

Когда выбирается план с большим COST: 1. Query transformations

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ПАО «Промсвязьбанк»

<http://orasql.org> [@xtner](#)

```

-- parent table with 100 rows only:
create table xt_nums(id int primary key);
insert into xt_nums select level from dual connect by level<=100;

-- fact table:
create table xt_big_tab as
  with dates as (select sysdate-365+numtodsinterval(level,'minute') dt
                 from dual
                 connect by level<=370*24*60)
  select id as nums_id, dt, id || dt as padding_str from xt_nums,dates;

alter table xt_big_tab modify nums_id not null;

-- foreign key to XT_NUMS(ID):
alter table xt_big_tab
  add constraint fk_big_table
  foreign key (nums_id)
  references xt_nums(id);

-- first column in the index is NUMS_ID - ID from XT_NUMS
create index ix_big_tab on xt_big_tab(nums_id, dt);
begin
  dbms_stats.gather_table_stats('','XT_NUMS');
  dbms_stats.gather_table_stats('','XT_BIG_TAB');
end;
/

```

Без хинтов

```
select t.*
from xt_big_tab t, xt_nums n
where
    mod(n.id,10) = 0
and t.nums_id=n.id
and t.dt between sysdate-0.01 and sysdate
```

Plan Table

```
=====
```

Id	Operation	Name	Rows	Cost
0	SELECT STATEMENT			105
* 1	FILTER			
2	TABLE ACCESS BY INDEX ROWID	XT_BIG_TAB	16	105
* 3	INDEX SKIP SCAN	IX_BIG_TAB	7	102

```
-----
```

Predicate Information (identified by operation id):

```
-----
```

- 1 - filter(SYSDATE@!>=SYSDATE@!-.01)
- 3 - access("T"."DT">=SYSDATE@!-.01 AND "T"."DT"<=SYSDATE@!)
 - filter((MOD("T"."NUMS_ID",10)=0 AND "T"."DT">=SYSDATE@!-.01 AND "T"."DT"<=SYSDATE@!))

С хинтом /*+ NO_ELIMINATE_JOIN */

```
select /*+ NO_ELIMINATE_JOIN(n) */ t.*
from xt_big_tab t, xt_nums n
where
    mod(n.id,10) = 0
and t.nums_id=n.id
and t.dt between sysdate-0.01 and sysdate
```

Plan Table

```
=====
```

Id	Operation	Name	Rows	Cost
0	SELECT STATEMENT			10
* 1	FILTER			
2	NESTED LOOPS		16	10
3	NESTED LOOPS		16	10
* 4	INDEX FULL SCAN	SYS_C0012440	1	1
* 5	INDEX RANGE SCAN	IX_BIG_TAB	16	2
6	TABLE ACCESS BY INDEX ROWID	XT_BIG_TAB	16	9

```
-----
```

Predicate Information (identified by operation id):

```
-----
```

- 1 - filter(SYSDATE@!>=SYSDATE@!-.01)
- 4 - filter(MOD("N"."ID",10)=0)
- 5 - access("T"."NUMS_ID"="N"."ID" AND "T"."DT">=SYSDATE@!-.01 AND "T"."DT"<=SYSDATE@!)

Трассировка 10053

JE: Considering Join Elimination on query block SEL\$1 (#0)

Join Elimination (JE)

SQL:***** UNPARSED QUERY IS *****

```
SELECT "T"."NUMS_ID" "NUMS_ID", "T"."DT" "DT", "T"."PADDING_STR" "PADDING_STR"
FROM "OD"."XT_BIG_TAB" "T", "OD"."XT_NUMS" "N"
WHERE "T"."NUMS_ID"="N"."ID"
AND "T"."DT">=SYSDATE@!-0.01
AND "T"."DT"<=SYSDATE@!
```

JE: cfro: XT_BIG_TAB objn:21256116 col#:1 dfro:XT_NUMS dcol#:1

JE: cfro: XT_BIG_TAB objn:21256116 col#:1 dfro:XT_NUMS dcol#:1

Query block (ffffffffff7df8bf20) before join elimination:

