

# TPCH 10 Queries on Hive

Harish Butani

May 16, 2013

## Contents

<b>1</b>	<b>Schema and Storage</b>	<b>3</b>
1.1	Data sizes . . . . .	3
<b>2</b>	<b>Runtime settings</b>	<b>3</b>
<b>3</b>	<b>Queries</b>	<b>6</b>
3.1	Q1 . . . . .	6
3.1.1	Plan . . . . .	6
3.1.2	Analysis . . . . .	7
3.2	Q2 . . . . .	9
3.2.1	Plan . . . . .	9
3.2.2	Analysis . . . . .	10
3.3	Q3 . . . . .	12
3.3.1	Plan . . . . .	12
3.3.2	Analysis . . . . .	13
3.4	Q4 . . . . .	15
3.4.1	Plan . . . . .	15
3.4.2	Analysis . . . . .	16
3.5	Q5 . . . . .	18
3.5.1	Plan . . . . .	18
3.5.2	Analysis . . . . .	19
3.6	Q6 . . . . .	21
3.6.1	Plan . . . . .	21
3.6.2	Analysis . . . . .	22
3.7	Q7 . . . . .	24
3.7.1	Plan . . . . .	24
3.7.2	Analysis . . . . .	25
3.8	Q8 . . . . .	25

3.8.1	Query . . . . .	25
3.8.2	Plan . . . . .	26
3.8.3	Analysis . . . . .	27
3.9	Q9 . . . . .	29
3.9.1	Plan . . . . .	29
3.9.2	Analysis . . . . .	30
3.10	Q10 . . . . .	32
3.10.1	Plan . . . . .	32
3.10.2	Analysis . . . . .	33
3.11	Q11 . . . . .	35
3.11.1	Plan . . . . .	35
3.11.2	Analysis . . . . .	36
3.12	Q12 . . . . .	38
3.12.1	Plan . . . . .	38
3.12.2	Analysis . . . . .	39
3.13	Q13 . . . . .	41
3.13.1	Plan . . . . .	41
3.13.2	Analysis . . . . .	42
3.14	Q14 . . . . .	44
3.14.1	Plan . . . . .	44
3.14.2	Analysis . . . . .	45
3.15	Q15 . . . . .	47
3.15.1	Plan . . . . .	47
3.15.2	Analysis . . . . .	48
3.16	Q16 . . . . .	50
3.16.1	Plan . . . . .	50
3.16.2	Analysis . . . . .	51
3.17	Q17 . . . . .	53
3.17.1	Plan . . . . .	53
3.17.2	Analysis . . . . .	54
3.18	Q18 . . . . .	56
3.18.1	Plan . . . . .	56
3.18.2	Analysis . . . . .	57
3.19	Q19 . . . . .	59
3.19.1	Plan . . . . .	59
3.19.2	Analysis . . . . .	60
3.20	Q20 . . . . .	62
3.20.1	Plan . . . . .	62
3.20.2	Analysis . . . . .	63
3.21	Q21 . . . . .	65

3.21.1 Plan . . . . .	65
3.21.2 Analysis . . . . .	66

## 1 Schema and Storage

**Customer** is denormalized to contain nation fields; stored in RCFile format

**Part** stored in RCFile format

**Supplier** is denormalized to contain nation fields; stored in RCFile format

**PartSupp** denormalized to contain Part and Supplier fields; stored as RC-File format. Even though PartSupp contains Part and Supplier fields most queries still join with Part and Supplier tables.

**Orders** Stored as RCFile

**LineItem** Stored as RCFile; Partitioned on **ship<sub>year</sub>**

### 1.1 Data sizes

Table	NumFiles	File Format	TotalSize	Num Partitions
Nation	1	Text	2k	-
Region	1	Text	0.5k	-
Part	2	RCFile	8M	-
Supplier	2	RCFile	9.6M	-
PartSupp	6	RCFile	1.3G	-
Orders	16	RCFile	745M	-
LineItem	30	RCFile	3.2G	7

## 2 Runtime settings

```
-- tuning settings
-- reuse jvm for all tasks of a job running on a node
set mapred.job.reuse.jvm.num.tasks=-1;
-- compress map output in each job
set mapred.compress.map.output=true;

set hive.exec.parallel=true;
```

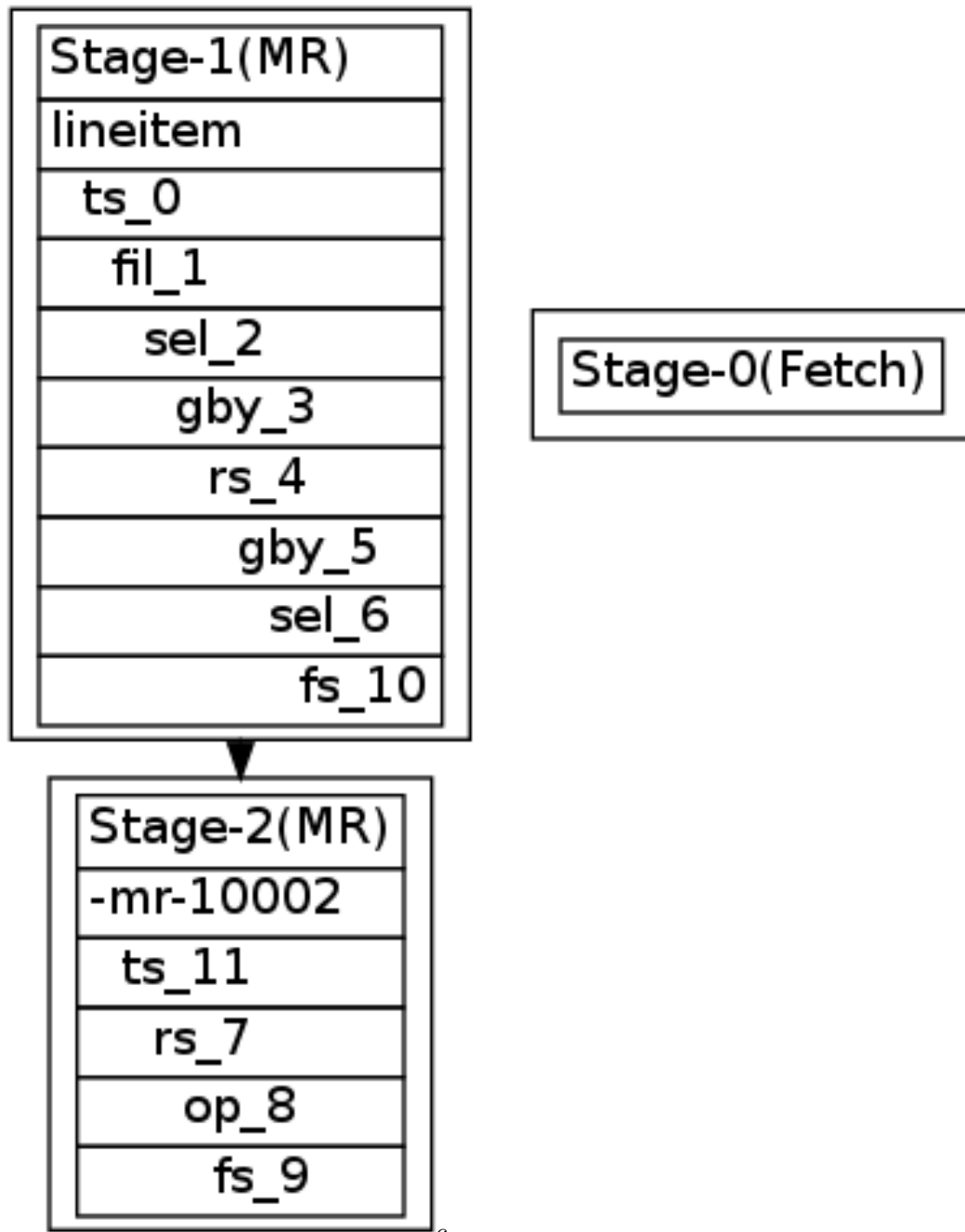
```
-- compress output of intermediate jobs in a hive query  
set hive.exec.compress.intermediate=true;
```



