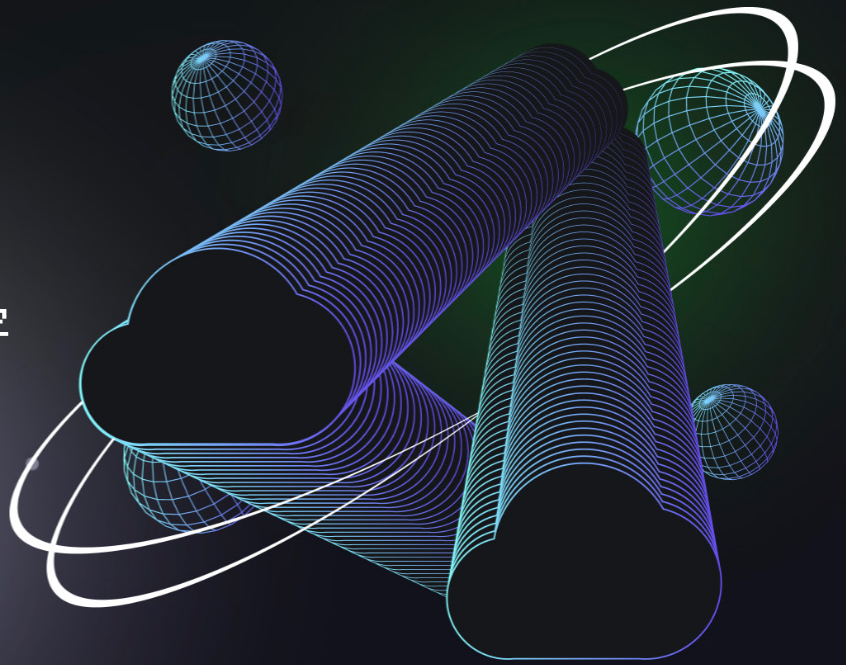
TiDB 黑客马拉松 | TiDB HACKATHON 2021 PingCAP TiDB

项目名称：TiDB Visual Plan

主讲人：张粲宇



团队介绍 - TiVP

PingCAP TiDB

队长：张粲宇 @yiwen92

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“把复杂交给我们，把简单还给你”

TiDB ☺

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项目背景

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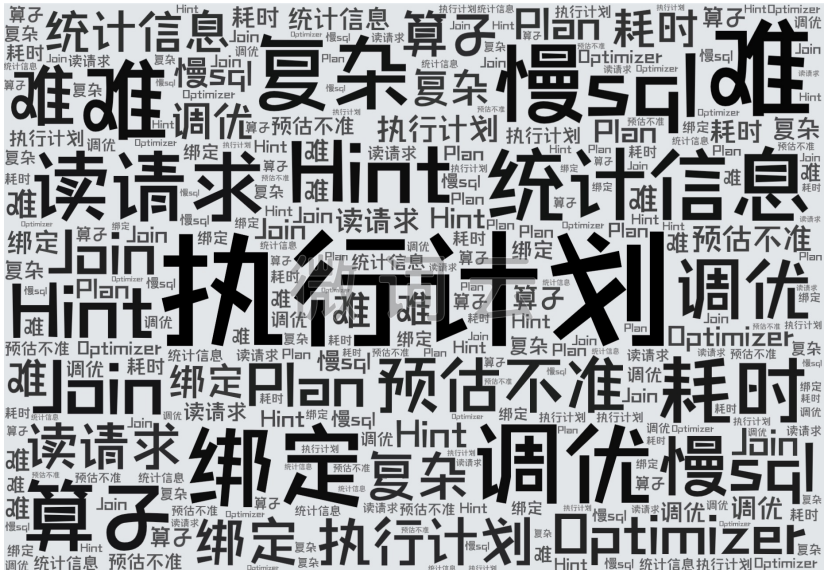
为什么做这个项目？

