基于PG数据库插件的SQL规范审核工具介绍

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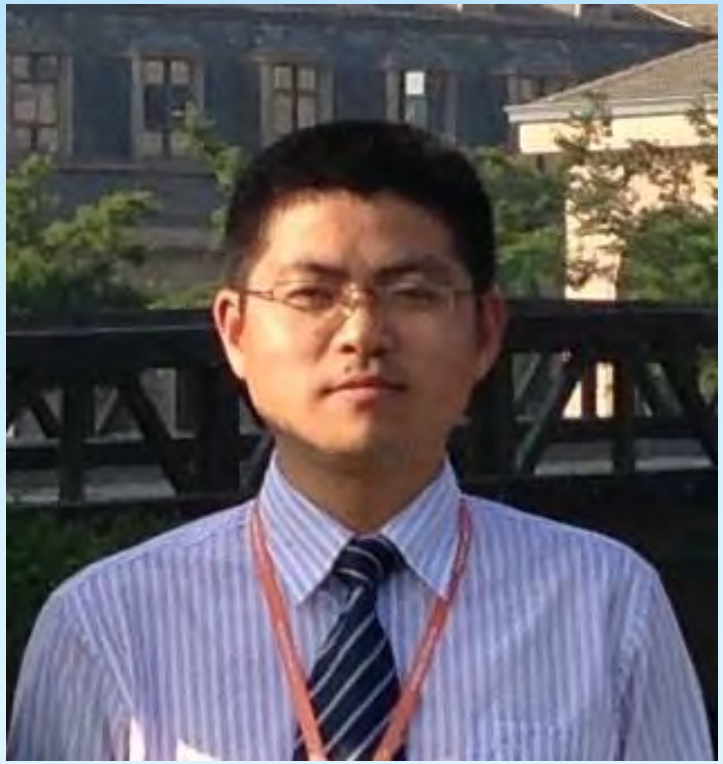
个人简介

陈刚

- ✓ 中国平安集团旗下平安科技数据库架构师
- ✓ 13年工作经验
- ✓ 2011年加入平安科技
- ✓ 先后负责过多种类型数据库的数据库架构设计、新数据库产品的研究引入、数据库的规范制定与规范审核工具开发
- ✓ 对Java、C语言开发及源码研究比较感兴趣



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Hook技术基础简介

HOOK技术简介

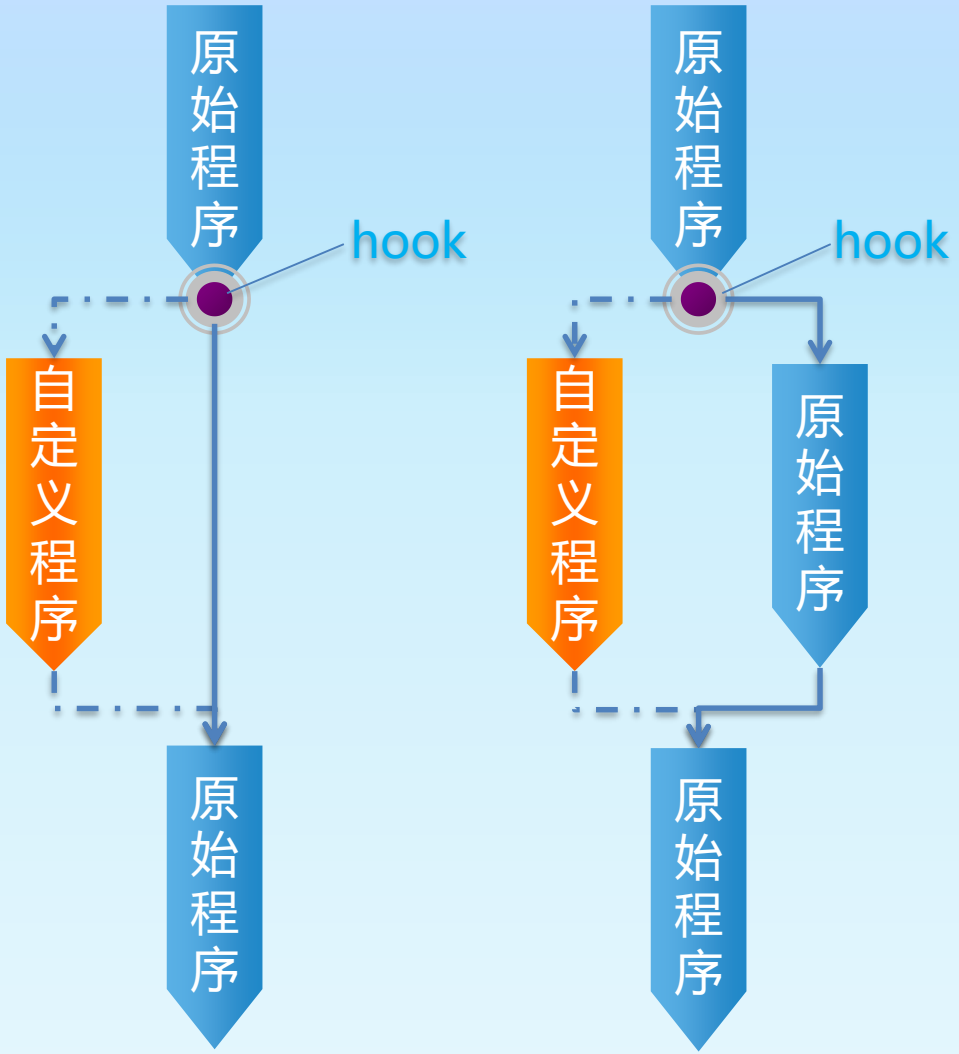
--基本概念

概念

HOOK机制，可以让用户有机会切入到PostgreSQL的内部运行机制中，进行中断、增加或修改原来的程序逻辑，从而实现一些用户自定义的功能。

四要素

- 定义hook
- 自定义程序
- 安装hook
- 卸载hook



HOOK技术简介
--代码样例

```
typedef void (*shmem_startup_hook_type) (void);
shmem_startup_hook_type shmem_startup_hook = NULL;

void createSharedMemoryAndSemaphores(bool
makePrivate, int port)
{
   .....
   if (shmem_startup_hook)
      shmem_startup_hook();
}
```