### 3 Queries

#### 3.1 Q1

##### 3.1.1 Plan



### 3.1.2 Analysis

MapReduce Jobs Launched:

Job 0: Map: 38 Reduce: 4 Cumulative CPU: 595.04 sec HDFS Read: 1157970521 HDFS Write: 5835

Job 1: Map: 4 Reduce: 1 Cumulative CPU: 3.36 sec HDFS Read: 3107 HDFS Write: 5835

Total MapReduce CPU Time Spent: 9 minutes 58 seconds 400 msec

OK

A	F	3.77518399E8	5.660657277972454E11	5.3775910427807275E11	5.59270
---	---	--------------	----------------------	-----------------------	---------

N	F	9851614.0	1.4767438399170015E10	1.4028805792211437E10	1.45904
---	---	-----------	-----------------------	-----------------------	---------

N	O	7.42645576E8	1.1135803021456763E12	1.0578950594817264E12	1.10022
---	---	--------------	-----------------------	-----------------------	---------

R	F	3.7773283E8	5.664310549760026E11	5.381109226647674E11	5.59634
---	---	-------------	----------------------	----------------------	---------

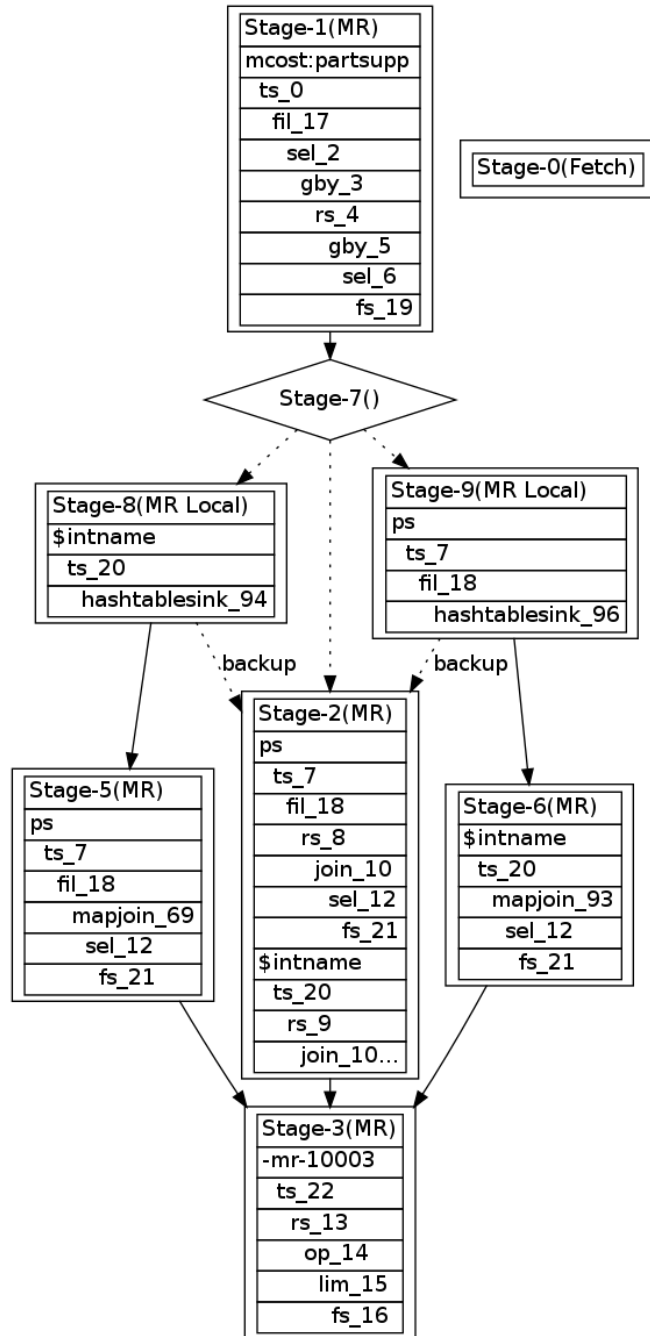
Time taken: 68.51 seconds





## 3.2 Q2

### 3.2.1 Plan



### 3.2.2 Analysis

MapReduce Jobs Launched:

Job 0: Map: 12 Reduce: 2 Cumulative CPU: 49.82 sec HDFS Read: 136471083 HDFS Write: 136471083

Job 1: Map: 12 Cumulative CPU: 185.36 sec HDFS Read: 740257853 HDFS Write: 329491507

Job 2: Map: 12 Reduce: 1 Cumulative CPU: 9.08 sec HDFS Read: 335923 HDFS Write: 136471083

Total MapReduce CPU Time Spent: 4 minutes 4 seconds 260 msec

OK

9994.37 Supplier#000030084 GERMANY 380077 Manufacturer#5

gBEvSkyW o1uHea0CV,oHtkTTVW 17-519-171-

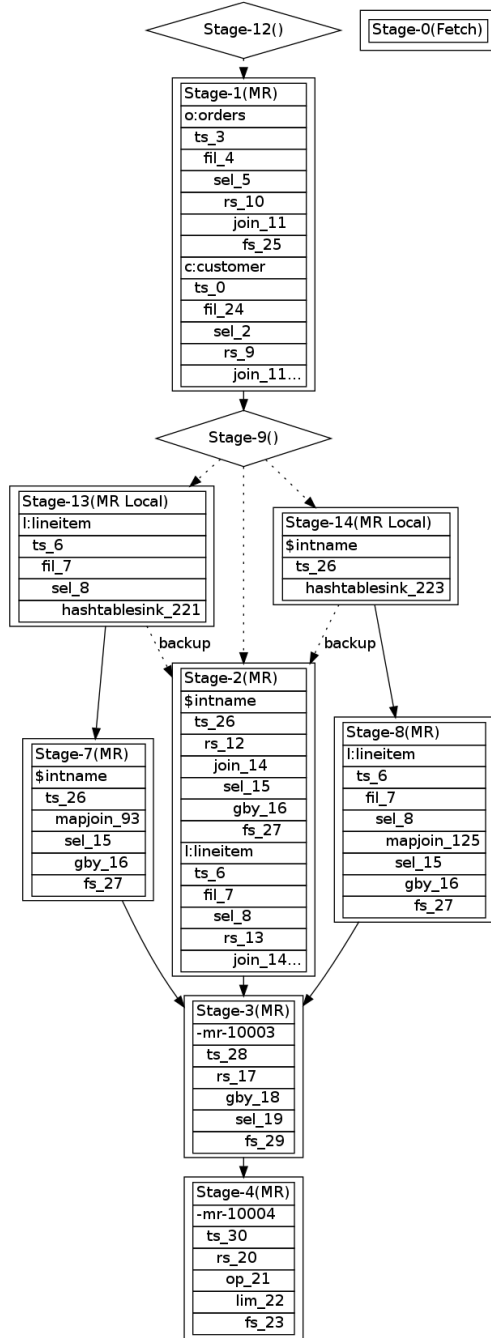
...

