# HAWK : Performance Monitoring Hive
# Introduction



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# Reasons related to Hive performance

- Inefficient hive query

- Not suitable configuration of hadoop, hive and system

- Bad distributed strategy of data

- System problems

# How to find out the reason?

- Hive
  - Hive plan
  - Hive log
- Hadoop
  - MapReduce monitoring
  - Hadoop job log
- System

# How to find out the reason ?

```
ABSTRACT SYNTAX TREE:
  (TOK_QUERY (TOK_FROM (TOK_JOIN (TOK_TABREF emp e) (TOK_TABREF dept d) (= (. (TOK_TABLE_OR_COL e) deptno) (. (TOK_TABLE_OR_COL d) deptno)))) (TOK_INSERT
(TOK_DESTINATION (TOK_DIR TOK_TMP_FILE)) (TOK_SELECT (TOK_SELEXPR (. (TOK_TABLE_OR_COL e) empno)) (TOK_SELEXPR (. (TOK_TABLE_OR_COL e) ename)) (TOK_SELEXPR
(. (TOK_TABLE_OR_COL d) dname))) (TOK_WHERE (= (. (TOK_TABLE_OR_COL d) deptno) 30))))

STAGE DEPENDENCIES:
  Stage-1 is a root stage
  Stage-0 is a root stage

STAGE PLANS:
  Stage: Stage-1
    Map Reduce
      Alias -> Map Operator Tree:
        d
          TableScan
            alias: d
            Filter Operator
              predicate:
                  expr: (deptno = 30)
                  type: boolean
              Reduce Output Operator
                key expressions:
                      expr: deptno
                      type: int
                sort order: +
                Map-reduce partition columns:
                      expr: deptno
                      type: int
                tag: 1
                value expressions:
                      expr: deptno
                      type: int
                      expr: dname
                      type: string
        e
          TableScan
            alias: e
            Reduce Output Operator
              key expressions:
                    expr: deptno
                    type: int
              sort order: +
              Map-reduce partition columns:
                    expr: deptno
                    type: int
              tag: 0
              value expressions:
                    expr: empno
                    type: int
                    expr: ename
                    type: string
      Reduce Operator Tree:
        Join Operator
          condition map:
              Inner Join 0 to 1
          condition expressions:
            0 {VALUE._col0} {VALUE._col1}
            1 {VALUE._col0} {VALUE._col1}
          handleSkewJoin: false
          outputColumnNames: _col0, _col1, _col4, _col5
          Filter Operator
            predicate:
                expr: (_col4 = 30)
                type: boolean
            Select Operator
              expressions:
                    expr: _col0
                    type: int
                    expr: _col1
                    type: string
                    expr: _col5
                    type: string
              outputColumnNames: _col0, _col1, _col2
              File Output Operator
                compressed: false
                GlobalTableId: 0
                table:
                    input format: org.apache.hadoop.mapred.TextInputFormat
                    output format: org.apache.hadoop.hive.ql.io.HiveIgnoreKeyTextOutputFormat

  Stage: Stage-0
    Fetch Operator
      limit: -1
```

# of MapReduce Job
Data Source/Target
Operators

- Hive
  - Hive plan
  - Hive log
- Hadoop
  - MapReduce monitoring
  - Hadoop job log
- System