1

原始程序

```
static shmem_startup_hook_type prev_shmem_startup_hook
= NULL;

void _PG_init(void)
{
   .....
   prev_shmem_startup_hook = shmem_startup_hook;
   shmem_startup_hook = pgss_shmem_startup;
}
```

3

```
static void pgss_shmem_startup(void);

static void pgss_shmem_startup(void)
{
    if (prev_shmem_startup_hook)
        prev_shmem_startup_hook();

    //此处为自定义逻辑代码
    ......
}
```

2

自定义程序

```
void _PG_fini(void)
{
   shmem_startup_hook = prev_shmem_startup_hook;
}
```

4

原始程序

注：

PG内核程序

插件程序

其他辅助操作

- 参数配置(postgresql.conf) : shared_preload_libraries ='xxxx'
- 或者执行load命令 : postgres=# LOAD 'xxxx';
- 必要时重启实例

注意事项

- 自定义程序性能
- 是否存在内存泄漏
- 做好容量评估
- 有异常处理机制

HOOK技术简介
--auth_delay

```
typedef void (*ClientAuthentication_hook_type) (Port *, int);
ClientAuthentication_hook_type ClientAuthentication_hook =
NULL;

void ClientAuthentication(Port *port)
{ .....
  if (ClientAuthentication_hook)
    (*ClientAuthentication_hook) (port, status);
}
```

1

原始程序

```
static ClientAuthentication_hook_type
  original_client_auth_hook = NULL;

void _PG_init(void)
{
  .....
  original_client_auth_hook =
ClientAuthentication_hook;
  ClientAuthentication_hook = auth_delay_checks;
}
```

3

注：

PG内核程序

插件程序

自定义程序

```
static void
auth_delay_checks(Port *port, int status)
{
  if (original_client_auth_hook)
    original_client_auth_hook(port, status);

  if (status != STATUS_OK)
  {
    pg_usleep(1000L * auth_delay_milliseconds);
  }
}
```

2

原始程序

史上最简单的插件

HOOK技术简介

--常用HOOK

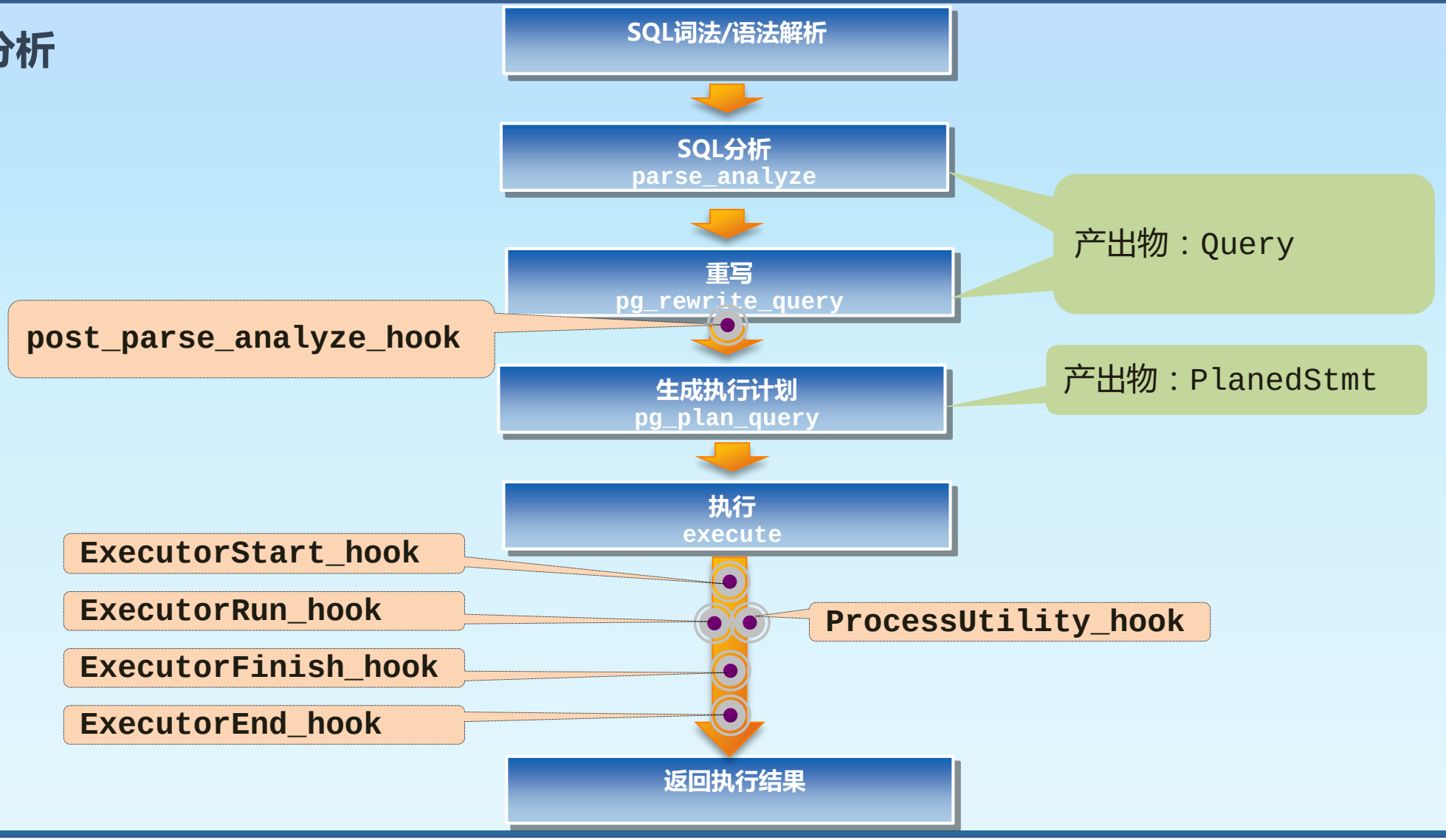
序号	HOOK名	源码位置
1	object_access_hook_type	src/backend/catalog/objectaccess.c
2	ExplainOneQuery_hook_type	src/backend/commands/explain.c
3	explain_get_index_name_hook_type	src/backend/commands/explain.c
4	check_password_hook_type	src/backend/commands/user.c
5	ExecutorStart_hook_type	src/backend/executor/execMain.c
6	ExecutorRun_hook_type	src/backend/executor/execMain.c
7	ExecutorFinish_hook_type	src/backend/executor/execMain.c
8	ExecutorEnd_hook_type	src/backend/executor/execMain.c
9	ExecutorCheckPerms_hook_type	src/backend/executor/execMain.c
10	ClientAuthentication_hook_type	src/backend/libpq/auth.c
11	set_rel_pathlist_hook_type	src/backend/optimizer/path/allpaths.c
12	join_search_hook_type	src/backend/optimizer/path/allpaths.c
13	set_join_pathlist_hook_type	src/backend/optimizer/path/joinpath.c
14	planner_hook_type	src/backend/optimizer/plan/planner.c
15	create_upper_paths_hook_type	src/backend/optimizer/plan/planner.c
16	get_relation_info_hook_type	src/backend/optimizer/util/plancat.c
17	post_parse_analyze_hook_type	src/backend/parser/analyze.c
18	row_security_policy_hook_type	src/backend/rewrite/rowsecurity.c
19	shmem_startup_hook_type	src/backend/storage/ipc/ipci.c
20	ProcessUtility_hook_type	src/backend/tcop/utility.c
21	get_relation_stats_hook_type	src/backend/utils/adt/selfuncs.c
22	get_index_stats_hook_type	src/backend/utils/adt/selfuncs.c
23	get_attavgwidth_hook_type	src/backend/utils/cache/lsyscache.c
24	emit_log_hook_type	src/backend/utils/error/elog.c
25	needs_fmgr_hook_type	src/backend/utils/fmgr/fmgr.c
26	fmgr_hook_type	src/backend/utils/fmgr/fmgr.c