Time taken: 119.077 seconds



### 3.3 Q3

#### 3.3.1 Plan



### 3.3.2 Analysis

MapReduce Jobs Launched:

Job 0: Map: 18 Reduce: 1 Cumulative CPU: 162.33 sec HDFS Read: 275625760 HDFS Write: 0

Job 1: Map: 39 Reduce: 4 Cumulative CPU: 646.3 sec HDFS Read: 1062210875 HDFS Write: 0

Job 2: Map: 4 Reduce: 1 Cumulative CPU: 11.17 sec HDFS Read: 1414319 HDFS Write: 0

Job 3: Map: 2 Reduce: 1 Cumulative CPU: 6.68 sec HDFS Read: 2080845 HDFS Write: 5

Total MapReduce CPU Time Spent: 13 minutes 46 seconds 480 msec

OK

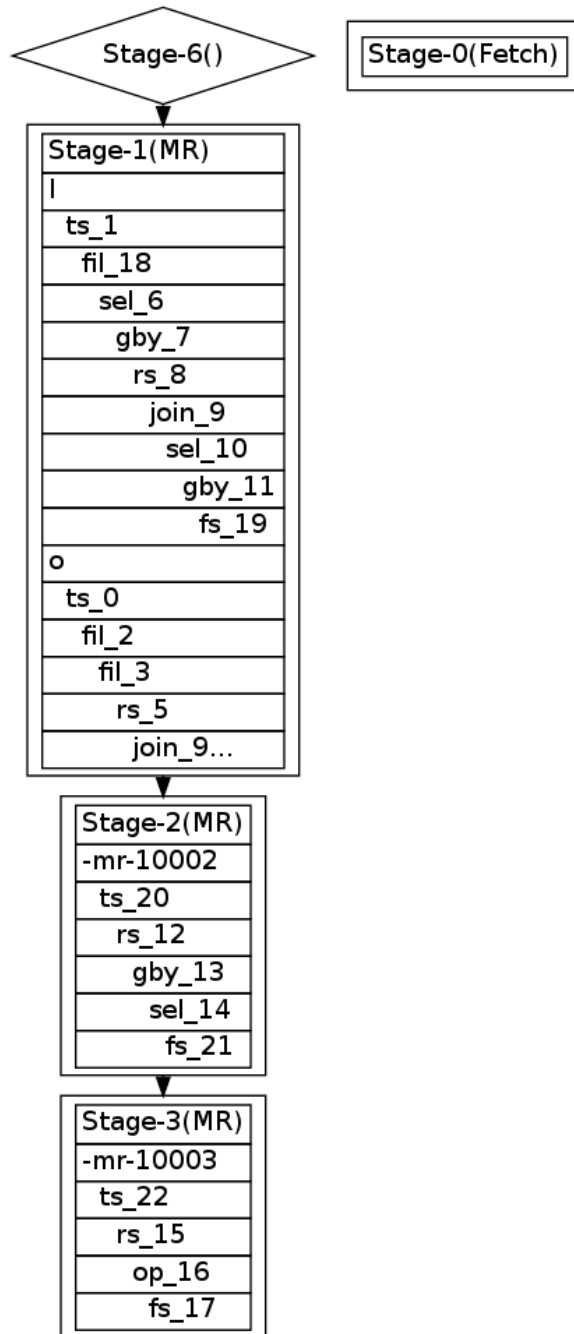
4791171	1.9030027277145126E-307	1995-02-23	00:00:00	0
46678469	1.9029799190846666E-307	1995-01-27	00:00:00	0
23906758	1.9027908823813936E-307	1995-03-14	00:00:00	0
23861382	1.902685062777517E-307	1995-03-09	00:00:00	0
59393639	1.9026133639720684E-307	1995-02-12	00:00:00	0
3355202	1.90258855252302E-307	1995-03-04	00:00:00	0
9806272	1.902588218072611E-307	1995-03-13	00:00:00	0
22810436	1.9025389854413704E-307	1995-01-02	00:00:00	0
16384100	1.9024924808532234E-307	1995-03-02	00:00:00	0
52974151	1.9023303707221757E-307	1995-02-05	00:00:00	0

Time taken: 160.917 seconds



### 3.4 Q4

#### 3.4.1 Plan



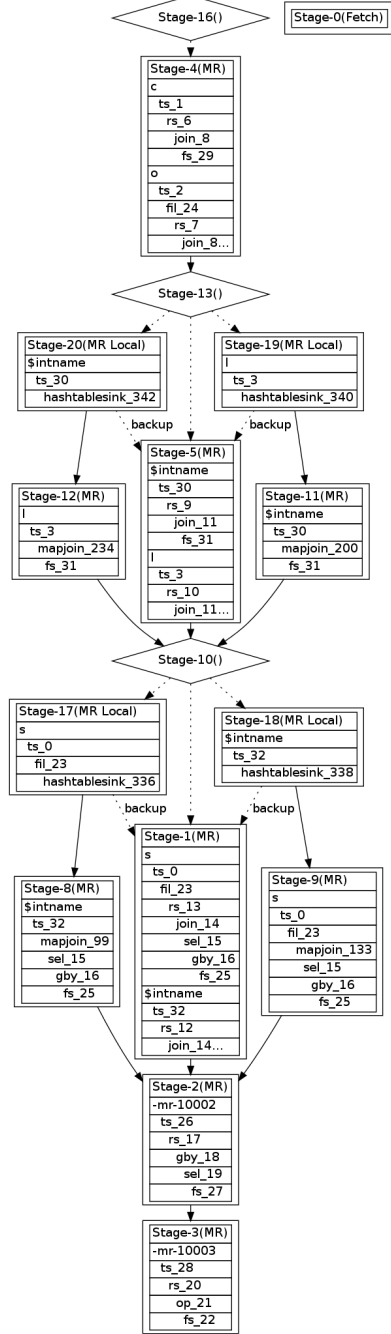
### 3.4.2 Analysis





## 3.5 Q5

### 3.5.1 Plan



### 3.5.2 Analysis



### 3.6 Q6

#### 3.6.1 Plan

Stage-0(Fetch)

