MySQL执行计划解读

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纲要

- MySQL执行计划调用方式
- 执行计划包含的信息
- 执行计划显示内容解读
- MySQL执行计划的局限
- Q&A

通过执行计划可以了解什么

```
mysql> explain
    -> select d1.col2, t2.col1
    -> from (select col2, col3
    ->         from t1
    ->           where col1 in ('ab','ac')) d1, t2
    -> where d1.col2 = t2.col1
    -> group by d1.col2, t2.col1
    -> order by t2.id;
+----+-------------+------------+-------+-------------------+-------------------+---------+---------+------+---------------------------------+
| id | select_type | table      | type  | possible_keys     | key               | key_len | ref     | rows | Extra                           |
+----+-------------+------------+-------+-------------------+-------------------+---------+---------+------+---------------------------------+
|  1 | PRIMARY     | <derived2> | ALL   | NULL              | NULL              | NULL    | NULL    |  286 | Using temporary; Using filesort |
|  1 | PRIMARY     | t2         | ref   | idx_col1_col2     | idx_col1_col2     | 195     | d1.col2 |   45 | Using where; Using index        |
|  2 | DERIVED     | t1         | range | idx_col1_col2_col3 | idx_col1_col2_col3 | 13      | NULL    |  285 | Using where; Using index        |
+----+-------------+------------+-------+-------------------+-------------------+---------+---------+------+---------------------------------+
3 rows in set (0.00 sec)
```

MySQL执行计划调用方式

- EXPLAIN SELECT ……

  变体：

- 1. EXPLAIN EXTENDED SELECT ……

  将执行计划“反编译”成SELECT语句，运行SHOW WARNINGS可得到被MySQL优化器优化后的查询语句

- 2. EXPLAIN PARTITIONS SELECT ……

  用于分区表的EXPLAIN

执行计划包含的信息

```
+----+-------------+-------+------+---------------+------+---------+------+------+-------+
| id | select_type | table | type | possible_keys | key  | key_len | ref  | rows | Extra |
+----+-------------+-------+------+---------------+------+---------+------+------+-------+
```

1. id：

包含一组数字，表示查询中执行select子句或操作表的顺序

e.g.

```
mysql> explain select t2.*
    -> from t1, t2, t3
    -> where t1.id = t2.id and t1.id = t3.id
    -> and t1.other_column = '';
+----+-------------+-------+--------+---------------+----------+---------+------------+------+-------------+
| id | select_type | table | type   | possible_keys | key      | key_len | ref        | rows | Extra       |
+----+-------------+-------+--------+---------------+----------+---------+------------+------+-------------+
|  1 | SIMPLE      | t1    | ref    | PRIMARY,idx_t1 | idx_t1   | 92      | const      |    1 | Using where |
|  1 | SIMPLE      | t3    | eq_ref | PRIMARY       | PRIMARY  | 4       | test.t1.ID |    1 | Using index |
|  1 | SIMPLE      | t2    | eq_ref | PRIMARY       | PRIMARY  | 4       | test.t1.ID |    1 |             |
+----+-------------+-------+--------+---------------+----------+---------+------------+------+-------------+
3 rows in set (0.00 sec)
```

id相同，执行顺序由上至下

e.g.

```
mysql> explain SELECT t2.*
    -> FROM t2
    -> WHERE id = (SELECT id
    ->                FROM t1
    ->                WHERE id = (SELECT t3.id
    ->                            FROM t3
    ->                            WHERE t3.other_column = ''));
+----+-------------+-------+-------+---------------+---------+---------+-------+------+-------------+
| id | select_type | table | type  | possible_keys | key     | key_len | ref   | rows | Extra       |
+----+-------------+-------+-------+---------------+---------+---------+-------+------+-------------+
|  1 | PRIMARY     | t2    | const | PRIMARY       | PRIMARY | 4       | const |    1 |             |
|  2 | SUBQUERY    | t1    | const | PRIMARY       | PRIMARY | 4       |       |    1 | Using index |
|  3 | SUBQUERY    | t3    | ALL   | NULL          | NULL    | NULL    | NULL  |    1 | Using where |
+----+-------------+-------+-------+---------------+---------+---------+-------+------+-------------+
3 rows in set (0.00 sec)
```