Reason ①： TiDB SQL 调优的需求很大



Fact 1：慢 SQL 调优是 DBA **最头疼**的问题之一，甚至是同类竞对间的**胜负手**

Fact 2：TiDB Server 客户申请的原厂支持里，与**执行计划**（Plan）相关的问题过半

为什么做这个项目？

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Reason ②：SQL，尤其慢 SQL 的执行计划难懂

```
mysql> explain select * from t join t1 on t.a = t1.b where t.a = 100 or t1.b = 200;
+-----------------------------------+---------+-----------+-------------------+-----------------------------------------------------------------------------------------------+
| id                                | estRows | task      | access object     | operator info                                                                                 |
+-----------------------------------+---------+-----------+-------------------+-----------------------------------------------------------------------------------------------+
| MergeJoin_9                       | 1.60    | root      |                   | inner join, left key:test.t.a, right key:test.t1.b, other cond:or(eq(test.t.a, 100), eq(test.t1.b, 200)) |
| ├─Projection_49(Build)            | 2.00    | root      |                   | test.t1.a, test.t1.b                                                                          |
| │ └─IndexLookUp_48                | 2.00    | root      |                   |                                                                                               |
| │   ├─Selection_47(Build)         | 2.00    | cop[tikv] |                   | not(isnull(test.t1.b))                                                                        |
| │   │ └─IndexRangeScan_45         | 2.00    | cop[tikv] | table:t1, index:b(b) | range:[100,100], [200,200], keep order:true                                                |
| │   └─TableRowIDScan_46(Probe)    | 2.00    | cop[tikv] | table:t1          | keep order:false                                                                              |
| └─Projection_44(Probe)            | 2.00    | root      |                   | test.t.a, test.t.b                                                                            |
|   └─IndexLookUp_43                | 2.00    | root      |                   |                                                                                               |
|     ├─Selection_42(Build)         | 2.00    | cop[tikv] |                   | not(isnull(test.t.a))                                                                         |
|     │ └─IndexRangeScan_40         | 2.00    | cop[tikv] | table:t, index:a(a) | range:[100,100], [200,200], keep order:true                                                |
|     └─TableRowIDScan_41(Probe)    | 2.00    | cop[tikv] | table:t           | keep order:false                                                                              |
+-----------------------------------+---------+-----------+-------------------+-----------------------------------------------------------------------------------------------+
11 rows in set (0.00 sec)
```

Fact 1：SQL 是一种声明性语言，观察执行计划是排查执行效率的**唯一手段**

Fact 2：慢 SQL 往往比较长，Explain 出来的执行计划**异常复杂**会**影响效率**

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为什么做这个项目？


回复 张粲宇：比如这个执行计划是不是就很花时间去看？
是的，我基本是根据 exection info 中的耗时去找哪块耗时时间长
嗯嗯，你觉得这个执行计划大概需要花多长时间去理解和完全读懂？
甚至说就是很难完全读懂...
Support
有查询 sql 和表结构辅助的情况下会更容易弄明白执行计划在干嘛，如果完全看执行计划就比较费时间了
执行计划里面还是有一些东西不是那么清楚的吧
嗯嗯，首先这个执行计划是不是很大，即便像你是比较有经验的，通篇阅读下来应该也挺耗时间的吧？
这个倒不是主要问题
主要的问题是这玩意一行太长了，左右拖来拖去的
DBA
嗯嗯是的，explain 出来的信息你觉得简明清晰嘛
Dev
“明确显示耗时最长或代价最大的执行路径”这个explain不太明确 需要自己一行一行找
嗯嗯，如果你要理解这个执行计划，是否需要把这个按步骤，或者按图形进行个转义？
有工具最好啊。。没工具就在脑子里想想