注：基于V10.0版本统计

SQL执行过程分析

SQL执行过程分析

--执行过程分解

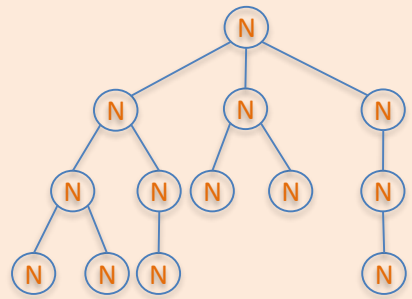


SQL执行过程分析

--parse tree

```
select id,col1 from t1 where id=1 order by id
```

```
{ QUERY
  :commandType 1
  :querySource 0
  :canSetTag true
  :utilityStmt <>
  :resultRelation 0
  :hasAggs false
  :hasWindowFuncs false
  :hasSubLinks false
  :hasDistinctOn false
  :hasRecursive false
  :hasModifyingCTE false
  :hasForUpdate false
  :hasRowSecurity false
  :cteList <>
  :rtable (
    {RTE
    :alias <>
    :eref
      {ALIAS
      :aliasname t1
      :colnames (""id"" ""col1"" ""col2"")
      }
    :rtekind 0
    :relid 123056
    :relkind r
    :tablesample <>
    :lateral false
    :inh true
    :inFromCl true
    :requiredPerms 2
    :checkAsUser 0
    :selectedCols (b 9 10)
    :insertedCols (b)
    :updatedCols (b)
    :securityQuals <>
    }
  )
  :jointree
    {FROMEXPR
    :fromlist (
      {RANGETBLREF
      :rtindex 1
      }
    )
    :quals
      {OPEXPR
      :opno 96
      :opfuncid 65
      :opresulttype 16
      :opretset false
      :opcollid 0
      :inputcollid 0
      :args (
        {VAR
        :varno 1
        :varattno 1
        :vartype 23
        :vartypmod -1
        :varcollid 0
        :varlevelsup 0
        :varnoold 1
        :varoattno 1
        :location 29
        }
        {CONST
        :consttype 23
        :consttypmod -1
        :constcollid 0
        :constlen 4
        :constbyval true
        :constisnull false
        :location 32
        :constvalue 4 [ 1 0 0 0 0 0 0 0 ]
        }
      )
      :location 31
      }
    }
  :targetList (
    {TARGETENTRY
    :expr
      {VAR
      :varno 1
      :varattno 1
      :vartype 23
      :vartypmod -1
      :varcollid 0
      :varlevelsup 0
      :varnoold 1
      :varoattno 1
      :location 7
      }
    :resno 1
    :resname id
    :ressortgroupref 1
    :resorigtbl 123056
    :resorigcol 1
    :resjunk false
    }
    {TARGETENTRY
    :expr
      {VAR
      :varno 1
      :varattno 2
      :vartype 23
      :vartypmod -1
      :varcollid 0
      :varlevelsup 0
      :varnoold 1
      :varoattno 2
      :location 10
      }
    :resno 2
    :resname col1
    :ressortgroupref 0
    :resorigtbl 123056
    :resorigcol 2
    :resjunk false
    }
  )
  :onConflict <>
  :returningList <>
  :groupClause <>
  :groupingSets <>
  :havingQual <>
  :windowClause <>
  :distinctClause <>
  :sortClause (
    {SORTGROUPCLAUSE
    :tleSortGroupRef 1
    :eqop 96
    :sortop 97
    :nulls_first false
    :hashable true
    }
  )
  :limitOffset <>
  :limitCount <>
  :rowMarks <>
  :setOperations <>
  :constraintDeps <>
  }
```