如果是子查询，id的序号会递增，id值越大优先级越高，越先被执行

e.g.

```
mysql> explain select t2.* from (
    -> select t3.id
    -> from t3
    -> where t3.other_column = '') s1, t2
    -> where s1.id = t2.id;
+----+-------------+------------+--------+---------------+---------+---------+-------+------+-------------+
| id | select_type | table      | type   | possible_keys | key     | key_len | ref   | rows | Extra       |
+----+-------------+------------+--------+---------------+---------+---------+-------+------+-------------+
|  1 | PRIMARY     | <derived2> | system | NULL          | NULL    | NULL    | NULL  |    1 |             |
|  1 | PRIMARY     | t2         | const  | PRIMARY       | PRIMARY | 4       | const |    1 |             |
|  2 | DERIVED     | t3         | ALL    | NULL          | NULL    | NULL    | NULL  |    1 | Using where |
+----+-------------+------------+--------+---------------+---------+---------+-------+------+-------------+
3 rows in set (0.00 sec)
```

id如果相同，可以认为是一组，从上往下顺序执行；在所有组中，id值越大，优先级越高，越先执行

2. select_type

表示查询中每个select子句的类型（简单 OR复杂）

```
+----+--------------+
| id | select_type  |
+----+--------------+
|  1 | SIMPLE       |
|  2 | PRIMARY      |
|  3 | SUBQUERY     |
|  4 | DERIVED      |
|  5 | UNION        |
|  6 | UNION RESULT |
+----+--------------+
```

a. SIMPLE：查询中不包含子查询或者UNION
b. 查询中若包含任何复杂的子部分，最外层查询则被标记为：PRIMARY
c. 在SELECT或WHERE列表中包含了子查询，该子查询被标记为：SUBQUERY
d. 在FROM列表中包含的子查询被标记为：DERIVED（衍生）
e. 若第二个SELECT出现在UNION之后，则被标记为UNION；若UNION包含在FROM子句的子查询中，外层SELECT将被标记为：DERIVED
f. 从UNION表获取结果的SELECT被标记为：UNION RESULT

e.g.

```
mysql> explain select d1.name, (select id from t3) d2
    -> from (select id, name from t1 where other_column = '') d1
    -> union
    -> (select name, id from t2);
+------+-------------+------------+--------+---------------+---------+---------+------+------+-------------+
| id   | select_type | table      | type   | possible_keys | key     | key_len | ref  | rows | Extra       |
+------+-------------+------------+--------+---------------+---------+---------+------+------+-------------+
|  1   | PRIMARY     | <derived3> | system | NULL          | NULL    | NULL    | NULL |    1 |             |
|  3   | DERIVED     | t1         | ALL    | NULL          | NULL    | NULL    | NULL |    1 | Using where |
|  2   | SUBQUERY    | t3         | index  | NULL          | PRIMARY | 4       | NULL |    1 | Using index |
|  4   | UNION       | t2         | ALL    | NULL          | NULL    | NULL    | NULL |    1 |             |
| NULL | UNION RESULT | <union1,4> | ALL    | NULL          | NULL    | NULL    | NULL | NULL |             |
+------+-------------+------------+--------+---------------+---------+---------+------+------+-------------+
5 rows in set (0.01 sec)
```

第一行：id列为1，表示第一个select，select_type列的primary表 示该查询为外层查询，table列被标记为<derived3>，表示查询结果来自一个衍生表，其中3代表该查询衍生自第三个select查询，即id为3的select。