# How to find out the reason ?

**essionStart** SESSION_ID="nexr_201111060248" TIME="1320509893783"
QueryStart **QUERY_STRING**="select ename from emp" **QUERY_ID**="nexr_20111106024848_36387a27-924a-4d03-9614-
e9ab5a86898a" TIME="1320509912081"
**Counters plan**="{"queryId":"nexr_20111106024848_36387a27-924a-4d03-9614-e9ab5a86898a","queryType":null,"queryAttributes":
{"queryString":"select ename from emp"},"queryCounters":"null","stageGraph":
{"nodeType":"STAGE","roots":"null","adjacencyList":"]"},"stageList":
[{"stageId":"Stage-1","stageType":"MAPRED","stageAttributes":"null","stageCounters":"}","taskList":
[{"taskId":"Stage-1_MAP","taskType":"MAP","taskAttributes":"null","taskCounters":"null","operatorGraph":
{"nodeType":"OPERATOR","roots":"null","adjacencyList":[{"node":"TS_0","children":["SEL_1"],"adjacencyType":"CONJUNCTIVE"},
{"node":"SEL_1","children":["FS_2"],"adjacencyType":"CONJUNCTIVE"}]},"operatorList":
[{"operatorId":"TS_0","operatorType":"TABLESCAN","operatorAttributes":
{"alias":"emp"},"operatorCounters":"null","done":"false","started":"false"},
{"operatorId":"SEL_1","operatorType":"SELECT","operatorAttributes":
{"expressions":"ename"},"operatorCounters":"null","done":"false","started":"false"},
{"operatorId":"FS_2","operatorType":"FILESINK","operatorAttributes":"null","operatorCounters":"null","done":"false","started":"false"},"
done":"false","started":"false"}],"done":"false","started":"false"},"done":"false","started":"true"}" TIME="1320509912095"
TaskStart TASK_NAME="org.apache.hadoop.hive.ql.exec.MapRedTask" TASK_ID="Stage-1"
QUERY_ID="nexr_20111106024848_36387a27-924a-4d03-9614-e9ab5a86898a" TIME="1320509912099"
TaskProgress TASK_HADOOP_PROGRESS="2011-11-06 02:48:38,867 Stage-1 map = 0%, reduce = 0%" TASK_NUM_REDUCERS="0"
TASK_NAME="org.apache.hadoop.hive.ql.exec.MapRedTask" TASK_NUM_MAPPERS="1"
TASK_COUNTERS="org.apache.hadoop.hive.ql.exec.Operator$ProgressCounter.CREATED_FILES:0,Job
Counters .SLOTS_MILLIS_MAPS:308,Job Counters .Launched map tasks:1,Job Counters .Data-local map tasks:1,Map-Reduce
Framework.CPU_MILLISECONDS:0" TASK_ID="Stage-1" QUERY_ID="nexr_20111106024848_36387a27-924a-4d03-9614-
e9ab5a86898a" TASK_HADOOP_ID="job_201111060121_0001" TIME="1320509918868"
...
**TaskEnd** TASK_RET_CODE="0" TASK_HADOOP_PROGRESS="2011-11-06 02:48:46,926 Stage-1 map = 100%, reduce = 100%"
TASK_NUM_REDUCERS="0" TASK_NAME="org.apache.hadoop.hive.ql.exec.MapRedTask" TASK_NUM_MAPPERS="1"
TASK_COUNTERS="org.apache.hadoop.hive.ql.exec.Operator$ProgressCounter.CREATED_FILES:1,Job
Counters .SLOTS_MILLIS_MAPS:8909,Job Counters .Total time spent by all reduces waiting after reserving slots (ms):0,Job
Counters .Total time spent by all maps waiting after reserving slots (ms):0,Job Counters .Launched map tasks:1,Job Counters .Data-local
map tasks:1,Job Counters .SLOTS_MILLIS_REDUCES:0,FileSystemCounters.HDFS_BYTES_READ:
512,FileSystemCounters.FILE_BYTES_WRITTEN:81235,FileSystemCounters.HDFS_BYTES_WRITTEN:
37,org.apache.hadoop.hive.ql.exec.MapOperator$Counter.DESERIALIZE_ERRORS:0,Map-Reduce Framework.Map input records:8,Map-
Reduce Framework.Spilled Records:0,Map-Reduce Framework.CPU_MILLISECONDS:0,Map-Reduce Framework.Map input bytes:
0,Map-Reduce Framework.Map output records:0,Map-Reduce Framework.SPLIT_RAW_BYTES:173" TASK_ID="Stage-1"
QUERY_ID="nexr_20111106024848_36387a27-924a-4d03-9614-e9ab5a86898a" TASK_HADOOP_ID="job_201111060121_0001"
TIME="1320509926006"
**QueryEnd** QUERY_STRING="select ename from emp" QUERY_ID="nexr_20111106024848_36387a27-924a-4d03-9614-
e9ab5a86898a" QUERY_RET_CODE="0" QUERY_NUM_TASKS="1" TIME="1320509926006"
Counters plan="{"queryId":"nexr_20111106024848_36387a27-924a-4d03-9614-e9ab5a86898a","queryType":null,"queryAttributes":
{"queryString":"select ename from emp"},"queryCounters":"null","stageGraph":
{"nodeType":"STAGE","roots":"null","adjacencyList":"]"},"stageList":
[{"stageId":"Stage-1","stageType":"MAPRED","stageAttributes":"null","stageCounters":
{"CNTR_NAME_Stage-1_REDUCE_PROGRESS":"100","CNTR_NAME_Stage-1_MAP_PROGRESS":"100"},"taskList":
[{"taskId":"Stage-1_MAP","taskType":"MAP","taskAttributes":"null","taskCounters":"null","operatorGraph":
{"nodeType":"OPERATOR","roots":"null","adjacencyList":[{"node":"TS_0","children":["SEL_1"],"adjacencyType":"CONJUNCTIVE"},
{"node":"SEL_1","children":["FS_2"],"adjacencyType":"CONJUNCTIVE"}]},"operatorList":
[{"operatorId":"TS_0","operatorType":"TABLESCAN","operatorAttributes":
{"alias":"emp"},"operatorCounters":"}","done":"true","started":"true"},
{"operatorId":"SEL_1","operatorType":"SELECT","operatorAttributes":
{"expressions":"ename"},"operatorCounters":"null","done":"true","started":"true"},
{"operatorId":"FS_2","operatorType":"FILESINK","operatorAttributes":"null","operatorCounters":"null","done":"true","started":"true"},"
done":"true","started":"true"}],"done":"true","started":"true"}],"done":"true","started":"true"}" TIME="1320509926007"

Query ID
Elapsed Time
Mapping MROperator to JobID

- Hive
  - Hive plan
  - Hive log
- Hadoop
  - MapReduce monitoring
  - Hadoop job log
- System