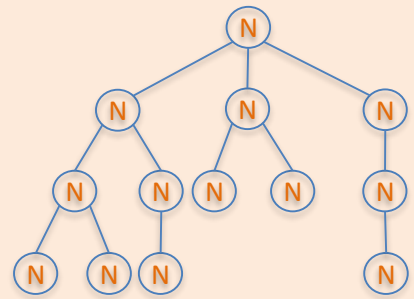


SQL执行过程分析

--plan

```
select id,col1 from t1 where id=1 order by id
```

```
{ PLANNEDSTMT
  :commandType 1
  :queryId 4258770327
  :hasReturning false
  :hasModifyingCTE false
  :canSetTag true
  :transientPlan false
  :dependsOnRole false
  :parallelModeNeeded false
  :planTree
    {SEQSCAN
    :startup_cost 0.00
    :total_cost 72755.05
    :plan_rows 1
    :plan_width 8
    :parallel_aware false
    :plan_node_id 0
    :targetlist (
      {TARGETENTRY
      :expr
        {VAR
        :varno 1
        :varattno 1
        :vartype 23
        :vartypmod -1
        :varcollid 0
        :varlevelsup 0
        :varnoold 1
        :varoattno 1
        :location 7
        }
      :resno 1
      :resname id
      :ressortgroupref 1
      :resorigtbl 123056
      :resorigcol 1
      :resjunk false
      }
      {TARGETENTRY
      :expr
        {VAR
        :varno 1
        :varattno 2
        :vartype 23
        :vartypmod -1
        :varcollid 0
        :varlevelsup 0
        :varnoold 1
        :varoattno 2
        :location 10
        }
      :resno 2
      :resname col1
      :ressortgroupref 0
      :resorigtbl 123056
      :resorigcol 2
      :resjunk false
      }
    )
    :qual (
      {OPEXPR
      :opno 96
      :opfuncid 65
      :opresulttype 16
      :opretset false
      :opcollid 0
      :inputcollid 0
      :args (
        {VAR
        :varno 1
        :varattno 1
        :vartype 23
        :vartypmod -1
        :varcollid 0
        :varlevelsup 0
        :varnoold 1
        :varoattno 1
        :location 29
        }
        {CONST
        :consttype 23
        :consttypmod -1
        :constcollid 0
        :constlen 4
        :constbyval true
        :constisnull false
        :location 32
        :constvalue 4 [ 1 0 0 0 0 0 0 0 ]
        }
      )
      :location 31
      }
    )
    :lefttree <>
    :righttree <>
    :initPlan <>
    :extParam (b)
    :allParam (b)
    :scanrelid 1
    }
  :rtable (
    {RTE
    :alias <>
    :eref
      {ALIAS
      :aliasname t1
      :colnames (""id"" ""col1"" ""col2"")
      }
    :rtekind 0
    :relid 123056
    :relkind r
    :tablesample <>
    :lateral false
    :inh false
    :inFromCl true
    :requiredPerms 2
    :checkAsUser 0
    :selectedCols (b 9 10)
    :insertedCols (b)
    :updatedCols (b)
    :securityQuals <>
    }
  )
  :resultRelations <>
  :utilityStmt <>
  :subplans <>
  :rewindPlanIDs (b)
  :rowMarks <>
  :relationOids (o 123056)
  :invalItems <>
  :nParamExec 0
  }
```



SQL规范审核插件介绍

SQL规范审核插件

--定义规范项

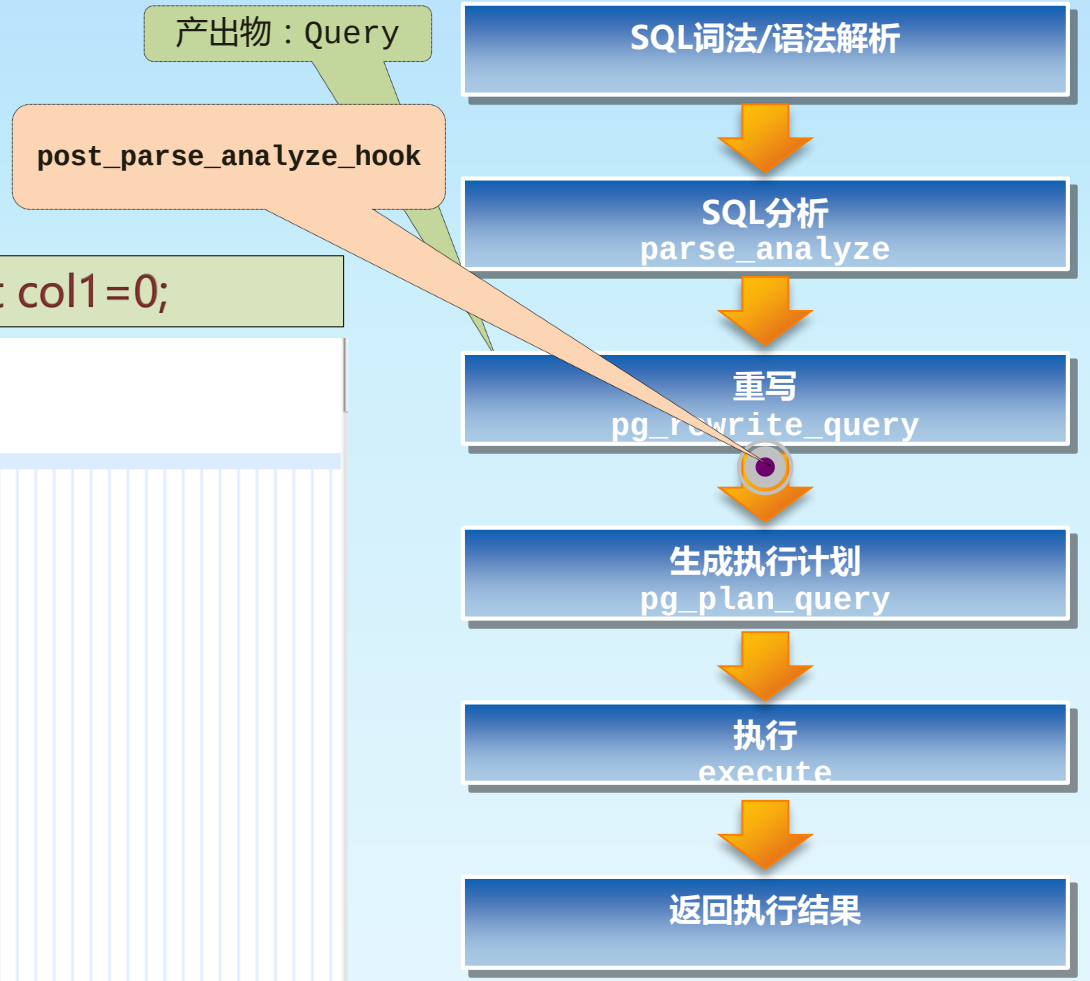
RULE_NO	RULE_CONTENT	RULE_HINT	STATUS	LEVEL	EXTRA_INFO
PG-DML-001	UPDATE禁止出现ORDER BY子句	请取消UPDATE语句中的ORDER BY子句	ENABLED	WARNING	
PG-DML-002	UPDATE必须出现WHERE子句	请增加WHERE子句	ENABLED	WARNING	
PG-DML-003	可能UPDATE全表数据	请检查WHERE条件，是否没有做行过滤	ENABLED	WARNING	
PG-DML-004	DELETE必须出现WHERE子句	请增加WHERE子句	ENABLED	WARNING	
PG-DML-005	DELETE禁止出现ORDER BY子句	请取消DELETE语句中的ORDER BY子句	ENABLED	WARNING	
PG-DML-006	可能DELETE全表数据	请检查WHERE条件，是否没有做行过滤	ENABLED	WARNING	
PG-DML-007	禁止嵌套SELECT子句	请不要在SELECT查询的字段中再嵌套SELECT子查询	ENABLED	WARNING	
PG-DCL-001	用户名不符合规范	请使用规范的用户名	ENABLED	ERROR	postgres,dbmgr,dbmon,dbmonopr,deployop,edsop,edsqry,repmgr,repuser,pub_test,dtcoll,dmlbak,devsup*,*data,*opr,*tjs,*ktl,*sqp,*etl
PG-DCL-002	r_*_qry角色授权违规	请不要将insert/update/delete/execute或all权限授权给QRY角色	ENABLED	ERROR	`select,usage`
PG-DCL-003	devsup用户授权违规	只能将r_*_dev_qry权限授权给devsup用户	ENABLED	ERROR	r_*_dev_qry
PG-DCL-004	edsqry用户授权违规	只能将r_*_qry权限授权给edsqry用户	ENABLED	ERROR	r_*_qry
PG-DDL-001	DATE类型字段命名违规	Date 类型的字段, 需要以"date_"作为前缀或者"_date"做为后缀	ENABLED	WARNING	
PG-DDL-002	索引名不符合规范	索引命名规则为：IDX_表名称_字段名	ENABLED	WARNING	