Stage-1

lineitem

ts\_0

fil\_8

sel\_

gb

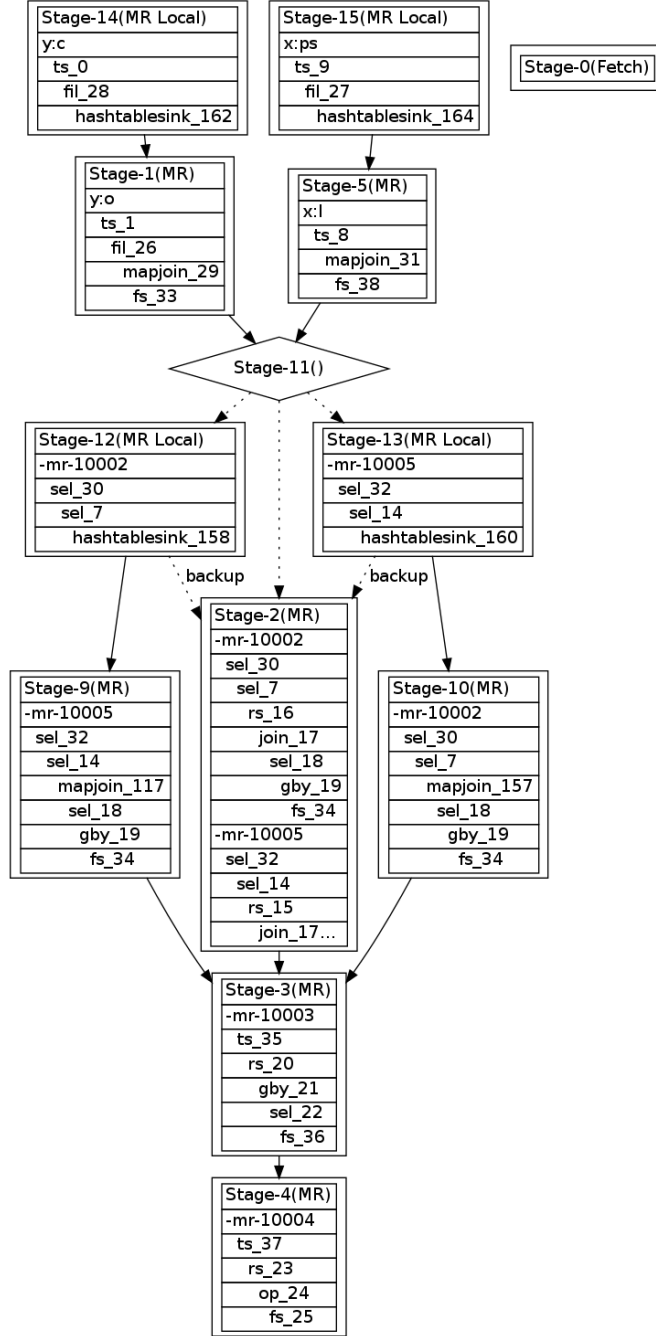
r

### 3.6.2 Analysis



## 3.7 Q7

### 3.7.1 Plan





### 3.7.2 Analysis

## 3.8 Q8

### 3.8.1 Query

```
select
  o_year,
  sum(case when nation = 'BRAZIL' then volume else 0.0 end) / sum(volume) as mkt_share
from
  (select /*+ mapjoin(ps) */ s_n_name as nation,
    l_extendedprice * (1- l_discount) as volume,
    l_orderkey
  from
    partsupp ps join lineitem l on ps.ps_partkey = l.l_partkey
                        and ps.ps_suppkey = l.l_suppkey
                        and ps.p_type = 'ECONOMY ANODIZED STEEL'
  ) x
join
  (select /*+ mapjoin(c) */ o_orderkey,
    year((o.o_orderdate)) as o_year
  from
    orders o join customer c on o.o_custkey = c.c_custkey
                        and c.c_r_name = 'AMERICA'
                        and year((o.o_orderdate)) in (1995, 1996)
  ) y on x.l_orderkey = y.o_orderkey
group by o_year
order by o_year;
```

### 3.8.2 Plan

q8-hplan.png

### 3.8.3 Analysis

- Do a MapJoin of Customers and Orders
- Do a MapJoin of PartSupp and LineItem
- Do a MapJoin of output1 and output2
- Do a GroupBy Job
- Do a OrderBy Job
- Do Fetch Job

MapReduce Jobs Launched:

Job 0: Map: 393 Cumulative CPU: 1376.29 sec HDFS Read: 2183132536 HDFS Write: 4819

Job 1: Map: 16 Cumulative CPU: 260.47 sec HDFS Read: 547175587 HDFS Write: 4395494

Job 2: Map: 393 Cumulative CPU: 6968.81 sec HDFS Read: 5030159 HDFS Write: 72543 S

Job 3: Map: 393 Reduce: 1 Cumulative CPU: 206.45 sec HDFS Read: 283191 HDFS Write

Job 4: Map: 1 Reduce: 1 Cumulative CPU: 1.78 sec HDFS Read: 768 HDFS Write: 51 SU