# How to find out the reason ?

Hadoop job_201110281201_1043 on tb301

User: root
Job Name: SELECT unfold(tbl.x, 0.0, 0.0, 0.0, 0....tbl(Stage-1)
Job File: hdfs://tb301/srv/clog/data/hadoop-root/mapred/staging/root/.staging/job_201110281201_1043/job.xml
Submit Host: tb301
Submit Host Address: 10.1.3.1
Job-ACLs: All users are allowed
Job Setup: Successful
Status: Succeeded
Started at: Wed Nov 02 11:31:26 KST 2011
Finished at: Wed Nov 02 11:32:32 KST 2011
Finished in: 1mins, 6sec
Job Cleanup: Successful

| Kind | % Complete | Num Tasks | Pending | Running | Complete | Killed | Failed/Killed Task Attempts |
|------|-----------|-----------|---------|---------|----------|--------|------------------------------|
| map | 100.00% | 1 | 0 | 0 | 1 | 0 | 0 / 0 |
| reduce | 100.00% | 1 | 0 | 0 | 1 | 0 | 0 / 0 |

JobID
Summary MapReduce Job

| | Counter | Map | Reduce | Total |
|---|---------|-----|--------|-------|
| org.apache.hadoop.hive.ql.exec.Operator$ProgressCounter | CREATED_FILES | 0 | 1 | 1 |
| File Input Format Counters | Bytes Read | 0 | | 0 |
| Job Counters | SLOTS_MILLIS_MAPS | 0 | 0 | 48,678 |
| | Launched reduce tasks | 0 | 0 | 1 |
| | Total time spent by all maps waiting after reserving slots (ms) | 0 | 0 | 0 |
| | Total time spent by all reduces waiting after reserving slots (ms) | 0 | 0 | 0 |
| | Launched map tasks | 0 | 0 | 1 |
| | Data-local map tasks | 0 | 0 | 1 |
| | SLOTS_MILLIS_REDUCES | 0 | 0 | 10,282 |
| File Output Format Counters | Bytes Written | 0 | 0 | 0 |
| FileSystemCounters | FILE_BYTES_READ | 0 | 671 | 671 |
| | HDFS_BYTES_READ | 1,796,025 | 0 | 1,796,025 |
| | FILE_BYTES_WRITTEN | 37,446 | 37,415 | 74,861 |
| | HDFS_BYTES_WRITTEN | 0 | 488 | 488 |
| org.apache.hadoop.hive.ql.exec.MapOperator$Counter | DESERIALIZE_ERRORS | 0 | 0 | 0 |
| | Map output materialized bytes | 671 | 0 | 671 |
| | Map input records | 12,153 | 0 | 12,153 |
| | Reduce shuffle bytes | 0 | 671 | 671 |
| | Spilled Records | 3 | 3 | 6 |
| | Map output bytes | 656 | 0 | 656 |

- Hive
  - Hive plan
  - Hive log
- Hadoop
  - MapReduce monitoring
  - Hadoop job log
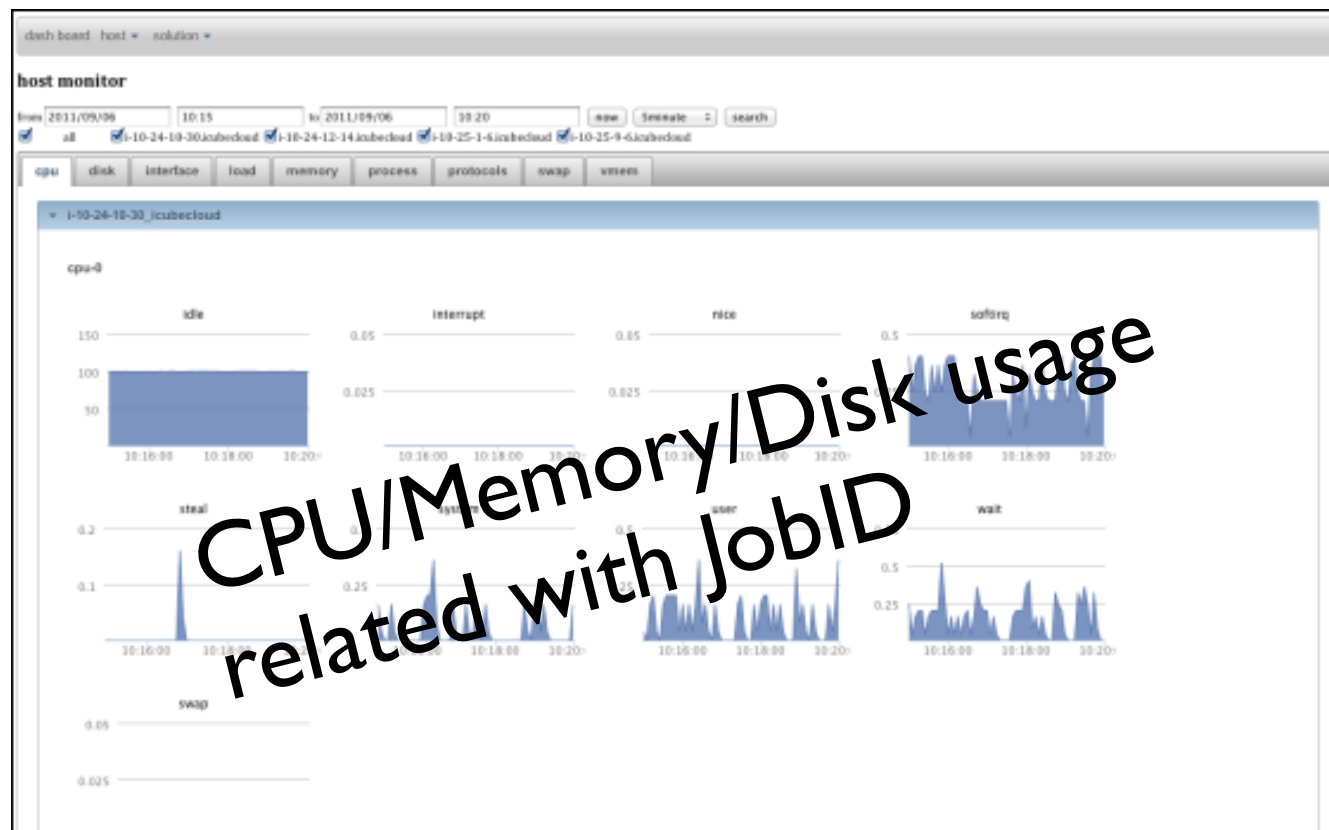- System