第二行：id为3，表示该查询的执行次序为2（4→3），是整个查询中第三个select的一部分。因查询包含在from中，所以为derived。

第三行：select列表中的子查询，select_type为subquery，为整个查询中的第二个select。

第四行：select_type为union，说明第四个select是union里的第二个select，最先执行。

第五行：代表从union的临时表中读取行的阶段，table列的<union1,4>表示用第一个和第四个select的结果进行union操作。

3. type

表示MySQL在表中找到所需行的方式，又称“访问类型”，常见类型如下：

```
+------+--------+-------+-----+--------+---------------+------+
| ALL  | index  | range | ref | eq_ref | const, system | NULL |
+------+--------+-------+-----+--------+---------------+------+
```

由左至右，由最差到最好

e.g.

```
+------+--------+-------+-----+--------+----------------+------+
| ALL  | index  | range | ref | eq_ref | const, system | NULL |
+------+--------+-------+-----+--------+----------------+------+
```

a. ALL：Full Table Scan， MySQL将遍历全表以找到匹配的行

```
mysql> explain select * from t1 where column_without_index = '';
+----+-------------+-------+------+---------------+------+---------+------+------+-------------+
| id | select_type | table | type | possible_keys | key  | key_len | ref  | rows | Extra       |
+----+-------------+-------+------+---------------+------+---------+------+------+-------------+
|  1 | SIMPLE      | t1    | ALL  | NULL          | NULL | NULL    | NULL |  516 | Using where |
+----+-------------+-------+------+---------------+------+---------+------+------+-------------+
1 row in set (0.00 sec)
```

```
+------+--------+-------+-----+--------+----------------+------+
| ALL  | index  | range | ref | eq_ref | const, system | NULL |
+------+--------+-------+-----+--------+----------------+------+
```

b. index：Full Index Scan，index与ALL区别为index类型只遍历索引树

```
mysql> explain select id from t1;
+----+-------------+-------+-------+---------------+---------+---------+------+------+-------------+
| id | select_type | table | type  | possible_keys | key     | key_len | ref  | rows | Extra       |
+----+-------------+-------+-------+---------------+---------+---------+------+------+-------------+
|  1 | SIMPLE      | t1    | index | NULL          | PRIMARY | 4       | NULL |  516 | Using index |
+----+-------------+-------+-------+---------------+---------+---------+------+------+-------------+
1 row in set (0.00 sec)
```

```
+------+--------+-------+-----+--------+---------------+------+
| ALL  | index  | range | ref | eq_ref | const, system | NULL |
+------+--------+-------+-----+--------+---------------+------+
```

c. range：索引范围扫描，对索引的扫描开始于某一点，返回匹配值域的行，常见于between、<、>等的查询

e.g.

```
mysql> explain SELECT * FROM t1 WHERE id between 30 and 60;
+----+-------------+-------+-------+---------------+---------+---------+------+------+-------------+
| id | select_type | table | type  | possible_keys | key     | key_len | ref  | rows | Extra       |
+----+-------------+-------+-------+---------------+---------+---------+------+------+-------------+
|  1 | SIMPLE      | t1    | range | PRIMARY       | PRIMARY | 4       | NULL |   31 | Using where |
+----+-------------+-------+-------+---------------+---------+---------+------+------+-------------+
1 row in set (0.00 sec)

mysql> explain select * from t1 where id in (1, 2, 6);
+----+-------------+-------+-------+---------------+---------+---------+------+------+-------------+
| id | select_type | table | type  | possible_keys | key     | key_len | ref  | rows | Extra       |
+----+-------------+-------+-------+---------------+---------+---------+------+------+-------------+
|  1 | SIMPLE      | t1    | range | PRIMARY       | PRIMARY | 4       | NULL |    3 | Using where |
+----+-------------+-------+-------+---------------+---------+---------+------+------+-------------+
1 row in set (0.00 sec)
```