Total MapReduce CPU Time Spent: 0 days 2 hours 26 minutes 53 seconds 800 msec

OK

1995 0.03882014251433219

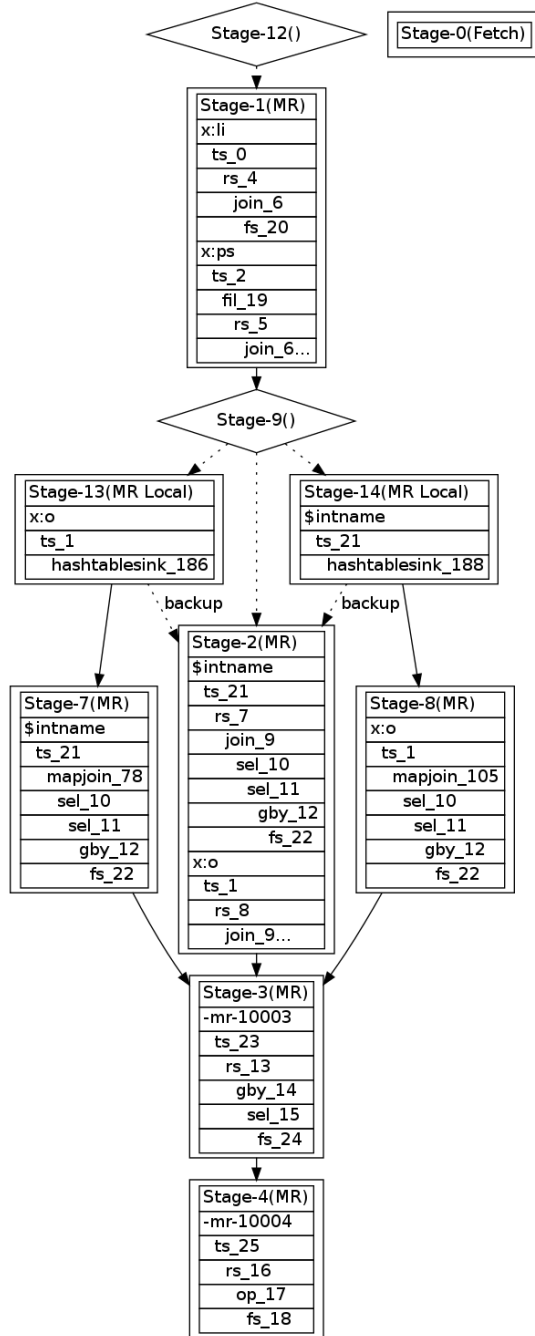
1996 0.039489687491839925

Time taken: 200.967 seconds



### 3.9 Q9

#### 3.9.1 Plan

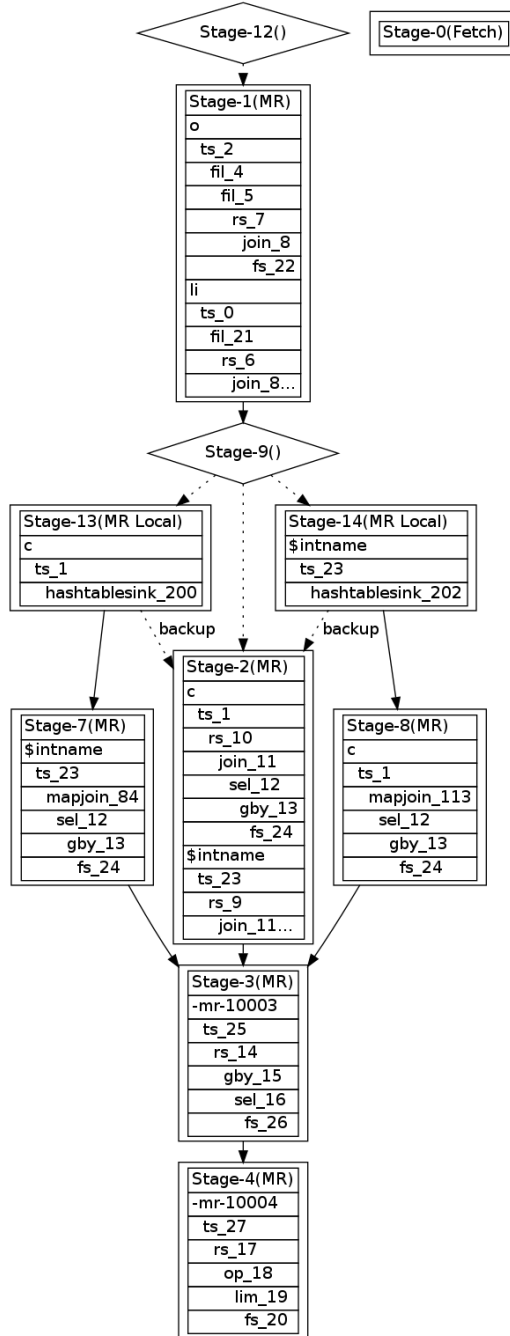


### 3.9.2 Analysis



### 3.10 Q10

#### 3.10.1 Plan



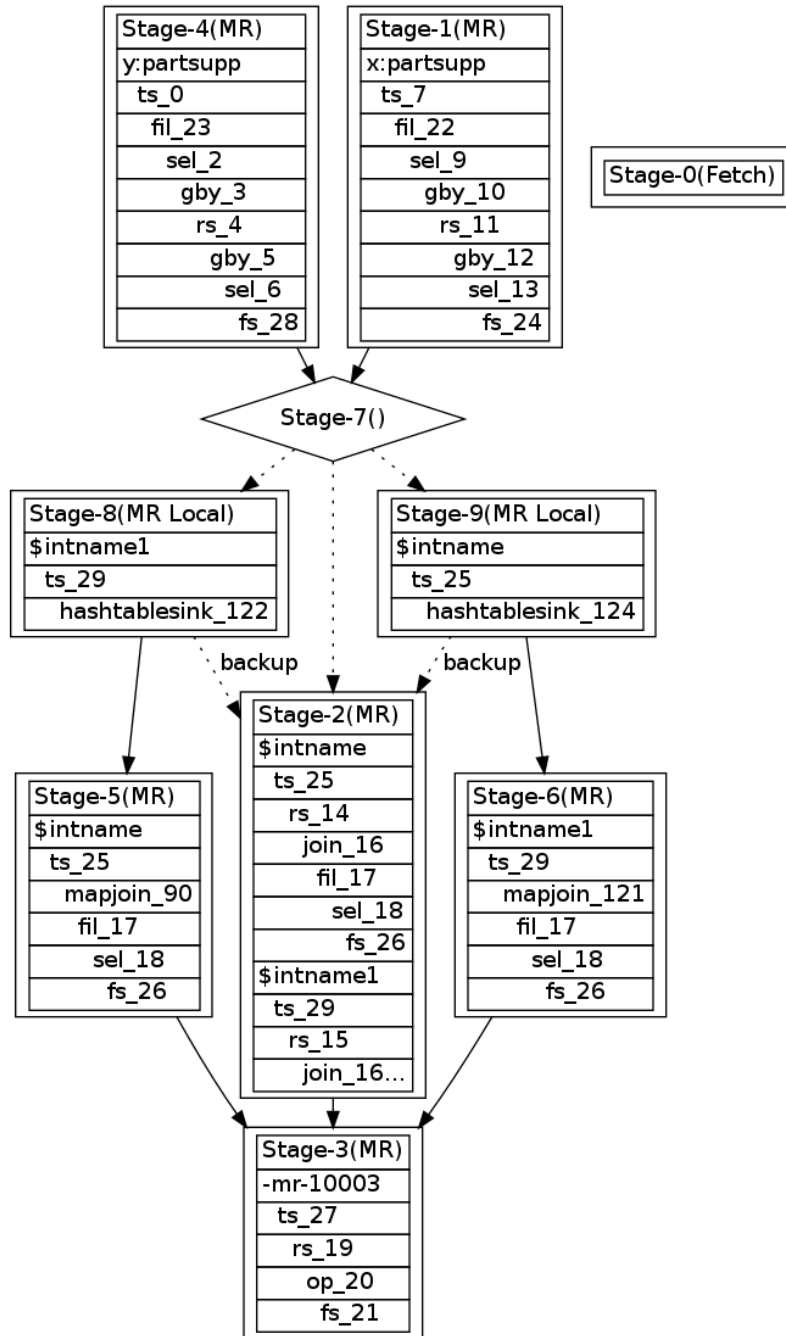