SQL规范审核插件

--规范审核案例1

RULE_NO	RULE_CONTENT	RULE_HINT	STATUS	LEVEL	EXTRA_INFO
PG-DML-002	UPDATE必须出现WHERE子句	请增加WHERE子句	ENABLED	WARNING	

- 利用post_parse_analyze_hook这个hook
- 对Query查询树进行分析
- 判断where条件Node是否为空



update t1 set col1=0 where id=1;

```
40      :jointree
41         {FROMEXPR
42         :fromlist (
43            {RANGETBLREF
44            :rtindex 1
45            }
46         )
47         :quals
48            {OPEXPR
49            :opno 96
50            :opfuncid 65
51            :opresulttype 16
52            :opretset false
53            :opcollid 0
54            :inputcollid 0
55            :args (
56               {VAR
57               :varno 1
58               :varattno 1
59               :vartype 23
60               :vartypmod -1
61               :varcollid 0
62               :varlevelsup 0
63               :varnoold 1
64               :varoattno 1
65               :location 27
66               }
67               {CONST
68               :consttype 23
69               :consttypmod -1
70               :constcollid 0
71               :constlen 4
72               :constbyval true
73               :constisnull false
74               :location 30
75               :constvalue 4 [ 1 0 0 0 0 0 0 0
76               ]
77            )
78            :location 29
79            }
80         }
81      :targetList (
82         {TARGETENTRY
83         :expr
```

update t1 set col1=0;

```
40      :jointree
41         {FROMEXPR
42         :fromlist (
43            {RANGETBLREF
44            :rtindex 1
45            }
46         )
47         :quals <>
48         }
49      :targetList (
50         {TARGETENTRY
51         :expr
```

SQL规范审核插件

--规范审核案例2

RULE_NO	RULE_CONTENT	RULE_HINT	STATUS	LEVEL	EXTRA_INFO
PG-DML-003	可能UPDATE全表数据	请检查WHERE条件，是否没有做行过滤	ENABLED	WARNING	

- 利用ExecutorStart_hook这个hook
- 对PlanedStmt树进行分析
- 判断(scan)node->plan.qual == NULL ?

update t1 set col1=0 where id=1;

