`, `HashJoin()` or `MergeJoin()` they will have from 2 to *n* aliases (order doesn't matter)
- *n* scan method SeqScan(), IndexScan(), IndexOnlyScan() IndexScanRegexp(), ...

  https://github.com/ossc-db/pg_hint_plan#hints-list

🧮 count 6**n*-2 closing (or opening) parentheses

Join selectivity estimation

You know you data better than PG

You can fix the cardinality

```
Rows( a b #42 )
```

or, better, apply a factor

```
Rows( a b c *0.3 )
```

Set parameters at query level

Example:

You know that Partition-wise join is good for one query but don't want to take more CPU and memory for other queries

```
/*+
 Set(enable_partitionwise_join true)
*/
```

no risk to forget to reset it back after

⚠️for planning only, not execution

What if you cannot change the query?

```
create extension pg_hint_plan;

insert into hint_plan.hints
 (norm_query_string, application_name, hints) values (
 $sql$select * from table where a=$1 and b=?$sql$,
 'my_app', 'Leading( (a b) )'
);

set pg_hint_plan.enable_hint_table=on;
```

Applies hints to your application query

by matching the command text

- $1,$2 are for prepared statements parameters
- ? is for literals replaced before matching a query
- No final ; except if there's one in your command

Hints in view?

Hints are ignored in views but applied in functions

explain the view to get the aliases

create a function on top of the view, with the hints

or create the function with the view text and a view on top of it

```
create or replace function myview()
returns setof myview as
$$
   /*+ NestLoop(demo1 demo2) */
   select * from myview;
$$ language sql;
```

Partitions?

```
Append
  ->  Index Scan using i1 on p1  p
        Index Cond: (c = 1)
  ->  Index Scan using i2 on p2  p_1
        Index Cond: (c = 1)
```

Table hinted with the global table alias: `/*+ IndexScan( p ) */`

Index hinted with the index partition name: `/*+ IndexScan( p  i1) */`

For multiple partitions, use a regexp `/*+ IndexScanRegexp( p  i?) */`

Core message:

You may need hints, one day, maybe in emergency

(short-term workaround with no side effect on other queries)

👉better have it installed and know how it works

Great tool to experiment and learn about the query planner

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The pg_hint_plan repo:
https://github.com/ossc-db/pg_hint_plan
My blog post series on pg_hint_plan:
https://dev.to/franckpachot/series/18404

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