TIPS：

range访问类型的不同形式的索引访问性能差异

```
mysql> explain select id from t1 where col1 in ('ac','ab','aa') and col2 = 'ac';
+----+-------------+-------+-------+----------------+----------------+---------+------+------+---------+
| id | select_type | table | type  | possible_keys  | key            | key_len | ref  | rows | Extra   |
+----+-------------+-------+-------+----------------+----------------+---------+------+------+---------+
|  1 | SIMPLE      | t1    | range | idx_col1_col2  | idx_col1_col2  | 388     | NULL |    3 |         |
+----+-------------+-------+-------+----------------+----------------+---------+------+------+---------+
1 row in set (0.00 sec)

mysql> explain select id from t1 where col1 > 'aa' and col2 = 'ac';
+----+-------------+-------+-------+----------------+----------------+---------+------+------+---------+
| id | select_type | table | type  | possible_keys  | key            | key_len | ref  | rows | Extra   |
+----+-------------+-------+-------+----------------+----------------+---------+------+------+---------+
|  1 | SIMPLE      | t1    | range | idx_col1_col2  | idx_col1_col2  | 194     | NULL |  299 |         |
+----+-------------+-------+-------+----------------+----------------+---------+------+------+---------+
1 row in set (0.00 sec)
```

```
+------+--------+-------+-----+--------+---------------+------+
| ALL  | index  | range | ref | eq_ref | const, system | NULL |
+------+--------+-------+-----+--------+---------------+------+
```

d. ref：非唯一性索引扫描，返回匹配某个单独值的所有行。常见于使用非唯一索引即唯一索引的非唯一前缀进行的查找

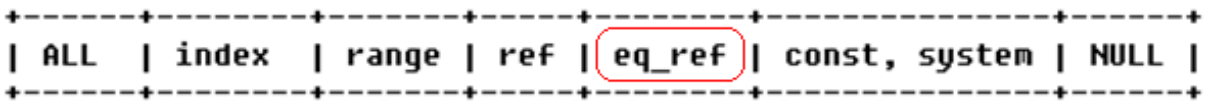
e.g.

```
mysql> create index idx_col1_col2 on t1(col1,col2);
Query OK, 1000 rows affected (0.15 sec)
Records: 1000  Duplicates: 0  Warnings: 0

mysql> select count(distinct col1) from t1;
+----------------------+
| count(distinct col1) |
+----------------------+
|                    7 |
+----------------------+
1 row in set (0.00 sec)

mysql> explain select * from t1 where col1 = 'ac';
+----+-------------+-------+------+----------------+----------------+---------+-------+------+---------+
| id | select_type | table | type | possible_keys  | key            | key_len | ref   | rows | Extra   |
+----+-------------+-------+------+----------------+----------------+---------+-------+------+---------+
|  1 | SIMPLE      | t1    | ref  | idx_col1_col2  | idx_col1_col2  | 194     | const |  284 |         |
+----+-------------+-------+------+----------------+----------------+---------+-------+------+---------+
1 row in set (0.00 sec)
```

e.g.

```
mysql> explain select * from t1, t2 WHERE t1.col1 = t2.col1;
+----+-------------+-------+------+---------------+---------------+---------+----------------+------+--------+
| id | select_type | table | type | possible_keys | key           | key_len | ref            | rows | Extra  |
+----+-------------+-------+------+---------------+---------------+---------+----------------+------+--------+
|  1 | SIMPLE      | t2    | ALL  | NULL          | NULL          | NULL    | NULL           |  639 |        |
|  1 | SIMPLE      | t1    | ref  | idx_col1_col2 | idx_col1_col2 | 195     | shared.t2.col1 |   45 |        |
+----+-------------+-------+------+---------------+---------------+---------+----------------+------+--------+
2 rows in set (0.00 sec)
```

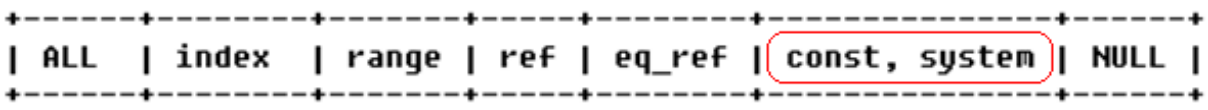
```
mysql> explain select * from t1, t2 WHERE t1.col1 = t2.col1 AND t1.col2 = 'ac';
+----+-------------+-------+------+---------------+---------------+---------+---------------------+------+--------+
| id | select_type | table | type | possible_keys | key           | key_len | ref                 | rows | Extra  |
+----+-------------+-------+------+---------------+---------------+---------+---------------------+------+--------+
|  1 | SIMPLE      | t2    | ALL  | NULL          | NULL          | NULL    | NULL                |  639 |        |
|  1 | SIMPLE      | t1    | ref  | idx_col1_col2 | idx_col1_col2 | 390     | shared.t2.col1,const |   45 |        |
+----+-------------+-------+------+---------------+---------------+---------+---------------------+------+--------+
2 rows in set (0.00 sec)
```