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为什么做这个项目？

Talk is cheap, show you the shit !


```
| Projection_40                      | 454128.34    | 0      | root     |                                                   | time:669.2µs, loops:1,
                                     | Column#129, Column#130, Column#136, Column#137, Column#138, merchant.mht_trade_request.trans_id, merchant.mht_trade_request.sub_trans_code, Column#128, merchant.mht_trad
e_request.asset_acct_id, merchant.mht_ta_user_account.trade_acct, merchant.mht_product_ta_info.ta_no, merchant.mht_user_account.customer_name, merchant.mht_trade_request.product_id, Column#139, Column#155, Column#133, Col
umn#272, Column#273, Column#274, Column#275, Column#276, Column#151, Column#152, Column#149
                                     | 169.5 KB   | N/A     |
| └HashAgg_41                        | 454128.34    | 0      | root     |                                                   | time:553.4µs, loops:1,
, concurrency:5, task_num:0, tot_wait:2.491273ms, tot_exec:0s, tot_time:2.496748ms, max:504.972µs, p95:504.972µs}, final_worker:{wall_time:554.785µs, concurrency:5, task_num:0, tot_wait:2.598492ms, tot_exec:6.35µs, tot_ti
0.906µs}                             | group by:Column#334, Column#335, Column#336, Column#337, Column#338, Column#339, Column#340, Column#341, Column#342, Column#343, Column#344, Column#345, Column#346, Colu
mn#350, Column#351, Column#352, Column#353, funcs:group_concat(Column#306 separator ",")->Column#269, funcs:group_concat(Column#307 separator ",")->Column#270, funcs:group_concat(Column#308 separator ",")->Column#271, fun
",")->Column#272, funcs:group_concat(Column#310 separator ",")->Column#273, funcs:group_concat(Column#311 separator ",")->Column#274, funcs:group_concat(Column#312 separator ",")->Column#275, funcs:sum(Column#313)->Colum
olumn#128, funcs:firstrow(Column#315)->Column#129, funcs:firstrow(Column#316)->Column#130, funcs:firstrow(Column#317)->Column#133, funcs:firstrow(Column#318)->Column#136, funcs:firstrow(Column#319)->Column#137, funcs:firs
firstrow(Column#321)->Column#139, funcs:firstrow(Column#322)->Column#149, funcs:firstrow(Column#323)->Column#151, funcs:firstrow(Column#324)->Column#152, funcs:firstrow(Column#325)->Column#155, funcs:firstrow(Column#326)-
, funcs:firstrow(Column#327)->merchant.mht_trade_request.sub_trans_code, funcs:firstrow(Column#328)->merchant.mht_trade_request.user_id, funcs:firstrow(Column#329)->merchant.mht_trade_request.asset_acct_id, funcs:firstrow
uest.product_id, funcs:firstrow(Column#331)->merchant.mht_user_account.customer_name, funcs:firstrow(Column#332)->merchant.mht_product_ta_info.ta_no, funcs:firstrow(Column#333)->merchant.mht_ta_user_account.trade_acct | 2
|   └Projection_197                  | 454128.34    | 0      | root     |                                                   | time:490.9µs, loops:1,
                                     | Column#153, Column#154, Column#142, Column#143, Column#140, Column#141, cast(Column#134, var_string(20))->Column#312, cast(Column#134, decimal(37,0) BINARY)->Column#313,
 Column#133, Column#136, Column#137, Column#138, Column#139, Column#149, Column#151, Column#152, Column#155, merchant.mht_trade_request.trans_id, merchant.mht_trade_request.sub_trans_code, merchant.mht_trade_request.user_
_acct_id, merchant.mht_trade_request.product_id, merchant.mht_user_account.customer_name, merchant.mht_product_ta_info.ta_no, merchant.mht_ta_user_account.trade_acct, Column#128, Column#129, Column#136, merchant.mht_trade
e_request.sub_trans_code, Column#155, merchant.mht_trade_request.user_id, merchant.mht_trade_request.asset_acct_id, merchant.mht_user_account.customer_name, merchant.mht_trade_request.product_id, Column#139, Column#130, C
ta_user_account.trade_acct, merchant.mht_product_ta_info.ta_no, Column#133, Column#151, Column#152, Column#149 | 217.6 KB  | N/A    |
|     └Projection_42                 | 454128.34    | 0      | root     |                                                   | time:315.7µs, loops:1,
                                     | Column#128, Column#129, Column#130, Column#133, Column#134, Column#136, Column#137, Column#138, Column#139, Column#140, Column#141, Column#142, Column#143, Column#149, C
olumn#154, Column#155, merchant.mht_trade_request.trans_id, merchant.mht_trade_request.sub_trans_code, merchant.mht_trade_request.user_id, merchant.mht_trade_request.asset_acct_id, merchant.mht_trade_request.product_id, m
me, merchant.mht_product_ta_info.ta_no, merchant.mht_ta_user_account.trade_acct
                                     | 153.1 KB   | N/A     |
|       └HashJoin_43                 | 454128.34    | 0      | root     |                                                   | time:202.1µs, loops:1,
ch:1.43ms, build:0s}
                                     | inner join, equal:[eq(merchant.mht_trade_request.request_id, Column#129)]

                                     | 0 Bytes    | 0 Bytes |
|         ├Union_112(Build)          | 5954.12      | 0      | root     |                                                   | time:1.3ms, loops:1
                                     |

                                     | N/A        | N/A     |
|         │ ├Projection_113          | 2977.06      | 0      | root     |                                                   | time:438.4µs, loops:1,
                                     | merchant.mht_trade_cash_out_info.cash_out_id, merchant.mht_trade_cash_out_info.request_id, merchant.mht_trade_cash_out_info.step_no, merchant.mht_trade_cash_out_info.cas
ut_info.cash_amt, merchant.mht_trade_cash_out_info.cash_out_date, merchant.mht_trade_cash_out_info.real_cash_out_date, merchant.mht_trade_cash_out_info.advance_natural_days, merchant.mht_trade_cash_out_info.cash_out_statu
inst_account_no, merchant.mht_trade_cash_out_info.pay_decision_id, merchant.mht_trade_cash_out_info.pay_success_date, merchant.mht_trade_cash_out_info.pay_success_time, merchant.mht_trade_cash_out_info.advance_type, merch
ime, merchant.mht_trade_cash_out_info.modify_time, merchant.mht_trade_request.card_idx_no, merchant.mht_trade_request.inst_id, merchant.mht_trade_cash_out_info.cash_type
                                     | 104.0 KB   | N/A     |
|         │ │ └IndexJoin_118         | 2977.06      | 0      | root     |                                                   | time:373.2µs, loops:1,
```