SQL:***** UNPARSED QUERY IS *****

```
SELECT "T"."NUMS_ID" "NUMS_ID", "T"."DT" "DT", "T"."PADDING_STR" "PADDING_STR"
FROM "OD"."XT_BIG_TAB" "T", "OD"."XT_NUMS" "N"
WHERE "T"."NUMS_ID"="N"."ID"
AND "T"."DT">=SYSDATE@!-0.01
AND "T"."DT"<=SYSDATE@!
```

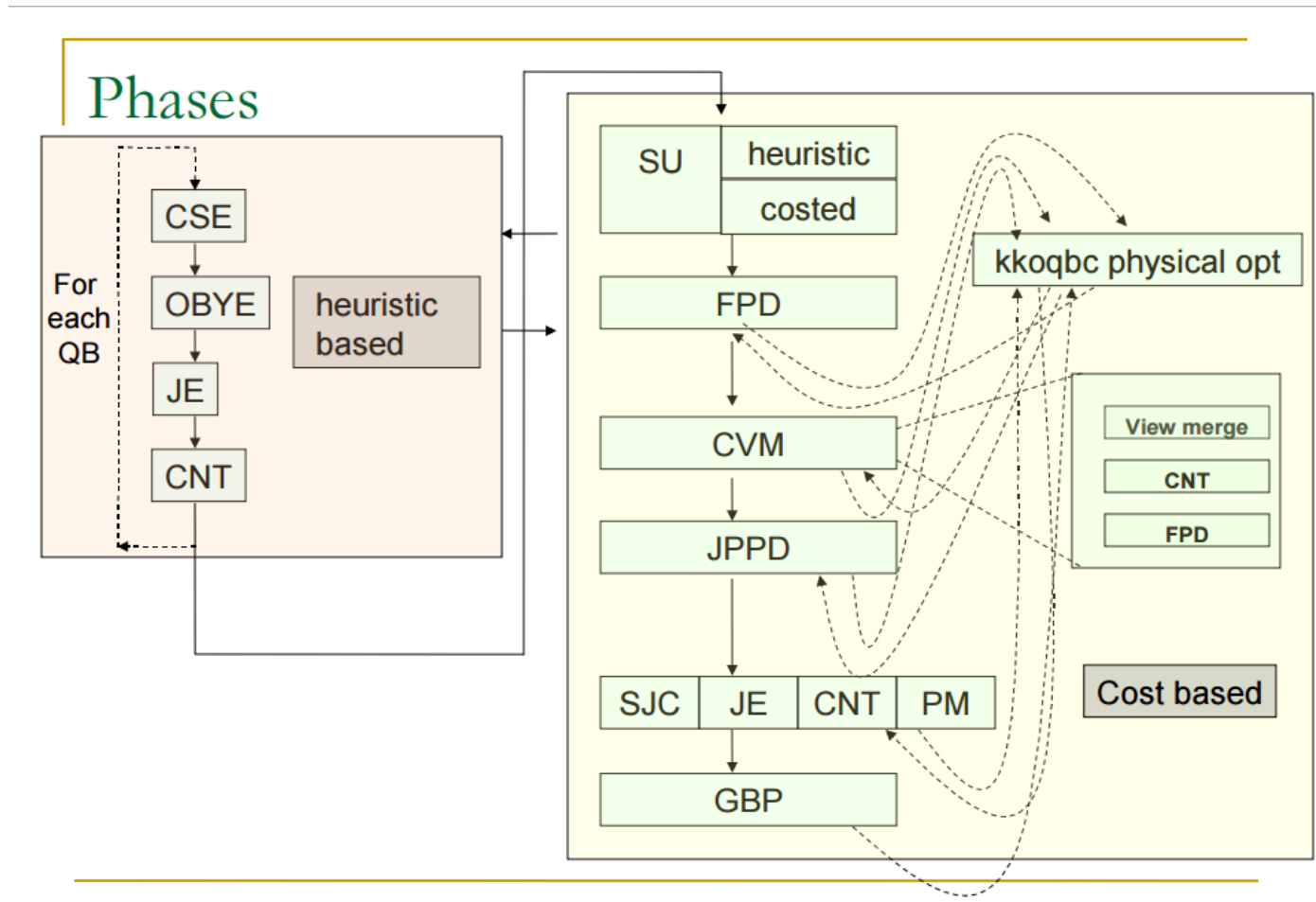
JE: eliminate table: XT_NUMS (N)