# How to find out the reason ?

Meta VERSION="1" .
Job JOBID="job_201111060121_0001" **JOBNAME**="select ename from emp(Stage-1)" USER="nexr" SUBMIT_TIME="1320509913049"
JOBCONF="hdfs://localhost:54310/tmp/hadoop-nexr/mapred/staging/nexr/\.staging/job_201111060121_0001/job\.xml" VIEW_JOB="*"
MODIFY_JOB="*" JOB_QUEUE="default" .
Job **JOBID**="job_201111060121_0001" JOB_PRIORITY="NORMAL" .
Job JOBID="job_201111060121_0001" LAUNCH_TIME="1320509913647" TOTAL_MAPS="1" TOTAL_REDUCES="0"
JOB_STATUS="PREP" .
Task **TASKID**="task_201111060121_0001_m_000002" TASK_TYPE="SETUP" **START_TIME**="1320509913881" SPLITS="" .
MapAttempt TASK_TYPE="SETUP" TASKID="task_201111060121_0001_m_000002"
**TASK_ATTEMPT_ID**="attempt_201111060121_0001_m_000002_0" START_TIME="1320509915561"
TRACKER_NAME="tracker_CentOS:CentOS/127\.0\.0\.1:59707" HTTP_PORT="50060" .
MapAttempt TASK_TYPE="SETUP" TASKID="task_201111060121_0001_m_000002"
TASK_ATTEMPT_ID="attempt_201111060121_0001_m_000002_0" TASK_STATUS="SUCCESS" FINISH_TIME="1320509918642"
HOSTNAME="/default-rack/CentOS" STATE_STRING="setup" COUNTERS="{(FileSystemCounters)(FileSystemCounters)
[(**FILE_BYTES_WRITTEN**)(FILE_BYTES_WRITTEN)(81235)]}{(org\.apache\.hadoop\.mapred\.Task$Counter)(Map-Reduce
Framework)[(SPILLED_RECORDS)(Spilled Records)(0)]}" .
Task TASKID="task_201111060121_0001_m_000002" TASK_TYPE="SETUP" **TASK_STATUS**="SUCCESS"
FINISH_TIME="1320509918715" COUNTERS="{(FileSystemCounters)(FileSystemCounters)[(FILE_BYTES_WRITTEN)
(FILE_BYTES_WRITTEN)(81235)]}{(org\.apache\.hadoop\.mapred\.Task$Counter)(Map-Reduce Framework)[(SPILLED_RECORDS)
(Spilled Records)(0)]}" .
Job JOBID="job_201111060121_0001" **JOB_STATUS**="RUNNING" .
Task TASKID="task_201111060121_0001_m_000000" TASK_TYPE="MAP" START_TIME="1320509918718" SPLITS="/default-rack/
CentOS" .
MapAttempt TASK_TYPE="MAP" TASKID="task_201111060121_0001_m_000000"
TASK_ATTEMPT_ID="attempt_201111060121_0001_m_000000_0" START_TIME="1320509918725"
TRACKER_NAME="tracker_CentOS:CentOS/127\.0\.0\.1:59707" HTTP_PORT="50060" .
MapAttempt TASK_TYPE="MAP" TASKID="task_201111060121_0001_m_000000"
TASK_ATTEMPT_ID="attempt_201111060121_0001_m_000000_0" TASK_STATUS="SUCCESS" FINISH_TIME="1320509921984"
HOSTNAME="/default-rack/CentOS" STATE_STRING="/rhive/data/emp\.txt:0+33" COUNTERS="{(org\.apache\.hadoop\.hive\.ql\.exec
\.Operator$ProgressCounter)(org\.apache\.hadoop\.hive\.ql\.exec\.Operator$ProgressCounter)[(CREATED_FILES)(CREATED_FILES)(1)]}
{(FileSystemCounters)(FileSystemCounters)[(HDFS_BYTES_READ)(**HDFS_BYTES_READ**)(512)][(FILE_BYTES_WRITTEN)