### 3.10.2 Analysis



### 3.11 Q11

#### 3.11.1 Plan

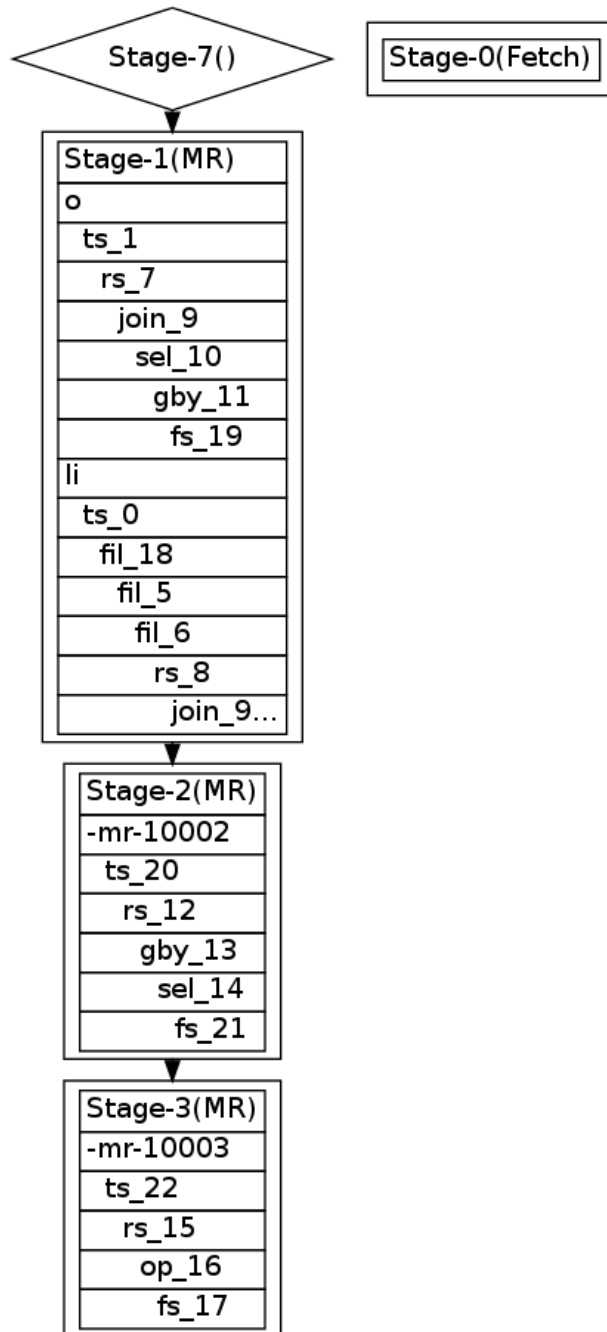


### **3.11.2 Analysis**



### 3.12 Q12

#### 3.12.1 Plan



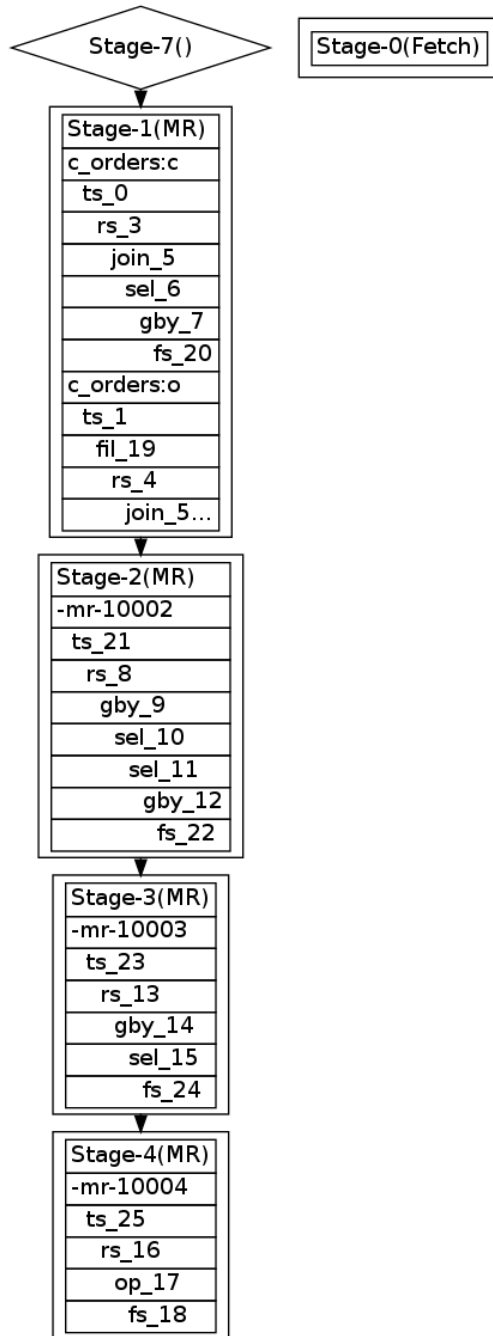
### 3.12.2 Analysis





### 3.13 Q13

#### 3.13.1 Plan

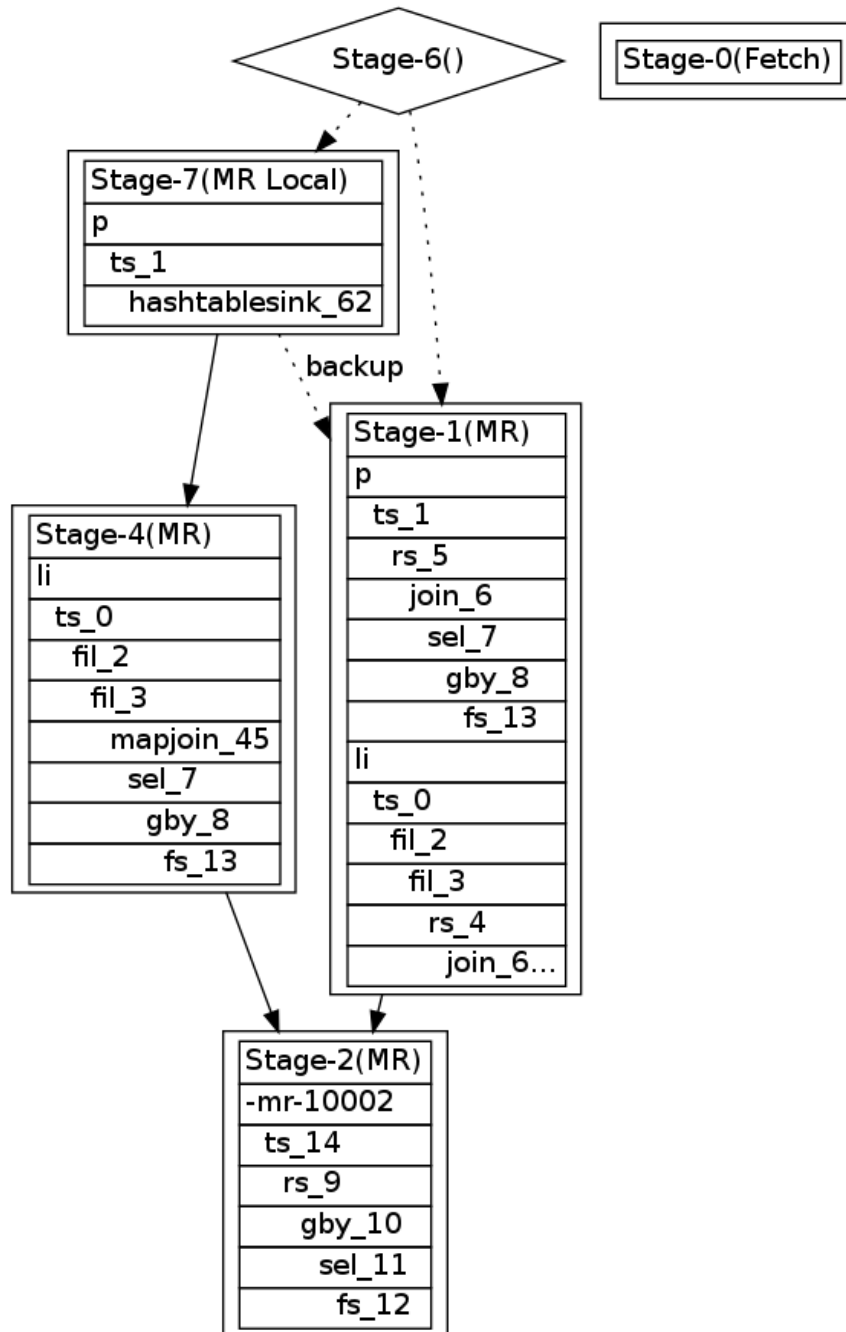