Registered qb: SEL\$A60C35B6 0x7df8bf20 (JOIN REMOVED FROM QUERY BLOCK SEL\$1; SEL\$1; "N"@SEL\$1")

SQL:***** UNPARSED QUERY IS *****

```
SELECT "T"."NUMS_ID" "NUMS_ID", "T"."DT" "DT", "T"."PADDING_STR" "PADDING_STR"
FROM "OD"."XT_BIG_TAB" "T"
WHERE "T"."DT">=SYSDATE@!-0.01
AND "T"."DT"<=SYSDATE@!
```

Query block SEL\$A60C35B6 (#0) simplified



TE – Table Expansion, JF – Join Factorization, DP – Distinct placement...

Tanel Poder - “[Understanding what a hint affects using the V\\$SQL_FEATURE views](#)”

```
SQL> @hinh2
Path mask[.*]: TRANSFORMATION
Hint mask[.*]:
Min version:
```

PATH	HINT_CLASS	HINT_NAME	VERSION	VER_OUTL
ALL -> COMPILATION -> TRANSFORMATION	ANTIJOIN	ANTIJOIN	9.0.0	
ALL -> COMPILATION -> TRANSFORMATION	CONNECT_BY_CB_WHR_ONLY	CONNECT_BY_CB_WHR_ONLY	10.2.0.5	10.2.0.5
ALL -> COMPILATION -> TRANSFORMATION	CONNECT_BY_CB_WHR_ONLY	NO_CONNECT_BY_CB_WHR_ONLY	10.2.0.5	10.2.0.5
ALL -> COMPILATION -> TRANSFORMATION	CONNECT_BY_COST_BASED	CONNECT_BY_COST_BASED	10.2.0.2	10.2.0.2
ALL -> COMPILATION -> TRANSFORMATION	CONNECT_BY_COST_BASED	NO_CONNECT_BY_COST_BASED	10.2.0.2	10.2.0.2
ALL -> COMPILATION -> TRANSFORMATION	ELIM_GROUPBY	ELIM_GROUPBY	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION	ELIM_GROUPBY	NO_ELIM_GROUPBY	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION	EXPAND_GSET_TO_UNION	EXPAND_GSET_TO_UNION	9.2.0	10.1.0
ALL -> COMPILATION -> TRANSFORMATION	EXPAND_GSET_TO_UNION	NO_EXPAND_GSET_TO_UNION	9.2.0	10.1.0
ALL -> COMPILATION -> TRANSFORMATION	GBY_CONC_ROLLUP	GBY_CONC_ROLLUP	9.0.0	
ALL -> COMPILATION -> TRANSFORMATION	INLINE	INLINE	9.0.0	
ALL -> COMPILATION -> TRANSFORMATION	INLINE	MATERIALIZE	9.0.0	
ALL -> COMPILATION -> TRANSFORMATION	LIKE_EXPAND	LIKE_EXPAND	8.1.7	