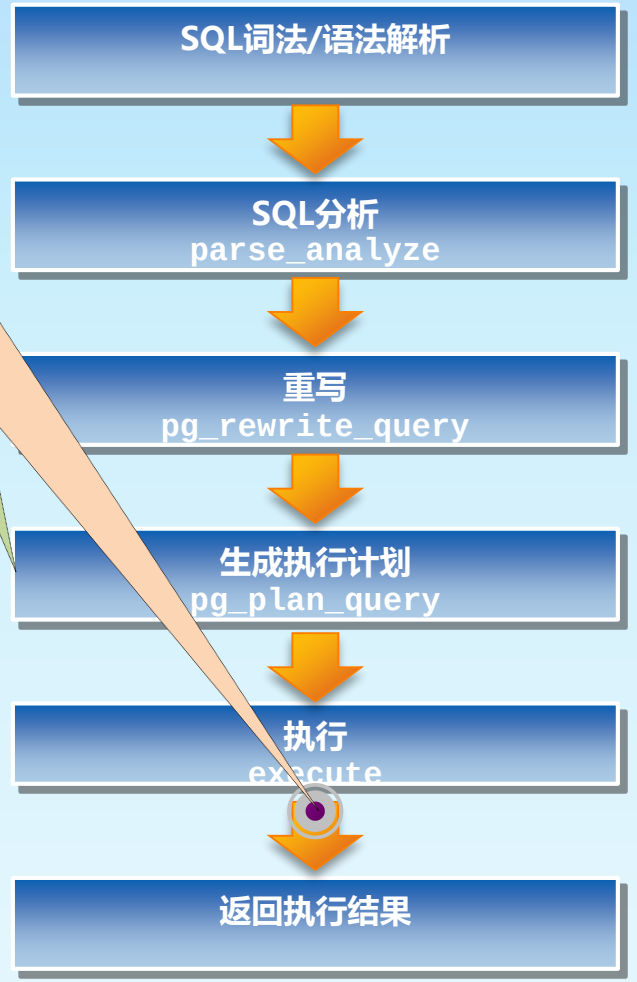
update t1 set col1=0 where 1=1;
update t1 set col1=0 where true;

```
373             :resjunk true
374             }
375         )
376         :qual (
377             {OPEXPR
378             :opno 96
379             :opfuncid 65
380             :opresulttype 16
381             :opretset false
382             :opcollid 0
383             :inputcollid 0
384             :args (
385                 {VAR
386                 :varno 1
387                 :varattno 1
388                 :vartype 23
389                 :vartypmod -1
390                 :varcollid 0
391                 :varlevelsup 0
392                 :varnoold 1
393                 :varoattno 1
394                 :location 27
395                 }
396                 {CONST
397                 :consttype 23
398                 :consttypmod -1
399                 :constcollid 0
400                 :constlen 4
401                 :constbyval true
402                 :constisnull false
403                 :location 30
404                 :constvalue 4 [ 1 0 0 0 0 0 0 0 ]
405                 }
406             )
407             :location 29
408             }
409         )
410         :lefttree <>
411         :righttree <>
```

```
372             :resjunk true
373             }
374         )
375         :qual <>
376         :lefttree <>
377         :righttree <>
```

产出物： PlanedStmt

ExecutorStart_hook



SQL规范审核插件

--规范审核案例3

RULE_NO	RULE_CONTENT	RULE_HINT	STATUS	LEVEL	EXTRA_INFO
PG-DCL-002	r_*_qry角色授权违规	请不要将insert/update/delete/execute或all权限授权给QRY角色	ENABLED	ERROR	select,usage

```
grant insert,update on t1 to r_demodata_qry;
```

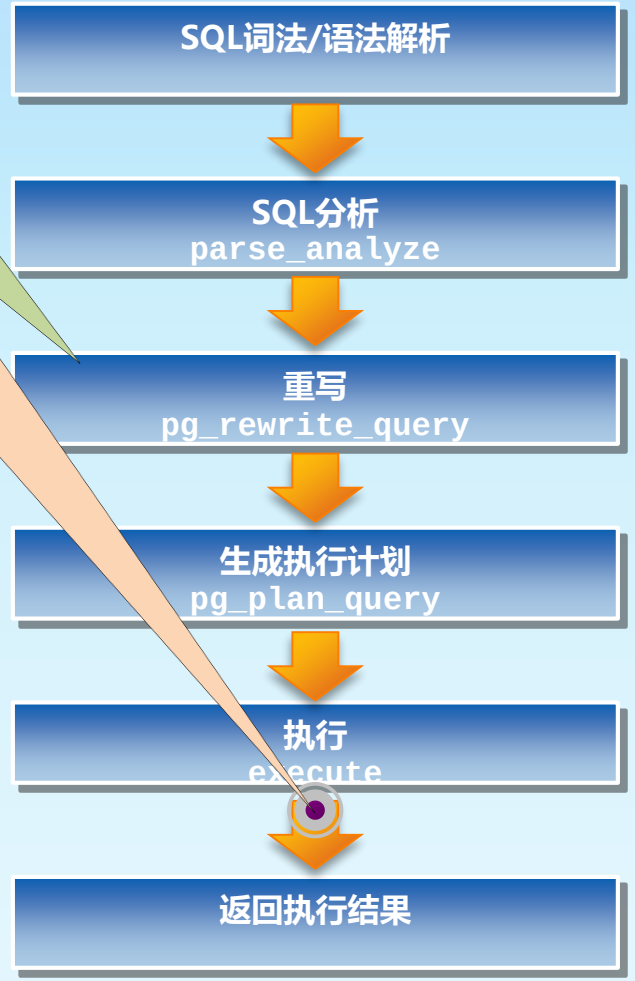
- 利用ProcessUtility_hook这个hook
- 对GrantStmt进行分析
- 对(GrantStmt)stmt->grantee-> rolename

  和(GrantStmt)stmt->privilege->priv_name的内容进行判断

```
foreach(cell, stmt->grantees)
{
        RoleSpec *grantee = (RoleSpec *) lfirst(cell);
        if (is_begin_with(grantee->rolename, "r_") == 1
                        && is_end_with(grantee->rolename, "_qry") == 1)
                existsQRYrule = true;
}

if (!existsQRYrule)
        return;

if (stmt->privileges == NIL) {
        flag = true;
} else {
        foreach(cell, stmt->privileges)
        {
                AccessPriv *privnode = (AccessPriv *) lfirst(cell);

                flag1 = false;
                foreach(cell1,privilegeList)
                {
                        char *priv = (char *) lfirst(cell1);

                        if (strcmp(privnode->priv_name, priv) != 0) {
                                flag1 = true;
                                break;
                        }
                }
                if (flag1) {
                        flag = true;
                        break;
                }
        }
}
```