e. eq_ref：唯一性索引扫描，对于每个索引键，表中只有一条记录与之匹配。常见于主键或唯一索引扫描

e.g.

```
mysql> explain select * from t1, t2 where t1.id = t2.id;
+----+-------------+-------+--------+---------------+---------+---------+--------------+------+-------+
| id | select_type | table | type   | possible_keys | key     | key_len | ref          | rows | Extra |
+----+-------------+-------+--------+---------------+---------+---------+--------------+------+-------+
|  1 | SIMPLE      | t2    | ALL    | PRIMARY       | NULL    | NULL    | NULL         |  639 |       |
|  1 | SIMPLE      | t1    | eq_ref | PRIMARY       | PRIMARY | 4       | shared.t2.ID |    1 |       |
+----+-------------+-------+--------+---------------+---------+---------+--------------+------+-------+
2 rows in set (0.00 sec)
```



f. const、system：当MySQL对查询某部分进行优化，并转换为一个常量时，使用这些类型访问。如将主键置于where列表中，MySQL就能将该查询转换为一个常量

e.g.

```
mysql> explain select * from (select * from t1 where id = 1) d1;
+----+-------------+------------+--------+---------------+---------+---------+------+------+-------+
| id | select_type | table      | type   | possible_keys | key     | key_len | ref  | rows | Extra |
+----+-------------+------------+--------+---------------+---------+---------+------+------+-------+
|  1 | PRIMARY     | <derived2> | system | NULL          | NULL    | NULL    | NULL |    1 |       |
|  2 | DERIVED     | t1         | const  | PRIMARY       | PRIMARY | 4       |      |    1 |       |
+----+-------------+------------+--------+---------------+---------+---------+------+------+-------+
2 rows in set (0.00 sec)
```

TIPS：system是const类型的特例，当查询的表只有一行的情况下，使用system

ALL	index	range	ref	eq_ref	const, system	NULL

g. NULL：MySQL在优化过程中分解语句，执行时甚至不用访问表或索引

e.g.

```
mysql> explain extended select * from t1 where id = (select min(id) from t2);
+----+-------------+-------+-------+---------------+---------+---------+-------+------+----------+-------+
| id | select_type | table | type  | possible_keys | key     | key_len | ref   | rows | filtered | Extra |
+----+-------------+-------+-------+---------------+---------+---------+-------+------+----------+-------+
|  1 | PRIMARY     | t1    | const | PRIMARY       | PRIMARY | 4       | const |    1 |   100.00 |       |
|  2 | SUBQUERY    | NULL  | NULL  | NULL          | NULL    | NULL    | NULL  | NULL |     NULL |       |
+----+-------------+-------+-------+---------------+---------+---------+-------+------+----------+-------+
2 rows in set, 1 warning (0.00 sec)

mysql> show warnings;
+-------+------+-----------------------------------------------------------------------------------+
| Level | Code | Message                                                                           |
+-------+------+-----------------------------------------------------------------------------------+
| Note  | 1003 | select '1' AS `ID`,'hu' AS `col1`,'dba' AS `col2` from `shared`.`t1` where 1 |
+-------+------+-----------------------------------------------------------------------------------+
1 row in set (0.00 sec)
```