ALL -> COMPILATION -> TRANSFORMATION	MODEL_COMPILE_SUBQUERY	MODEL_COMPILE_SUBQUERY	10.2.0.1	
ALL -> COMPILATION -> TRANSFORMATION	MODEL_DONTVERIFY_UNIQUENESS	MODEL_DONTVERIFY_UNIQUENESS	10.1.0.3	
ALL -> COMPILATION -> TRANSFORMATION	MODEL_DYNAMIC_SUBQUERY	MODEL_DYNAMIC_SUBQUERY	10.2.0.1	
ALL -> COMPILATION -> TRANSFORMATION	MODEL_MIN_ANALYSIS	MODEL_MIN_ANALYSIS	10.1.0.3	
ALL -> COMPILATION -> TRANSFORMATION	MODEL_PUSH_REF	MODEL_PUSH_REF	10.1.0.3	
ALL -> COMPILATION -> TRANSFORMATION	MV_MERGE	MV_MERGE	9.0.0	
ALL -> COMPILATION -> TRANSFORMATION	NO_ORDER_ROLLUPS	NO_ORDER_ROLLUPS	8.0.0	
ALL -> COMPILATION -> TRANSFORMATION	NO_PRUNE_GSETS	NO_PRUNE_GSETS	9.0.0	
ALL -> COMPILATION -> TRANSFORMATION	NO_QUERY_TRANSFORMATION	NO_QUERY_TRANSFORMATION	10.1.0.3	
ALL -> COMPILATION -> TRANSFORMATION	OPAQUE_TRANSFORM	OPAQUE_TRANSFORM	10.1.0.3	
ALL -> COMPILATION -> TRANSFORMATION	OPAQUE_XCANONICAL	OPAQUE_XCANONICAL	10.1.0.3	
ALL -> COMPILATION -> TRANSFORMATION	PRECOMPUTE_SUBQUERY	PRECOMPUTE_SUBQUERY	10.2.0.1	
ALL -> COMPILATION -> TRANSFORMATION	PUSH_SUBQ	NO_PUSH_SUBQ	9.2.0	10.2.0.5
ALL -> COMPILATION -> TRANSFORMATION	PUSH_SUBQ	PUSH_SUBQ	8.1.0	10.2.0.5
ALL -> COMPILATION -> TRANSFORMATION	REWRITE	NO_REWRITE	8.1.5	8.1.7
ALL -> COMPILATION -> TRANSFORMATION	REWRITE	REWRITE	8.1.5	8.1.7
ALL -> COMPILATION -> TRANSFORMATION	REWRITE	REWRITE_OR_ERROR	10.1.0.3	
ALL -> COMPILATION -> TRANSFORMATION	SEMIJOIN	NO_SEMIJOIN	9.0.0	
ALL -> COMPILATION -> TRANSFORMATION	SEMIJOIN	SEMIJOIN	9.0.0	
ALL -> COMPILATION -> TRANSFORMATION	TRANSFORM_DISTINCT_AGG	NO_TRANSFORM_DISTINCT_AGG	11.2.0.1	11.2.0.1
ALL -> COMPILATION -> TRANSFORMATION	TRANSFORM_DISTINCT_AGG	TRANSFORM_DISTINCT_AGG	11.2.0.1	11.2.0.1
ALL -> COMPILATION -> TRANSFORMATION	USE_TTT_FOR_GSETS	USE_TTT_FOR_GSETS	9.0.0	