产出物： GrantStmt

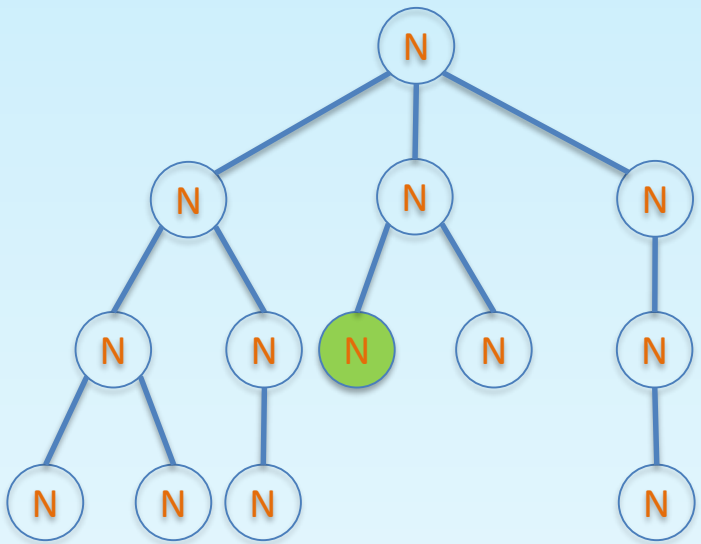
ProcessUtility_hook



SQL规范审核插件

--查询树遍历

- 递归遍历树中的每个Node
- 逐一判断每个Node的NodeTag
- 根据审核规则判断对应Node的内容是否符合某种条件




```
plan:
  {PLANNEDSTMT
  :commandType 2
  :queryId 2148518803
  :hasReturning false
 . . . . .  . . . . .  . . . . .
  :planTree
    {MODIFYTABLE
    :startup_cost 0.00
    :total_cost 72744.75
 . . . . .  . . . . .  . . . . .
    :resultRelations (i 1)
    :resultRelIndex 0
    :plans (
      {SEQSCAN
      :startup_cost 0.00
      :total_cost 72744.75
      :plan_rows 1575
 . . . . .  . . . . .  . . . . .
      :resorigcol 0
        :resjunk true
        }
      )
      :qual <>
      :lefttree <>
      :righttree <>
      :initPlan <>
      :extParam (b 0)
      :allParam (b 0)
      :scanrelid 1
      }
    )
```

```
void
outNode(StringInfo str, const void *obj)
{
    if (obj == NULL)
        appendStringInfoString(str, "<>");
    else if (IsA(obj, List) ||IsA(obj, IntList) || IsA(obj,
OidList))
        _outList(str, obj);
    else if (IsA(obj, Integer) || IsA(obj, Float) ||
IsA(obj, String) || IsA(obj, BitString))
    {   _outValue(str, obj);  }
    else    {
        appendStringInfoChar(str, '{');
        switch (nodeTag(obj))
        {
            case T_PlannedStmt:
                _outPlannedStmt(str, obj);
                break;
            case T_Plan:
                _outPlan(str, obj);
                break;
            . . . . .  . . . . .  . . . . .  . . . . .
            case T_XmlSerialize:
                _outXmlSerialize(str, obj);
                break;
            case T_ForeignKeyCacheInfo:
                _outForeignKeyCacheInfo(str, obj);
                break;
            default:
                break;
        }
        appendStringInfoChar(str, '}');
    }
```

源码位置：src/backend/nodes/outfuncs.c

```
bool traversalNode(const char *ruleNo, const void *obj)
{
    if (obj == NULL) return false;
    else if (IsA(obj, List) || IsA(obj, IntList) || IsA(obj,
OidList))
        return traversalNode_List(ruleNo, obj);
    else {
        switch (nodeTag(obj)) {
        case T_Query:
            return traversalNode_Query(ruleNo, obj);
            break;
        case T_SubLink:
            return traversalNode_SubLink(ruleNo, obj);
            break;
 . . . . .  . . . . .  . . . . .  . . . . .
        case T_SeqScan:
            return traversalNode_SeqScan(ruleNo, obj);
            break;
        default:
            break;
        }
    }
    return false;
}
```

```
static bool traversalNode_SeqScan(const char *ruleNo,
const SeqScan *node) {
    if (strcmp(ruleNo, "PG-DML-003") == 0
            || strcmp(ruleNo, "PG-DML-006") == 0) {
        if (node->plan.qual == NULL) {
            return true;
        }
    }
    return false;
}
```

SQL规范审核插件

--两张辅助表

1 **pg_sql_check_rule**
规则表

```
postgres=# select * from pg_sql_check_rule;
  rule_no   |        rule_content         |                    rule_hint                    | status  |  level
------------+-----------------------------+-------------------------------------------------+---------+---------
 PG-DML-001 | UPDATE禁止出现ORDER BY子句  | 请取消UPDATE语句中的ORDER BY子句                | ENABLED | WARNING
 PG-DML-002 | UPDATE必须出现WHERE子句     | 请增加WHERE子句                                 | ENABLED | WARNING
 PG-DML-003 | 可能UPDATE全表数据          | 请检查WHERE条件，是否没有做行过滤               | ENABLED | WARNING
 PG-DML-004 | DELETE必须出现WHERE子句     | 请增加WHERE子句                                 | ENABLED | WARNING
 PG-DML-005 | DELETE禁止出现ORDER BY子句  | 请取消DELETE语句中的ORDER BY子句                | ENABLED | WARNING
 PG-DML-006 | 可能DELETE全表数据          | 请检查WHERE条件，是否没有做行过滤               | ENABLED | WARNING
 PG-DML-007 | 禁止嵌套SELECT子句          | 请不要在SELECT查询的字段中再嵌套SELECT子查询    | ENABLED | WARNING
```