(**FILE_BYTES_WRITTEN**)(81235)][(HDFS_BYTES_WRITTEN)(HDFS_BYTES_WRITTEN)(37)]}{(org\.apache\.hadoop\.hive\.ql\.exec
\.MapOperator$Counter)(org\.apache\.hadoop\.hive\.ql\.exec\.MapOperator$Counter)[(DESERIALIZE_ERRORS)(DESERIALIZE_ERRORS)
(0)]}{(org\.apache\.hadoop\.mapred\.Task$Counter)(Map-Reduce Framework)[(MAP_INPUT_RECORDS)(Map input records)(8)]
[(SPILLED_RECORDS)(Spilled Records)(0)][(MAP_INPUT_BYTES)(Map input bytes)(0)][(MAP_OUTPUT_RECORDS)(Map output
records)(0)][(SPLIT_RAW_BYTES)(SPLIT_RAW_BYTES)(173)]}" .
Task TASKID="task_201111060121_0001_m_000000" TASK_TYPE="MAP" TASK_STATUS="SUCCESS" FINISH_TIME="1320509922187"
COUNTERS="{(org\.apache\.hadoop\.hive\.ql\.exec\.Operator$ProgressCounter)(org\.apache\.hadoop\.hive\.ql\.exec\.Operator
$ProgressCounter)[(CREATED_FILES)(CREATED_FILES)(1)]}{(FileSystemCounters)(FileSystemCounters)[(HDFS_BYTES_READ)
(HDFS_BYTES_READ)(512)][(FILE_BYTES_WRITTEN)(FILE_BYTES_WRITTEN)(81235)][(HDFS_BYTES_WRITTEN)
(HDFS_BYTES_WRITTEN)(37)]}{(org\.apache\.hadoop\.hive\.ql\.exec\.MapOperator$Counter)(org\.apache\.hadoop\.hive\.ql\.exec
\.MapOperator$Counter)[(DESERIALIZE_ERRORS)(DESERIALIZE_ERRORS)(0)]}{(org\.apache\.hadoop\.mapred\.Task$Counter)(Map-
Reduce Framework)[(MAP_INPUT_RECORDS)(Map input records)(8)][(SPILLED_RECORDS)(Spilled Records)(0)]
[(MAP_INPUT_BYTES)(Map input bytes)(0)][(MAP_OUTPUT_RECORDS)(Map output records)(0)][(SPLIT_RAW_BYTES)
(SPLIT_RAW_BYTES)(173)]}" .
Task TASKID="task_201111060121_0001_m_000001" TASK_TYPE="CLEANUP" START_TIME="1320509922192" SPLITS="" .
MapAttempt TASK_TYPE="CLEANUP" TASKID="task_201111060121_0001_m_000001"
TASK_ATTEMPT_ID="attempt_201111060121_0001_m_000001_0" START_TIME="1320509922195"
TRACKER_NAME="tracker_CentOS:CentOS/127\.0\.0\.1:59707" HTTP_PORT="50060" .
MapAttempt TASK_TYPE="CLEANUP" TASKID="task_201111060121_0001_m_000001"
TASK_ATTEMPT_ID="attempt_201111060121_0001_m_000001_0" TASK_STATUS="SUCCESS" FINISH_TIME="1320509924764"
HOSTNAME="/default-rack/CentOS" STATE_STRING="cleanup" COUNTERS="{(FileSystemCounters)(FileSystemCounters)
[(FILE_BYTES_WRITTEN)(FILE_BYTES_WRITTEN)(81235)]}{(org\.apache\.hadoop\.mapred\.Task$Counter)(Map-Reduce Framework)
[(SPILLED_RECORDS)(Spilled Records)(0)]}" .
Task TASKID="task_201111060121_0001_m_000001" TASK_TYPE="CLEANUP" TASK_STATUS="SUCCESS"
FINISH_TIME="1320509925033" COUNTERS="{(FileSystemCounters)(FileSystemCounters)[(FILE_BYTES_WRITTEN)
(FILE_BYTES_WRITTEN)(81235)]}{(org\.apache\.hadoop\.mapred\.Task$Counter)(Map-Reduce Framework)[(SPILLED_RECORDS)
(Spilled Records)(0)]}" .