CBQT

PATH	HINT_CLASS	HINT_NAME	VERSION	VER_OUTL
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> CVM	MERGE	MERGE	8.1.0	10.1.0
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> CVM	MERGE	NO_MERGE	8.0.0	10.1.0
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> DIST_PLCMT	PLACE_DISTINCT	NO_PLACE_DISTINCT	11.2.0.1	11.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> DIST_PLCMT	PLACE_DISTINCT	PLACE_DISTINCT	11.2.0.1	11.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> JOINFAC	FACTORIZE_JOIN	FACTORIZE_JOIN	11.2.0.1	11.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> JOINFAC	FACTORIZE_JOIN	NO_FACTORIZE_JOIN	11.2.0.1	11.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> PLACE_GROUP_BY	PLACE_GROUP_BY	NO_PLACE_GROUP_BY	11.1.0.6	11.1.0.6
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> PLACE_GROUP_BY	PLACE_GROUP_BY	PLACE_GROUP_BY	11.1.0.6	11.1.0.6
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> PULL_PRED	PULL_PRED	NO_PULL_PRED	10.2.0.1	10.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> PULL_PRED	PULL_PRED	PULL_PRED	10.2.0.1	10.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> STAR_TRANS	FACT	FACT	8.1.0	8.1.7
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> STAR_TRANS	FACT	NO_FACT	8.1.0	8.1.7
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> STAR_TRANS	STAR	STAR	8.1.0	
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> STAR_TRANS	STAR_TRANSFORMATION	NO_STAR_TRANSFORMATION	10.1.0.3	10.1.0.3
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> STAR_TRANS	STAR_TRANSFORMATION	STAR_TRANSFORMATION	8.1.0	8.1.7
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> STAR_TRANS -> TABLE_LOOKUP_BY_NL	TABLE_LOOKUP_BY_NL	NO_TABLE_LOOKUP_BY_NL	11.2.0.2	11.2.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> STAR_TRANS -> TABLE_LOOKUP_BY_NL	TABLE_LOOKUP_BY_NL	TABLE_LOOKUP_BY_NL	11.2.0.2	11.2.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> TABLE_EXPANSION	EXPAND_TABLE	EXPAND_TABLE	11.2.0.1	11.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> TABLE_EXPANSION	EXPAND_TABLE	NO_EXPAND_TABLE	11.2.0.1	11.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> UNNEST	UNNEST	NO_UNNEST	8.1.6	10.1.0
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> UNNEST	UNNEST	UNNEST	8.1.6	10.1.0
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	USE_VECTOR_AGGREGATION	NO_USE_VECTOR_AGGREGATION	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	USE_VECTOR_AGGREGATION	USE_VECTOR_AGGREGATION	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM	NO_VECTOR_TRANSFORM	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM	VECTOR_TRANSFORM	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM_DIMS	NO_VECTOR_TRANSFORM_DIMS	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM_DIMS	VECTOR_TRANSFORM_DIMS	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM_FACT	NO_VECTOR_TRANSFORM_FACT	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM_FACT	VECTOR_TRANSFORM_FACT	12.1.0.2	12.1.0.2

HEURISTIC

PATH	HINT_CLASS	HINT_NAME	VERSION	VER_OUTL
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> COALESCE_SQ	COALESCE_SQ	COALESCE_SQ	11.2.0.1	11.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> COALESCE_SQ	COALESCE_SQ	NO_COALESCE_SQ	11.2.0.1	11.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> CVM	MERGE	MERGE	8.1.0	10.1.0
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> CVM	MERGE	NO_MERGE	8.0.0	10.1.0
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> DECORRELATE	DECORRELATE	DECORRELATE	12.1.0.1	12.1.0.1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> DECORRELATE	DECORRELATE	NO_DECORRELATE	12.1.0.1	12.1.0.1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> FILTER_PUSH_PRED	PUSH_PRED	NO_PUSH_PRED	8.1.0	8.1.5
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> FILTER_PUSH_PRED	PUSH_PRED	PUSH_PRED	8.1.0	8.1.5
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> OBYE	ELIMINATE_OBYE	ELIMINATE_OBYE	10.2.0.1	10.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> OBYE	ELIMINATE_OBYE	NO_ELIMINATE_OBYE	10.2.0.1	10.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> OLD_PUSH_PRED	OLD_PUSH_PRED	OLD_PUSH_PRED	10.2.0.1	10.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> OUTER_JOIN_TO_INNER	OUTER_JOIN_TO_INNER	NO_OUTER_JOIN_TO_INNER	11.1.0.6	11.1.0.6
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> OUTER_JOIN_TO_INNER	OUTER_JOIN_TO_INNER	OUTER_JOIN_TO_INNER	11.1.0.6	11.1.0.6
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> SET_TO_JOIN	SET_TO_JOIN	NO_SET_TO_JOIN	10.1.0.3	10.1.0.3
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> SET_TO_JOIN	SET_TO_JOIN	SET_TO_JOIN	10.1.0.3	10.1.0.3
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> TABLE_ELIM	ELIMINATE_JOIN	ELIMINATE_JOIN	10.2.0.1	10.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> TABLE_ELIM	ELIMINATE_JOIN	NO_ELIMINATE_JOIN	10.2.0.1	10.2.0.1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> UNNEST	UNNEST	NO_UNNEST	8.1.6	10.1.0
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> UNNEST	UNNEST	UNNEST	8.1.6	10.1.0
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> USE_CONCAT	USE_CONCAT	NO_EXPAND	8.1.0	8.1.7
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> USE_CONCAT	USE_CONCAT	USE_CONCAT	8.1.0	8.1.7