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为什么做这个项目？

当前 Explain 只管疯狂输出…
完全不顾使用者的感受 > <

随着 TiDB 深入到更复杂的场景，业务 SQL 也愈发复杂 T.T

HTAP 引入了更复杂 AP 查询，让原本并不富裕的生活雪上加霜…

当所有这些因素结合到一起时 @@

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项目解决了什么问题？

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项目解决了什么问题？

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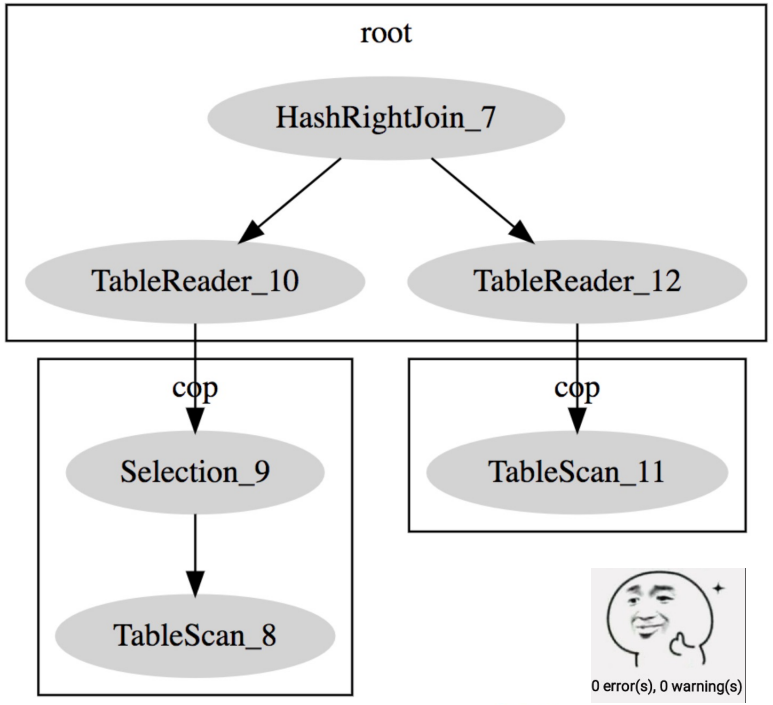
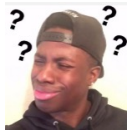
假如能有个图像化的显示...Ummm