JobID to Task Attempt ID
Mapping JobID to Task Attempt ID
Gather System Counters

- Hive
  - Hive plan
  - Hive log
- Hadoop
  - MapReduce monitoring
  - Hadoop job log
- System

# How to find out the reason ?



CPU/Memory/Disk usage related with JobID

- Hive
  - Hive plan
  - Hive log
- Hadoop
  - MapReduce monitoring
  - Hadoop job log
- System

# Hawk Features

- **Performance Data Collector**
  - gathering hive / hadoop / sytem log
  - gathering hadoop / system metric

- **Performance Report / Monitoring**
  - Performance Report
    - hourly / daily / weekly / monthly report
  - Performance Analysis
    - Correlate related performance data (hive log, job log, mapreduce metric)

- **Hive Plan Analyzer**
  - Summarize hive system environment
  - Summarize hive query plan similar to Oracle plan
  - Correlate hive query plan to performance data
  - Query history management

# Architecture
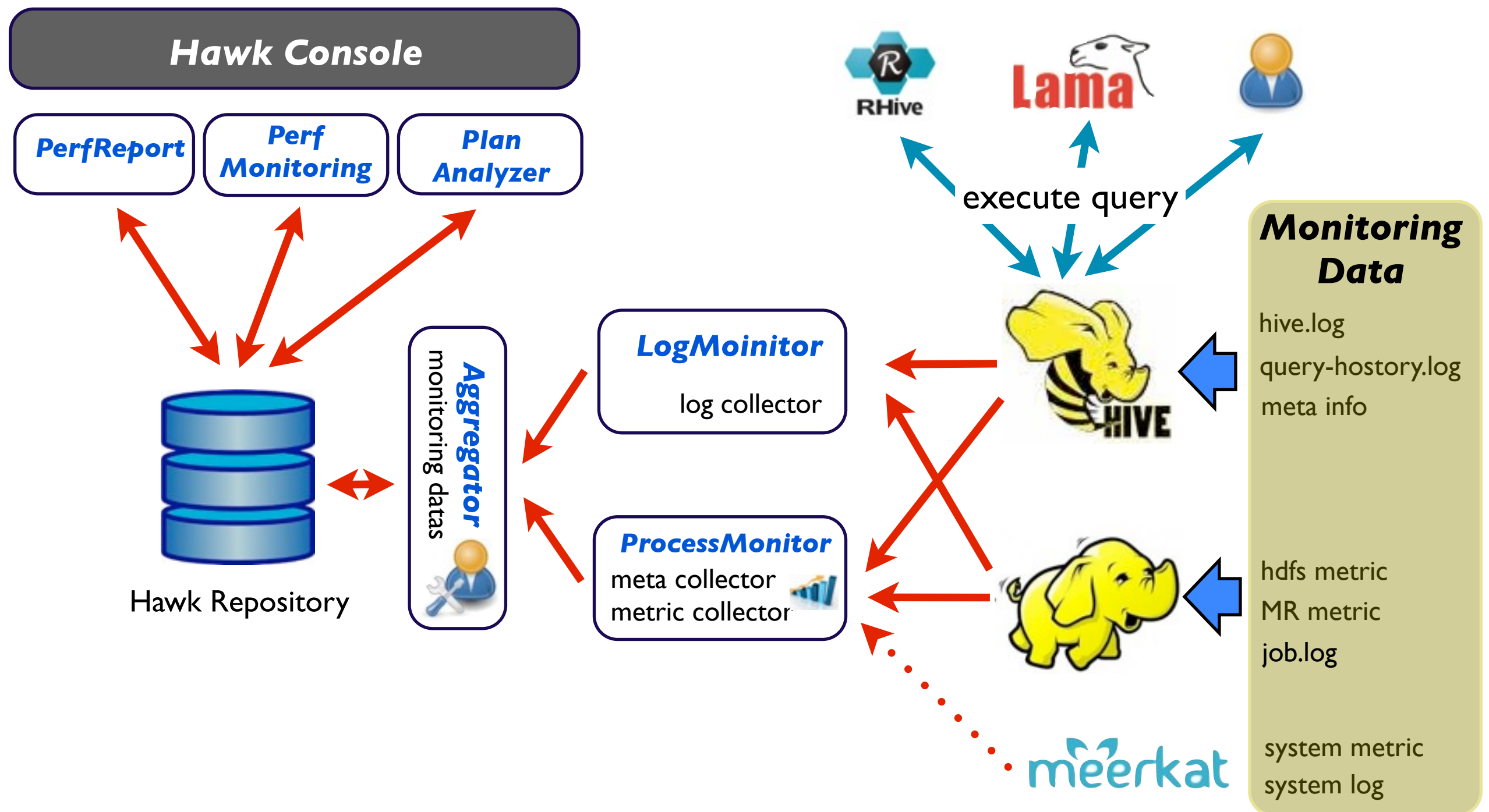


Hawk Console

PerfReport    Perf Monitoring    Plan Analyzer

Aggregator
monitoring datas

Hawk Repository

LogMoinitor
log collector

ProcessMonitor
meta collector
metric collector

RHive    Lama

execute query

HIVE

meerkat

**Monitoring Data**

hive.log
query-hostory.log
meta info

hdfs metric
MR metric
job.log

system metric
system log

# Hawk Plan Analyzer

# UseCase

## 8 Nodes Hadoop Cluster
## # of Concurrent Reduce Task is 4

## Hive Query

```
CREATE TABLE TMP_VOICE
ROW FORMAT SERDE 'org.apache.hadoop.hive.serde2.columnar.ColumnarSerDe' STORED AS RCFILE
AS
SELECT yyyymmdd, substr(yyyymmdd,1,6) yy    m, weekly, id, bits, call, rank
FROM (
    SELECT ((yyyymmdd, weekly, id,
    FROM TMP_LOCAL_REAL_CUST k1
    UNION ALL
    SELECT yyyymmdd, weekly, id, bi
    FROM TMP_WORLD_REAL_CUST k2
    ) X
DISTRIBUTE BY HASH(X.yyyymmdd,X.id)
SORT BY X.yyyymmdd, X.id, X.call DESC , X.bits DESC
) t ) k2 WHERE   rank <= 10;
```

SLOW

# How to find out bottleneck using Hawk

Hive Configuration
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
false = hive.auto.convert.join
false = hive.exec.compress.intermediate
false = hive.exec.compress.output
false = hive.exec.dynamic.partition
false = hive.exec.parallel