v\$sql_feature_hierarchy

parent_id: 'QKSFM_HEURISTIC', 'QKSFM_CBQT'

HEURISTIC_FEATURES	CBQT_FEATURES
-----	-----
QKSFM_JPPD	QKSFM_JPPD
QKSFM_UNNEST	QKSFM_UNNEST
QKSFM_CVM	QKSFM_CVM
-----	-----
QKSFM_OBYE	QKSFM_JOINFAC
QKSFM_CSE	QKSFM_STAR_TRANS
QKSFM_CNT	QKSFM_PLACE_GROUP_BY
QKSFM_FILTER_PUSH_PRED	QKSFM_TABLE_EXPANSION
QKSFM_OLD_PUSH_PRED	QKSFM_VECTOR_AGG
QKSFM_TABLE_ELIM	QKSFM_DIST_PLCMT
QKSFM_PRED_MOVE_AROUND	QKSFM_PULL_PRED
QKSFM_SET_TO_JOIN	
QKSFM_SVM	
QKSFM_OUTER_JOIN_TO_INNER	
QKSFM_GBYEL	
QKSFM_DECORRELATE	
QKSFM_OUTER_JOIN_TO_ANTI	
QKSFM_FULL_OUTER_JOIN_TO_OUTER	
QKSFM_COALESCE_SQ	
QKSFM_USE_CONCAT	

12.1.0.2

```
SQL> @hinh2
Path mask[*]:
Hint mask[*]:
Min version: 12.1.0.2
```

PATH	HINT_CLASS	HINT_NAME	VERSION	VER_OUTL
ALL -> ANSI_REARCH	ANSI_REARCH	ANSI_REARCH	12.1.0.2	12.1.0.2
ALL -> ANSI_REARCH	ANSI_REARCH	NO_ANSI_REARCH	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> CBO -> ADAPTIVE_PLAN	ADAPTIVE_PLAN	ADAPTIVE_PLAN	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> CBO -> ADAPTIVE_PLAN	ADAPTIVE_PLAN	NO_ADAPTIVE_PLAN	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> CBO -> CBQT -> VECTOR_AGG	USE_VECTOR_AGGREGATION	NO_USE_VECTOR_AGGREGATION	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> CBO -> CBQT -> VECTOR_AGG	USE_VECTOR_AGGREGATION	USE_VECTOR_AGGREGATION	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> CBO -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM	NO_VECTOR_TRANSFORM	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> CBO -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM	VECTOR_TRANSFORM	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> CBO -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM_DIMS	NO_VECTOR_TRANSFORM_DIMS	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> CBO -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM_DIMS	VECTOR_TRANSFORM_DIMS	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> CBO -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM_FACT	NO_VECTOR_TRANSFORM_FACT	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> CBO -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM_FACT	VECTOR_TRANSFORM_FACT	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION	ELIM_GROUPBY	ELIM_GROUPBY	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION	ELIM_GROUPBY	NO_ELIM_GROUPBY	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	USE_VECTOR_AGGREGATION	NO_USE_VECTOR_AGGREGATION	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	USE_VECTOR_AGGREGATION	USE_VECTOR_AGGREGATION	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM	NO_VECTOR_TRANSFORM	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM	VECTOR_TRANSFORM	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM_DIMS	NO_VECTOR_TRANSFORM_DIMS	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM_DIMS	VECTOR_TRANSFORM_DIMS	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM_FACT	NO_VECTOR_TRANSFORM_FACT	12.1.0.2	12.1.0.2
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> VECTOR_AGG	VECTOR_TRANSFORM_FACT	VECTOR_TRANSFORM_FACT	12.1.0.2	12.1.0.2
ALL -> EXECUTION	INMEMORY	INMEMORY	12.1.0.2	12.1.0.2
ALL -> EXECUTION	INMEMORY	NO_INMEMORY	12.1.0.2	12.1.0.2
ALL -> EXECUTION	INMEMORY_PRUNING	INMEMORY_PRUNING	12.1.0.2	12.1.0.2
ALL -> EXECUTION	INMEMORY_PRUNING	NO_INMEMORY_PRUNING	12.1.0.2	12.1.0.2