4. possible_keys

指出MySQL能使用哪个索引在表中找到行，查询涉及到的字段上若存在索引，则该索引将被列出，但不一定被查询使用

5. key

显示MySQL在查询中实际使用的索引，若没有使用索引，显示为NULL

TIPS：查询中若使用了覆盖索引，则该索引仅出现在key列表中

```
mysql> explain select col1, col2 from t1;
+----+-------------+-------+-------+---------------+---------------+---------+------+------+-------------+
| id | select_type | table | type  | possible_keys | key           | key_len | ref  | rows | Extra       |
+----+-------------+-------+-------+---------------+---------------+---------+------+------+-------------+
|  1 | SIMPLE      | t1    | index | NULL          | idx_col1_col2 | 390     | NULL |  682 | Using index |
+----+-------------+-------+-------+---------------+---------------+---------+------+------+-------------+
1 row in set (0.00 sec)
```

6. key_len

表示索引中使用的字节数，可通过该列计算查询中使用的索引的长度

```
mysql> desc t1;
+-------+---------+------+-----+---------+----------------+
| Field | Type    | Null | Key | Default | Extra          |
+-------+---------+------+-----+---------+----------------+
| ID    | int(11) | NO   | PRI | NULL    | auto_increment |
| col1  | char(4) | YES  | MUL | NULL    |                |
| col2  | char(4) | YES  |     | NULL    |                |
+-------+---------+------+-----+---------+----------------+
3 rows in set (0.00 sec)


mysql> explain select * from t1 where col1 = 'ab';
+----+-------------+-------+------+---------------+---------------+---------+-------+------+--------+
| id | select_type | table | type | possible_keys | key           | key_len | ref   | rows | Extra  |
+----+-------------+-------+------+---------------+---------------+---------+-------+------+--------+
|  1 | SIMPLE      | t1    | ref  | idx_col1_col2 | idx_col1_col2 | 13      | const |  143 |        |
+----+-------------+-------+------+---------------+---------------+---------+-------+------+--------+
1 row in set (0.00 sec)

mysql> explain select * from t1 where col1 = 'ab' and col2 = 'ac';
+----+-------------+-------+------+---------------+---------------+---------+-------------+------+-------+
| id | select_type | table | type | possible_keys | key           | key_len | ref         | rows | Extra |
+----+-------------+-------+------+---------------+---------------+---------+-------------+------+-------+
|  1 | SIMPLE      | t1    | ref  | idx_col1_col2 | idx_col1_col2 | 26      | const,const |    1 |       |
+----+-------------+-------+------+---------------+---------------+---------+-------------+------+-------+
1 row in set (0.01 sec)
```

TIPS：key_len显示的值为索引字段的最大可能长度，并非实际使用长度，即key_len是根据表定义计算而得，不是通过表内检索出的

7. ref

表示上述表的连接匹配条件，即哪些列或常量被用于查找索引列上的值

```
mysql> explain select * from t1, t2 where t1.col1 = t2.col1 and t1.col2 = 'ac';
+----+…+-------+------+---------------+---------------+---------+---------------------+------+
| id |…| table | type | possible_keys | key           | key_len | ref                 | rows |
+----+…+-------+------+---------------+---------------+---------+---------------------+------+
|  1 |…| t2    | ALL  | NULL          | NULL          | NULL    | NULL                |  640 |
|  1 |…| t1    | ref  | idx_col1_col2 | idx_col1_col2 | 26      | shared.t2.col1,const |   82 |
+----+…+-------+------+---------------+---------------+---------+---------------------+------+
2 rows in set (0.01 sec)
```

本例中，由key_len可知t1表的idx_col1_col2被充分使用，col1匹配t2表的col1，col2匹配了一个常量，即 'ac'