## 1000000000 = hive.exec.reducers.bytes.per.reducer

org.apache.hadoop.hive.ql.io.CombineHiveInputF... = hive.input.format
100000 = hive.mapjoin.maxsize
25000000 = hive.mapjoin.smalltable.filesize
true = hive.mapred.reduce.tasks.speculative.execution
true = hive.optimize.cp
true = hive.optimize.groupby
true = hive.optimize.ppd
true = hive.optimize.pruner
false = hive.optimize.skewjoin
-1 = mapred.reduce.tasks

```
+----+-------------------+---------------------------+--------+-----------------+----------------+-----------+---------+--------+
| ID|STEP               |TABLE                      |MR JOB|       MR ROWS|        MR BYTES|       FILE|     HDFS|    TIME|
+----+-------------------+---------------------------+--------+-----------------+----------------+-----------+---------+--------+
|  1|MAPRED (Stage-1)    |                           |      |               |                |           |         |00:04:18|
|  2|  MAP              |                           |     7| 44.4M/44.4M(-/-)|     973.0M/3.9G|   3.9G/7.9G|   1.5G/-|00:06:09|
|  3|    TABLESCAN      |TMP_LOCAL_REAL_CUST (k1)   |      |               |                |           |         |       -|
|  4|    TABLESCAN      |TMP_WORLD_REAL_CUST (k2)   |      |               |                |           |         |       -|
|  5|  REDUCE           |                           |     2|        44.4M/-|          (3.3G)|   4.0G/4.0G|   -/1.6G|00:07:52|
|    |                   |                           |      |               |                |           |         |        |
|  6|MOVE (Stage-0)      |                           |      |               |                |           |         |00:00:00|
|    |                   |                           |      |               |                |           |         |        |
|  7|DDL (Stage-3)       |                           |      |               |                |           |         |00:00:01|
+----+-------------------+---------------------------+--------+-----------------+----------------+-----------+---------+--------+

Predicate Information (Identified by operation ID) :
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

  5 - FILTER - (_col5 <= 10)
```

# How to find out bottleneck using Hawk

```
+----+----------------------+------------------------+--------+----------------+------------------+-----------+---------+----------+
| ID|STEP                   |TABLE                   |MR JOB|       MR ROWS|        MR BYTES|      FILE|     HDFS|     TIME|
+----+----------------------+------------------------+--------+----------------+------------------+-----------+---------+----------+
| 1|MAPRED (Stage-1)       |                        |      |                |                  |          |         |00:04:18 |
| 2|  MAP                  |                        |     7| 44.4M/44.4M(-/-)|      973.0M/3.9G|   3.9G/7.9G|   1.5G/-|00:00:09 |
| 3|    TABLESCAN          |TMP_LOCAL_REAL_CUST (k1)|      |                |                  |          |         |        -|
| 4|    TABLESCAN          |TMP_WORLD_REAL_CUST (k2)|      |                |                  |          |         |        -|
| 5|  REDUCE               |                        |     2|        44.4M/-|            (3.3G)|   4.0G/4.0G|   -/1.6G|00:07:52 |
+----+----------------------+------------------------+--------+----------------+------------------+-----------+---------+----------+
| 6|MOVE (Stage-0)         |                        |      |                |                  |          |         |00:00:00 |
+----+----------------------+------------------------+--------+----------------+------------------+-----------+---------+----------+
| 7|DDL (Stage-3)          |                        |      |                |                  |          |         |00:00:01 |
+----+----------------------+------------------------+--------+----------------+------------------+-----------+---------+----------+
```

```
Predicate Information (Identified by operation ID) :
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
  5 - FILTER - (_col5 <= 10)
```

- set 'hive.exec.reducer.bytes.per.reducer=10000000' (1GB -> 100MB)

```
+----+----------------------+------------------------+--------+----------------+------------------+-----------+---------+----------+
| ID|STEP                   |TABLE                   |MR JOB|       MR ROWS|        MR BYTES|      FILE|     HDFS|     TIME|
+----+----------------------+------------------------+--------+----------------+------------------+-----------+---------+----------+
| 1|MAPRED (Stage-1)       |                        |      |                |                  |          |         |00:01:56 |
| 2|  MAP                  |                        |     7| 44.4M/44.4M(-/-)|      973.0M/3.9G|   4.0G/7.9G|   1.5G/-|00:06:19 |
| 3|    TABLESCAN          |TMP_LOCAL_REAL_CUST (k1)|      |                |                  |          |         |        -|
| 4|    TABLESCAN          |TMP_WORLD_REAL_CUST (k2)|      |                |                  |          |         |        -|
| 5|  REDUCE               |                        |    15|        44.4M/-|            (3.3G)|   4.0G/4.0G|   -/1.6G|00:22:45 |
+----+----------------------+------------------------+--------+----------------+------------------+-----------+---------+----------+
| 6|MOVE (Stage-0)         |                        |      |                |                  |          |         |00:00:00 |
+----+----------------------+------------------------+--------+----------------+------------------+-----------+---------+----------+
| 7|DDL (Stage-3)          |                        |      |                |                  |          |         |00:00:00 |
+----+----------------------+------------------------+--------+----------------+------------------+-----------+---------+----------+
```