### 3.13.2 Analysis



### 3.14 Q14

#### 3.14.1 Plan



### 3.14.2 Analysis



### 3.15 Q15

#### 3.15.1 Plan

q15-hplan.png

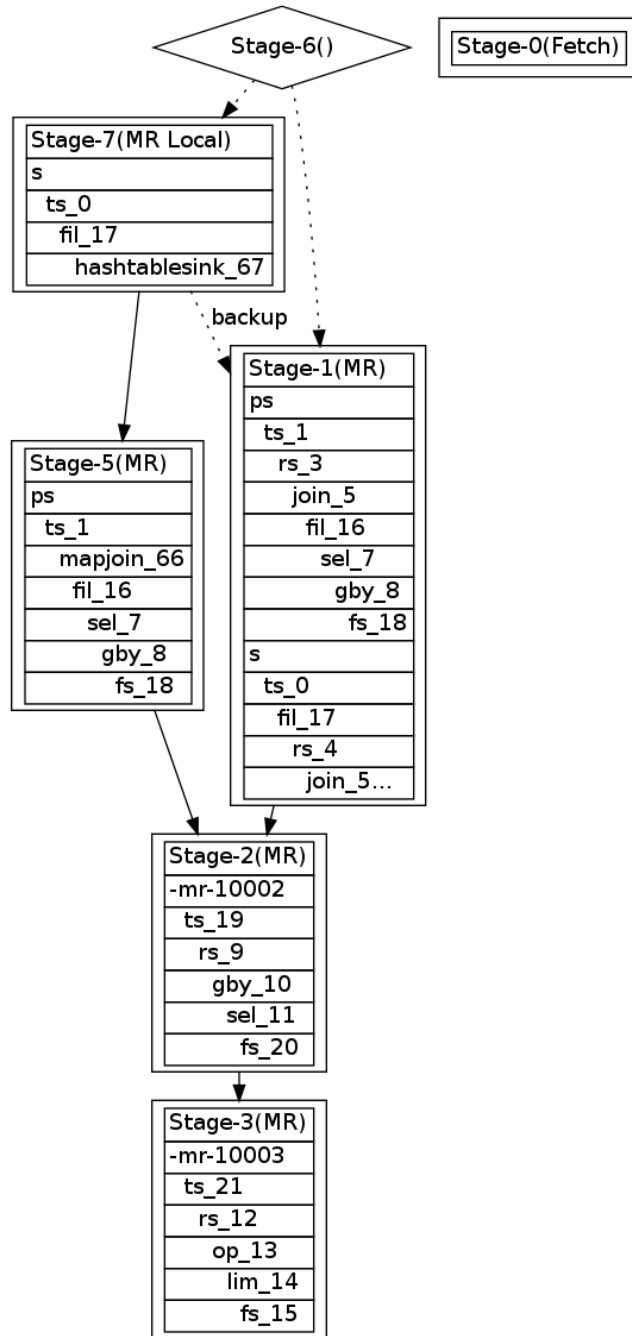
### 3.15.2 Analysis





### 3.16 Q16

#### 3.16.1 Plan

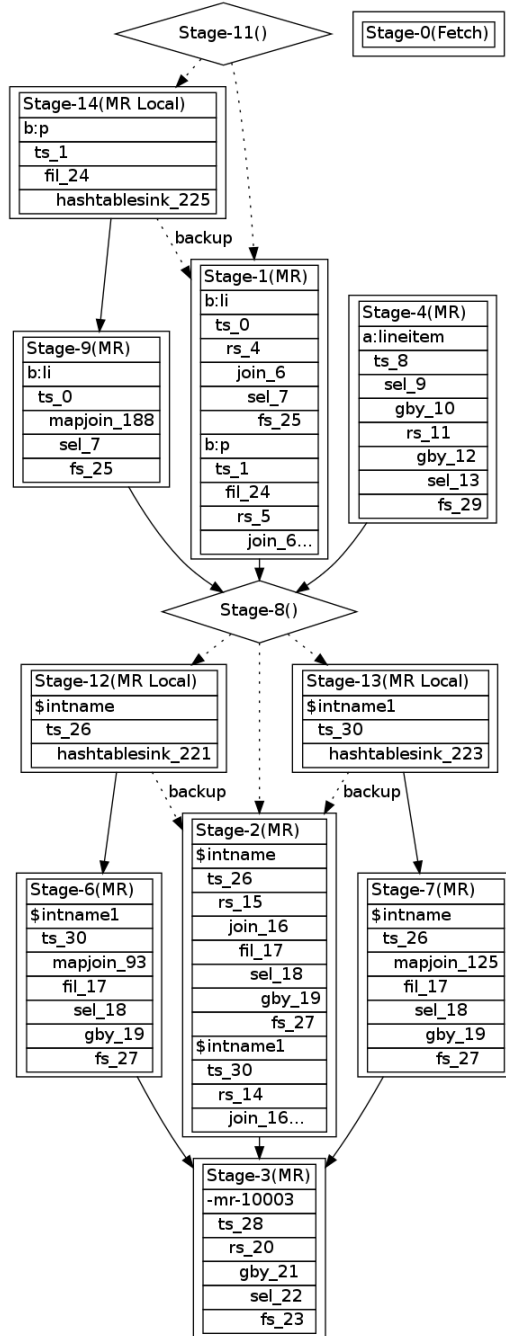


### **3.16.2 Analysis**



### 3.17 Q17

#### 3.17.1 Plan

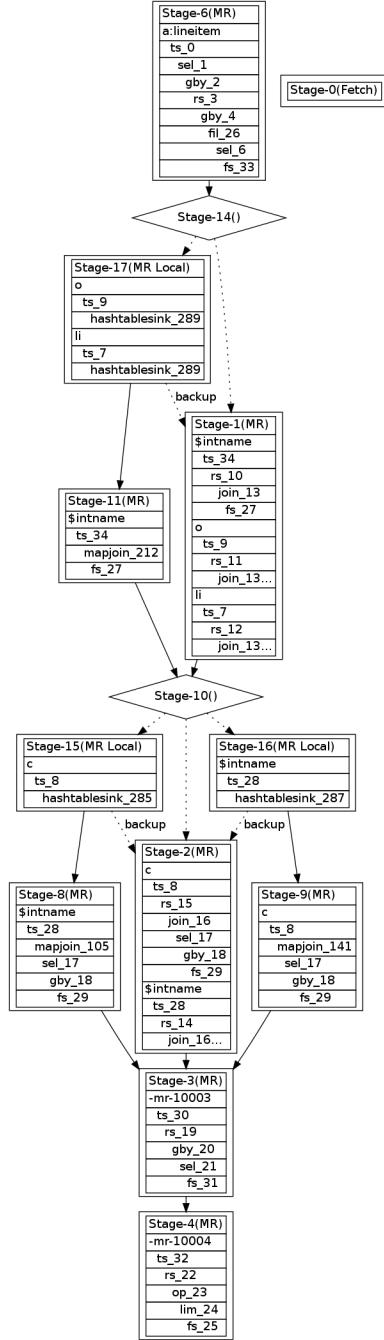