8. rows

表示MySQL根据表统计信息及索引选用情况，估算的找到所需的记录所需要读取的行数

```
mysql> explain select * from t1, t2 where t1.id = t2.id and t2.col1 = 'ac';
+----+-------------+-------+--------+---------------+---------+---------+--------------+------+-------------+
| id | select_type | table | type   | possible_keys | key     | key_len | ref          | rows | Extra       |
+----+-------------+-------+--------+---------------+---------+---------+--------------+------+-------------+
|  1 | SIMPLE      | t2    | ALL    | PRIMARY       | NULL    | NULL    | NULL         |  640 | Using where |
|  1 | SIMPLE      | t1    | eq_ref | PRIMARY       | PRIMARY | 4       | shared.t2.ID |    1 |             |
+----+-------------+-------+--------+---------------+---------+---------+--------------+------+-------------+
2 rows in set (0.00 sec)

mysql> create index idx_col1_col2 on t2(col1,col2);
Query OK, 1001 rows affected (0.17 sec)
Records: 1001  Duplicates: 0  Warnings: 0

mysql> explain select * from t1, t2 where t1.id = t2.id and t2.col1 = 'ac';
+----+-------------+-------+--------+-----------------------+---------------+---------+--------------+------+
| id | select_type | table | type   | possible_keys         | key           | key_len | ref          | rows |
+----+-------------+-------+--------+-----------------------+---------------+---------+--------------+------+
|  1 | SIMPLE      | t2    | ref    | PRIMARY,idx_col1_col2 | idx_col1_col2 | 195     | const        |  142 |
|  1 | SIMPLE      | t1    | eq_ref | PRIMARY               | PRIMARY       | 4       | shared.t2.ID |    1 |
+----+-------------+-------+--------+-----------------------+---------------+---------+--------------+------+
2 rows in set (0.00 sec)
```

9. Extra

包含不适合在其他列中显示但十分重要的额外信息

a. Using index

该值表示相应的select操作中使用了覆盖索引（Covering Index）

```
mysql> explain select col2 from t1 where col1 = 'ab';
+----+...+---------------+---------------+---------+-------+------+--------------------------+
| id |...| possible_keys | key           | key_len | ref   | rows | Extra                    |
+----+...+---------------+---------------+---------+-------+------+--------------------------+
|  1 |...| idx_col1_col2 | idx_col1_col2 | 13      | const |  143 | Using where; Using index |
+----+...+---------------+---------------+---------+-------+------+--------------------------+
1 row in set (0.00 sec)
```

TIPS：覆盖索引（Covering Index）

MySQL可以利用索引返回select列表中的字段，而不必根据索引再次读取数据文件

包含所有满足查询需要的数据的索引称为 **覆盖索引**（Covering Index）

注意：

如果要使用覆盖索引，一定要注意select列表中只取出需要的列，不可select *，因为如果将所有字段一起做索引会导致索引文件过大，查询性能下降

b. Using where

表示MySQL服务器在存储引擎受到记录后进行“后过滤”（Post-filter），如果查询未能使用索引，Using where的作用只是提醒我们MySQL将用where子句来过滤结果集

```
mysql> explain extended select t1.col2 from t1, t2 where t1.col1 = 'ab' and t1.id= t2.id ;
+----+……+---------------+---------+--------------+------+----------+--------------------------+
| id |……| key           | key_len | ref          | rows | filtered | Extra                    |
+----+……+---------------+---------+--------------+------+----------+--------------------------+
|  1 |……| idx_col1_col2 | 13      | const        |  143 |   100.00 | Using where; Using index |
|  1 |……| PRIMARY       | 4       | shared.t1.ID |    1 |   100.00 | Using index              |
+----+……+---------------+---------+--------------+------+----------+--------------------------+
2 rows in set, 1 warning (0.00 sec)
```

c. Using temporary

表示MySQL需要使用临时表来存储结果集，常见于排序和分组查询

```
mysql> explain select col1 from t1 where col1 in ('ac','ab','aa') group by col2\G
*************************** 1. row ***************************
           id: 1
  select_type: SIMPLE
        table: t1
         type: range
possible_keys: idx_col1_col2
          key: idx_col1_col2
      key_len: 13
          ref: NULL
         rows: 569
        Extra: Using where; Using index; Using temporary; Using filesort
1 row in set (0.00 sec)

mysql> explain select col1 from t1 where col1 in ('ac', 'ab') group by col1, col2\G
*************************** 1. row ***************************
           id: 1
  select_type: SIMPLE
        table: t1
         type: range
possible_keys: idx_col1_col2_col3
          key: idx_col1_col2_col3
      key_len: 26
          ref: NULL
         rows: 4
        Extra: Using where; Using index for group-by
1 row in set (0.00 sec)
```