v\$system fix control + v\$sql feature feature hierarchy

```
SQL> @fix_control_features.sql
Path mask[*]: transform
Min version: 11.2.0.3

PATH-----BUGNO DESCRIPTION-----OPT_FEAT-----EVENT IS_DEFAULT-----
ALL -> COMPILATION -> TRANSFORMATION 9913117 do not rename OJ elimination query blocks after view merging 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION 12352373 having subquery from any to single-row 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION 9680430 Use kko_expqmo instead of expqmo in kkqr 11.2.0.3 38049 1
ALL -> COMPILATION -> TRANSFORMATION 11740670 allow CBQT if all WITH views are inlined 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION 11720178 Enhance inline view merging security checks for PL/SQL functions 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION 10004943 enable removal of group by in subquery for create table 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION 8560951 allow SVM with multiply-referenced subquery 0 0 1
ALL -> COMPILATION -> TRANSFORMATION 7658097 Disable group-by placement under certain conditions 0 0 1
ALL -> COMPILATION -> TRANSFORMATION 4872602 Disable unnesting of SQ under certain conditions 0 0 1
ALL -> COMPILATION -> TRANSFORMATION 2194204 disable push predicate driven by func. index into partition view 38010 1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> CVM 9850461 Enable complex view merging if the order by has subquery 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> CVM 9841679 do not set col count for OPNTPLS 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> CVM 7676897 Disable CVM for distinct view when CBQT is invalid 0 0 1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> JPPD 10041074 clean stats if OJPPD rejected 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> JPPD 9380298 JPPD for cartesian joins under fix control 0 0 1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> JPPD 6987082 push join pred with single UV branch not promoting index 0 0 1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> PLACE_GROUP_BY 12348584 disable GBP for lateral qob with disjunction 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> PLACE_GROUP_BY 11744086 skip scg for query block with no aggregating columns 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> STAR_TRANS 11699884 fix selectivity of Table Lookup By NL view and dimensions 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION -> CBQT -> UNNEST 9659125 cutoff of table count to disable interleaved CVM and JPPD 0 0 1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> CVM 9850461 Enable complex view merging if the order by has subquery 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> CVM 9841679 do not set col count for OPNTPLS 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> CVM 7676897 Disable CVM for distinct view when CBQT is invalid 0 0 1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> FILTER_PUSH_PRED 12410972 push predicate with NLS_SORT in window function 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> FILTER_PUSH_PRED 9002661 Process mqb 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> JPPD 10041074 clean stats if OJPPD rejected 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> JPPD 9380298 JPPD for cartesian joins under fix control 0 0 1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> JPPD 6987082 push join pred with single UV branch not promoting index 0 0 1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> SVM 10420220 allow more OLAP TF view merging by disabling nnonfunc test 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> TABLE_ELIM 10232225 join elimination is not sensitive to predicate order 11.2.0.3 0 1
ALL -> COMPILATION -> TRANSFORMATION -> HEURISTIC -> UNNEST 9659125 cutoff of table count to disable interleaved CVM and JPPD 0 0 1
SQL>
```

https://github.com/xtender/xt_scripts

http://src.orasql.org/public/projects/root/xt_scripts