2 **pg_sql_check_log**
审核违规日志表

```
postgres=# select * from pg_sql_check_log;
         check_date          |  rule_no   |        rule_content         |                    rule_hint                    |  level  | datid | datname  | usesysid | usename |
application_name |  queryid   |                                query
--------------------------+------------+-----------------------------+-------------------------------------------------+---------+-------+----------+----------+---------+-
-----------------+------------+-----------------------------------------------------------------------------------------------------------------------------------------------
 2017-06-16 10:33:39.614251+08 | PG-DML-006 | 可能DELETE全表数据          | 请检查WHERE条件，是否没有做行过滤               | WARNING | 13269 | postgres |   123069 | demo    |
psql             | 4068198720 | delete from t2 where true;
 2017-06-16 10:33:46.424295+08 | PG-DML-003 | 可能UPDATE全表数据          | 请检查WHERE条件，是否没有做行过滤               | WARNING | 13269 | postgres |   123069 | demo    |
psql             |  390658016 | update t2 set col1=1 where 1=1;
 2017-06-16 10:35:49.479283+08 | PG-DML-001 | UPDATE禁止出现ORDER BY子句  | 请取消UPDATE语句中的ORDER BY子句                | WARNING | 13269 | postgres |   123069 | demo    |
psql             | 3247814783 | update t2 set col1=1 where id in (select id from t1 where col1=1 order by col2);
 2017-06-16 10:35:49.490815+08 | PG-DML-002 | UPDATE必须出现WHERE子句     | 请增加WHERE子句                                 | WARNING | 13269 | postgres |   123069 | demo    |
psql             |  165823437 | update t2 set col1=1;
 2017-06-16 10:35:49.492552+08 | PG-DML-003 | 可能UPDATE全表数据          | 请检查WHERE条件，是否没有做行过滤               | WARNING | 13269 | postgres |   123069 | demo    |
psql             |  165823437 | update t2 set col1=1;
 2017-06-16 10:35:49.496084+08 | PG-DML-003 | 可能UPDATE全表数据          | 请检查WHERE条件，是否没有做行过滤               | WARNING | 13269 | postgres |   123069 | demo    |
psql             |  390658016 | update t2 set col1=1 where 1=1;
 2017-06-16 10:35:49.50081+08  | PG-DML-003 | 可能UPDATE全表数据          | 请检查WHERE条件，是否没有做行过滤               | WARNING | 13269 | postgres |   123069 | demo    |
psql             |  257380939 | update t2 set col1=1 where true;
 2017-06-16 10:35:49.504195+08 | PG-DML-005 | DELETE禁止出现ORDER BY子句  | 请取消DELETE语句中的ORDER BY子句                | WARNING | 13269 | postgres |   123069 | demo    |
psql             | 1528877246 | delete from t2 where id in (select id from t1 where col1=1 order by col2);
 2017-06-16 10:35:49.511674+08 | PG-DML-006 | 可能DELETE全表数据          | 请检查WHERE条件，是否没有做行过滤               | WARNING | 13269 | postgres |   123069 | demo    |
psql             |  307860557 | delete from t2 where 1=1;
 2017-06-16 10:35:49.5157+08   | PG-DML-006 | 可能DELETE全表数据          | 请检查WHERE条件，是否没有做行过滤               | WARNING | 13269 | postgres |   123069 | demo    |
psql             | 4068198720 | delete from t2 where true;
 2017-06-16 10:35:49.517257+08 | PG-DML-007 | 禁止嵌套SELECT子句          | 请不要在SELECT查询的字段中再嵌套SELECT子查询    | WARNING | 13269 | postgres |   123069 | demo    |
psql             | 1999229256 | select id,(select col1 from t1 where t1.id=t2.id) from t2;
```

SQL规范审核插件

--三个辅助存储过程

1. **Setsqlcheckrulestatus()**
   设置某规则是否审核

```
postgres=# select setsqlcheckrulestatus('PG-DML-001','DISABLED');
 setsqlcheckrulestatus
-----------------------
 DISABLED
(1 row)
```

2. **Setsqlcheckrulelevel()**
   设置某规则警告级别

```
postgres=# select setsqlcheckrulelevel('PG-DML-001','WARNING');
 setsqlcheckrulelevel
----------------------
 WARNING
(1 row)
```

3. **Clearsqlchecklog()**
   清理审核违规日志表

```
postgres=# select clearsqlchecklog();
        clearsqlchecklog
-------------------------------
 TABLE pg_sql_check TRUNCATED
(1 row)
```

SQL规范审核插件

--最终效果

```
postgres=# select id,(select col1 from t1 where t1.id=t2.id) from t2;
WARNING:  (PG-DML-007)禁止嵌套select子句
HINT:  请不要在select查询的字段中再嵌套select子查询
```

```
postgres=# update t1 set col1=0 where 1=1;
WARNING:  (PG-DML-003)可能update全表数据
HINT:  请检查where条件，是否没有做行过滤
UPDATE 1000
```

```
postgres=# update t1 set col1=0 where true;
WARNING:  (PG-DML-003)可能update全表数据
HINT:  请检查where条件，是否没有做行过滤
UPDATE 1000
```

```
postgres=# update t1 set col1=0;
WARNING:  (PG-DML-002)update必须出现where子句
HINT:  请增加where子句
WARNING:  (PG-DML-003)可能update全表数据
HINT:  请检查where条件，是否没有做行过滤
UPDATE 1000
```

```
postgres=# delete from t2 ;
WARNING:  (PG-DML-004)delete必须出现where子句
HINT:  请增加where子句
WARNING:  (PG-DML-006)可能delete全表数据
HINT:  请检查where条件，是否没有做行过滤
DELETE 999
```

```
postgres=# delete from t2 where id in (select id from t1 where col1=1 order by col2);
WARNING:  (PG-DML-005)DELETE禁止出现ORDER BY子句
HINT:  请取消delete语句中的order by子句
```

```
postgres=# update t2 set col1=1 where id in (select id from t1 where col1=0 order by col2);
WARNING:  (PG-DML-001)update禁止出现order by子句
HINT:  请取消update语句中的order by子句
UPDATE 1000
```

SQL规范审核插件

--特点总结

- **轻量级**

  使用原生的SQL解析器，不需要额外对SQL语句进行分析解析，所以对数据库内核性能影响极小

- **只读、安全**

  对内核没有任何修改操作，只是读取SQL解析后的查询树等中间产物，所以安全可靠

- **兼容性强**

  目前兼容的版本包括：

  - ✓ PG 9.4.x / 9.5.x / 9.6.x / 10.0
  - ✓ EDB 9.4.x / 9.5.x / 9.6.x

- **灵活可控**

  可以随时启用或禁用某些审核项，并且可以灵活控制违规级别（警告或拦截）

4 未来与展望

未来

- 增加更多的SQL规范审核项
- 增加SQL智能优化建议的功能
- 开发出更多实用的插件

Thanks!