### 3.17.2 Analysis



## 3.18 Q18

### 3.18.1 Plan



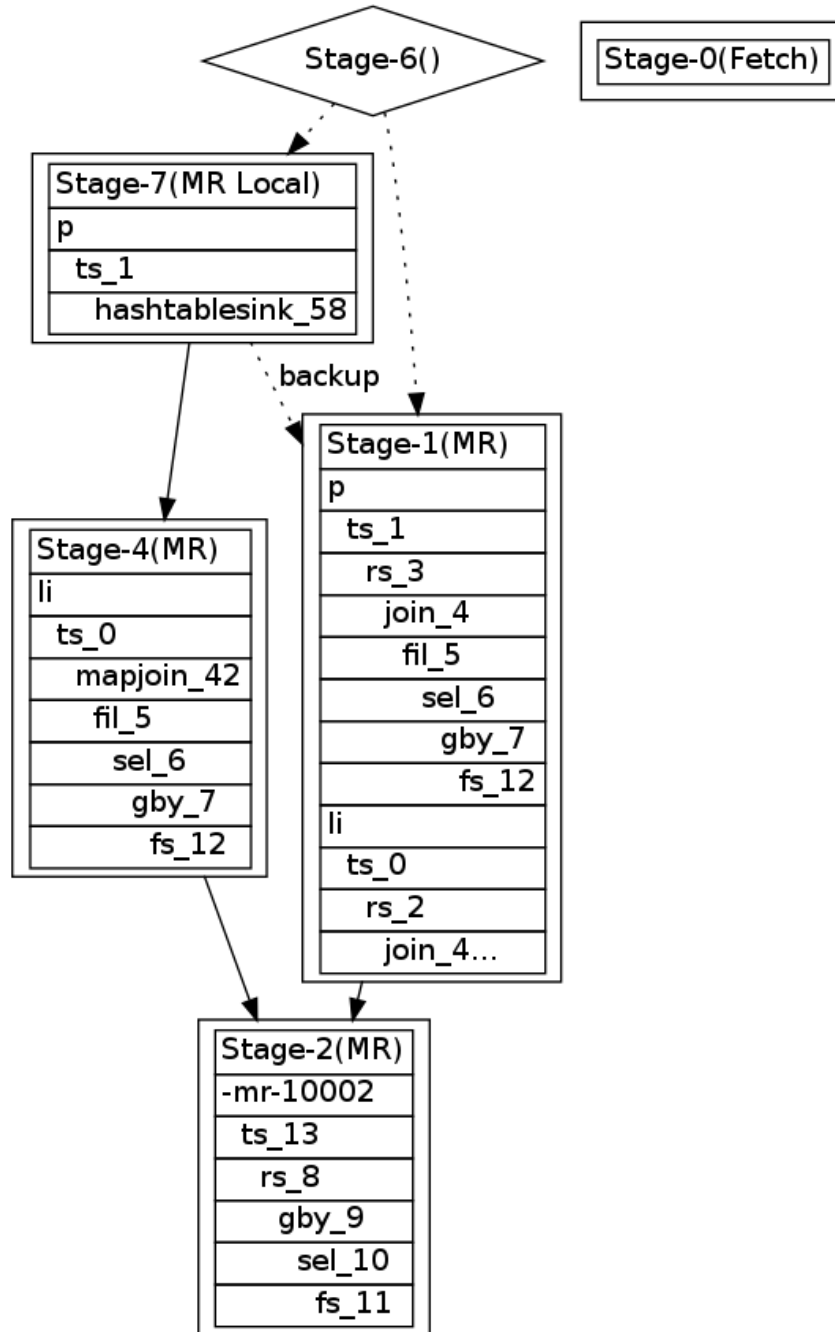


### 3.18.2 Analysis



### 3.19 Q19

#### 3.19.1 Plan

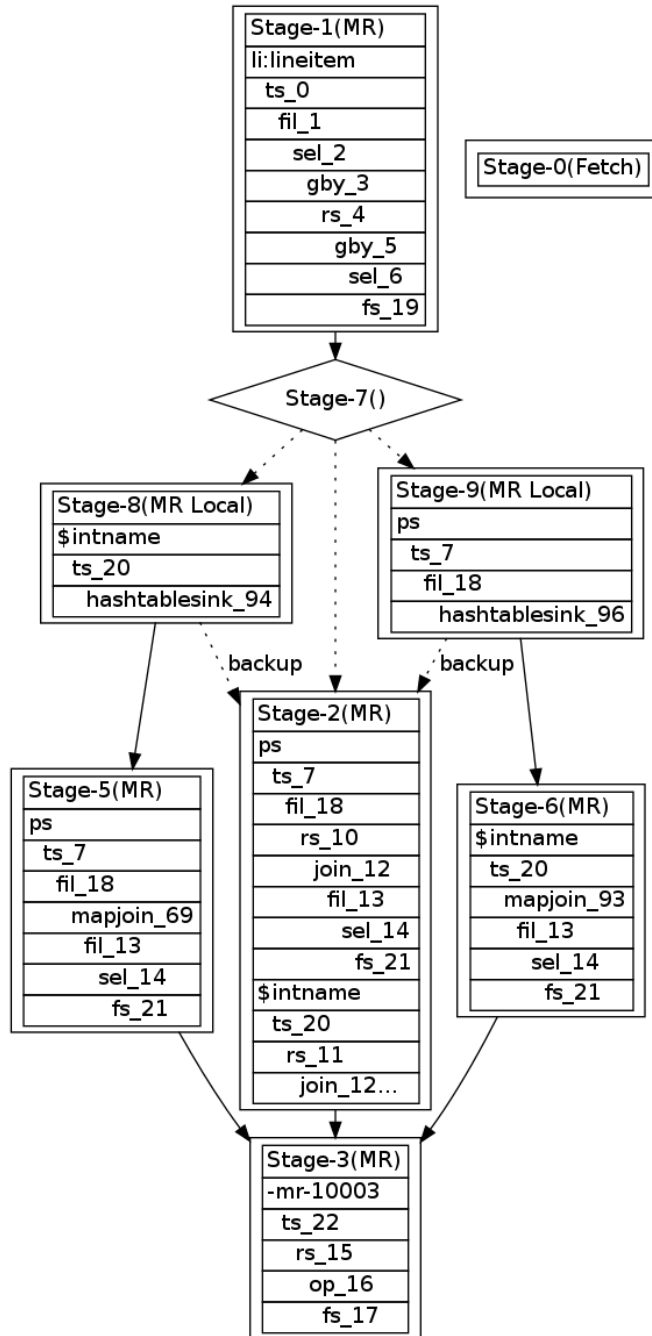


### 3.19.2 Analysis



### 3.20 Q20

#### 3.20.1 Plan



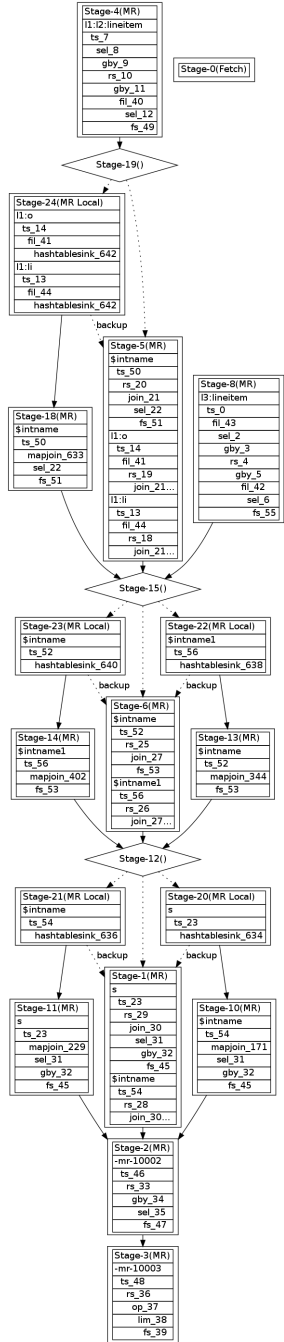
### 3.20.2 Analysis





## 3.21 Q21

### 3.21.1 Plan



### 3.21.2 Analysis