项目解决了什么问题？

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用户

用户

用户

内核

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项目解决了什么问题？

100% 解决 DBA 头疼难题

降低使用门槛，易用性++

复杂问题排查效率提升 >666%

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Hackathon 上实现了哪些内容？

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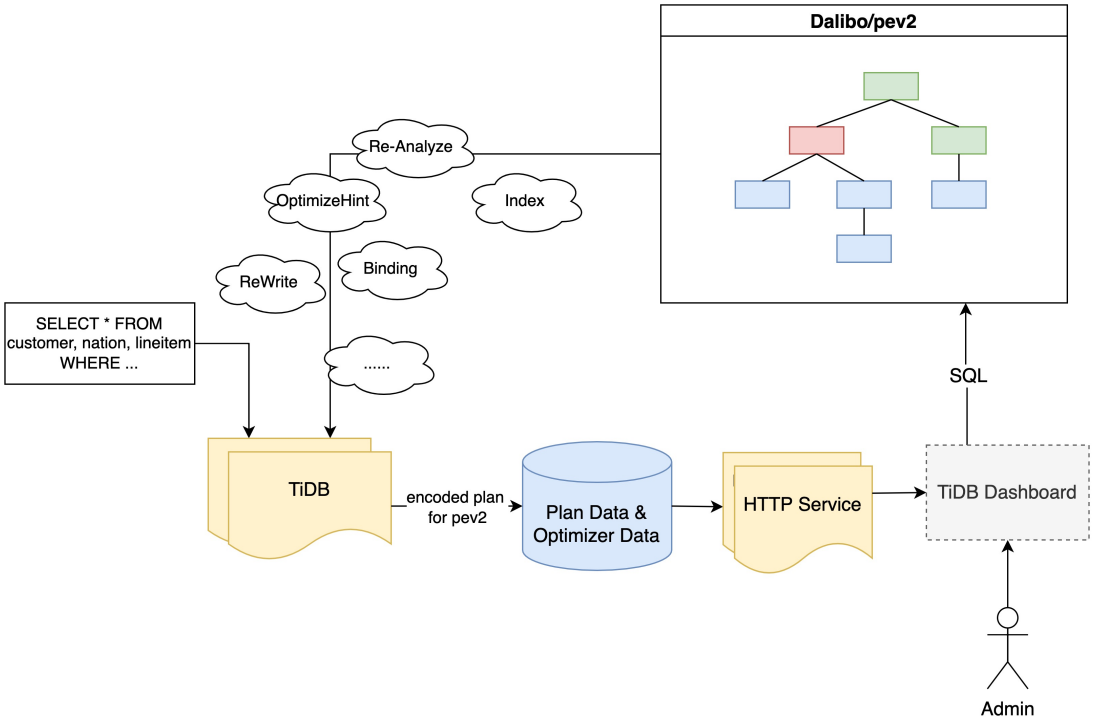
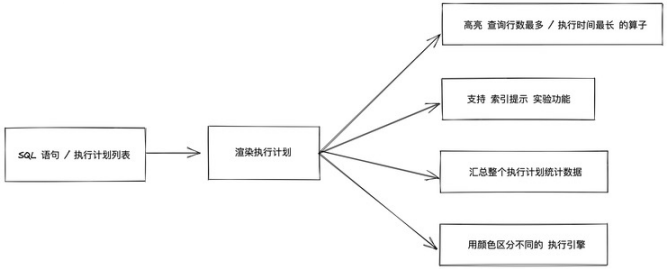
Hackathon 上实现了哪些内容？



前端技术实现：



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Hackathon 上实现了哪些内容？

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1. 将可读性差的执行计划做可视化的**呈现和交互**
2. 对庞杂数据库侧疯狂输出信息做**分类梳理**
3. 对问题**关键高亮**提示，**辅助问题定位**，加速处理效率

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Hackathon 上实现了哪些内容？

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1. RFC： https://github.com/Hackathon-2022-TiVP/TiVP/blob/main/README.md
2. 项目地址： https://github.com/Hackathon-2022-TiVP

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测试结果

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未来展望

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未来展望

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1. 功能
    - 更准确的 Insights：Cost、Time、Stats、...
    - 初级调优：一键更新统计信息、Plan Diff
    - Optimizer Trace 诊断可视化：打开黑盒，看见内核逻辑

2. 集成
    - 与 Dashboard 集成：开箱即用
    - 与 Clinic 集成：执行计划 JSON 的导入与导出

Explore The Sky

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1. What-If 启发式调优
智能 – Index Advisor, Hint Advisor, Partition Advisor, Data Temperature Advisor…

2. Not Only for TiDB
扩展 – 定义通用接口协议，支持 TiDB 外其他数据库如 MySQL, PostgreSQL 等，支持多种执行计划的展示、对比和优化

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Thanks

@ Dongyu，Baoling, Ruoxi, Wangfan
@ Eason, Darui, Shenghui, Yuanyuan
@ 初赛评委，双呆

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