d. Using filesort

MySQL中无法利用索引完成的排序操作称为“文件排序”

```
mysql> explain select col1 from t1 where col1 = 'ac' order by col3\G
*************************** 1. row ***************************
           id: 1
  select_type: SIMPLE
        table: t1
         type: ref
possible_keys: idx_col1_col2_col3
          key: idx_col1_col2_col3
      key_len: 13
          ref: const
         rows: 142
        Extra: Using where; Using index; Using filesort
1 row in set (0.00 sec)

mysql> explain select col1 from t1 where col1 = 'ac' order by col2, col3\G
*************************** 1. row ***************************
           id: 1
  select_type: SIMPLE
        table: t1
         type: ref
possible_keys: idx_col1_col2_col3
          key: idx_col1_col2_col3
      key_len: 13
          ref: const
         rows: 142
        Extra: Using where; Using index
1 row in set (0.00 sec)
```

```
mysql> explain
    -> select d1.col2, t2.col1
    -> from (select col2, col3
    ->         from t1
    ->           where col1 in ('ab','ac')) d1, t2
    -> where d1.col2 = t2.col1
    -> group by d1.col2, t2.col1
    -> order by t2.id;
+----+-------------+------------+-------+-------------------+-------------------+---------+---------+------+---------------------------------+
| id | select_type | table      | type  | possible_keys     | key               | key_len | ref     | rows | Extra                           |
+----+-------------+------------+-------+-------------------+-------------------+---------+---------+------+---------------------------------+
|  1 | PRIMARY     | <derived2> | ALL   | NULL              | NULL              | NULL    | NULL    |  286 | Using temporary; Using filesort |
|  1 | PRIMARY     | t2         | ref   | idx_col1_col2     | idx_col1_col2     | 195     | d1.col2 |   45 | Using where; Using index        |
|  2 | DERIVED     | t1         | range | idx_col1_col2_col3 | idx_col1_col2_col3 | 13      | NULL    |  285 | Using where; Using index        |
+----+-------------+------------+-------+-------------------+-------------------+---------+---------+------+---------------------------------+
3 rows in set (0.00 sec)
```

```
mysql> desc t1;
+-------+---------+------+-----+---------+----------------+
| Field | Type    | Null | Key | Default | Extra          |
+-------+---------+------+-----+---------+----------------+
| ID    | int(11) | NO   | PRI | NULL    | auto_increment |
| col1  | char(4) | YES  | MUL | NULL    |                |
| col2  | char(4) | YES  |     | NULL    |                |
| col3  | char(4) | YES  |     | NULL    |                |
+-------+---------+------+-----+---------+----------------+
4 rows in set (0.00 sec)

mysql> desc t2;
+-------+-------------+------+-----+---------+----------------+
| Field | Type        | Null | Key | Default | Extra          |
+-------+-------------+------+-----+---------+----------------+
| ID    | int(11)     | NO   | PRI | NULL    | auto_increment |
| col1  | varchar(64) | YES  | MUL | NULL    |                |
| col2  | varchar(64) | YES  |     | NULL    |                |
+-------+-------------+------+-----+---------+----------------+
3 rows in set (0.00 sec)
```

```
mysql> select count(*) from t1 where col1 = 'ac';
+----------+
| count(*) |
+----------+
|      143 |
+----------+
1 row in set (0.00 sec)

mysql> select count(*) from t1 where col1 = 'ab';
+----------+
| count(*) |
+----------+
|      143 |
+----------+
1 row in set (0.01 sec)
```

MySQL执行计划的局限

- EXPLAIN不会告诉你关于触发器、存储过程的信息或用户自定义函数对查询的影响情况
- EXPLAIN不考虑各种Cache
- EXPLAIN不能显示MySQL在执行查询时所作的优化工作
- 部分统计信息是估算的，并非精确值
- EXPALIN只能解释SELECT操作，其他操作要重写为SELECT后查看执行计划

……

Q&A

谢谢