NEXR
TOWARD OPEN PLATFORM

hawk

# Hawk Monitoring

```
hawk> history -day 10 -s elapsed_time -top 10 -desc
```

| WorkName | Type | StartTime | Elapsed |
|----------|------|-----------|---------|
| nexr_20111031013333_347bd21a-809f-4b95-9335-2fb25ca48be9 | HIVE_JOB | 2011-10-31 01:33:26.0 | 10854 sec |
| nexr_20111031012525_8c4b97a7-fe2c-4c12-ab47-788c68f4438d | HIVE_JOB | 2011-10-31 01:25:01.0 | 505 sec |
| nexr_20111103122727_613c6904-b95d-42ba-9dd0-8d10448132c1 | HIVE_JOB | 2011-11-03 12:27:44.0 | 494 sec |
| nexr_20111103114040_6d36c088-54c2-44f0-aabe-468dcc70cf34 | HIVE_JOB | 2011-11-03 11:40:45.0 | 470 sec |
| nexr_20111101220101_a7a0cec3-a4fe-4283-8def-e483528b4999 | HIVE_JOB | 2011-11-01 22:01:32.0 | 326 sec |
| nexr_20111102192727_78c44bb8-4a4b-4458-b97e-31f768b32fbf | HIVE_JOB | 2011-11-02 19:27:06.0 | 318 sec |
| nexr_20111102193636_b4e32c87-989b-402b-8f00-68dfc3d452b0 | HIVE_JOB | 2011-11-02 19:36:24.0 | 284 sec |
| nexr_20111031083939_c551ccb7-5ce4-40cb-8669-046f23482dcb | HIVE_JOB | 2011-10-31 08:39:58.0 | 244 sec |
| nexr_20111102182323_9f04514e-7da7-445d-9e7f-e8c0e2dbf5c8 | HIVE_JOB | 2011-11-02 18:23:08.0 | 236 sec |
| nexr_20111031074747_dc20db4e-62bb-4b5e-b52b-b85427402479 | HIVE_JOB | 2011-10-31 07:47:30.0 | 230 sec |

```
hawk> metric -n nexr_20111103122727_613c6904-b95d-42ba-9dd0-8d10448132c1 -c MAP_INPUT_RECORDS,MAP_INPUT_BYTES,FILE_BYTES_READ
```

| TimeStamp | MAP_INPUT_RECORDS | MAP_INPUT_BYTES | FILE_BYTES_READ |
|-----------|-------------------|-----------------|-----------------|
| 2011-11-03 12:27:50.0 | 0 | 0 | 0 |
| 2011-11-03 12:27:55.0 | 0 | 0 | 0 |
| 2011-11-03 12:28:00.0 | 781769 | 25622343 | 0 |
| 2011-11-03 12:28:05.0 | 30226426 | 891339946 | 0 |
| 2011-11-03 12:28:10.0 | 30226426 | 891339946 | 0 |
| 2011-11-03 12:28:15.0 | 47213583 | 1371490355 | 40632320 |
| 2011-11-03 12:28:20.0 | 131044562 | 3788847892 | 5418582484 |
| 2011-11-03 12:28:25.0 | 141485193 | 4093985561 | 5804067416 |
| 2011-11-03 12:28:30.0 | 141485193 | 4093985561 | 5804067416 |
| 2011-11-03 12:28:35.0 | 170018501 | 4942812887 | 7355840354 |
| 2011-11-03 12:28:40.0 | 170018501 | 4942812887 | 7355840354 |
| 2011-11-03 12:28:45.0 | 176952495 | 5138310773 | 8131961290 |

# Hawk Report

```
---------------------------------------------------------------------------------------------------------
| Day Of Week      | HiveJob Count  | MR MapTask Count | MR ReduceTask Count |        Elapsed Time |
---------------------------------------------------------------------------------------------------------
| Monday           | 2             | 64              | 29               |                     |
| Sunday           | 17            | 9               | 11               |            165 sec  |
| Thursday         | 14            | 666             | 197              |           1152 sec  |
| Tuesday          | 54            | 1993            | 552              |           3102 sec  |
| Wednesday        | 144           | 3623            | 1009             |          17092 sec  |
---------------------------------------------------------------------------------------------------------
```

How many hive queries were launched last week ?

# Hawk Report

| Day | HiveJob Count | MR MapTask Count | MR ReduceTask Count | Elapsed Time |
|-----|---------------|------------------|---------------------|--------------|
| 2011/10/26 | | | | 6468 sec |
| 2011/10/2 | 14 | | | 1152 sec |
| 2011/10/30 | 17 | 5 | 11 | 165 sec |
| 2011/10/31 | 72 | 1664 | 297 | 13980 sec |
| 2011/11/01 | 54 | 1993 | 552 | 3102 sec |
| 2011/11/02 | 99 | 26 | 37 | 624 sec |

How many MapReduces ran last night ?

# Hawk Report

| Day | HiveJob Count | MR MapTask Count | MR ReduceTask Count | Elapsed Time |
|-----|---------------|------------------|---------------------|--------------|
| 2011/10/30 | 17 | 5 | 11 | 165 sec |
| 2011/11/01 | 54 | 1993 | 552 | 3102 sec |
| 2011/11/02 | 99 | 26 | 37 | 624 sec |

## How long did hive queries run 2 days ago ?

# Hawk Report

| StartTime | WorkName | Type | Query | MR MapTask Count | MR ReduceTask Count | Elapsed Time |
|---|---|---|---|---|---|---|
| 2011-11-01 09:3 :2 .0 | nexr_2011 10109544 f096078-3820-49f7-aeb5-0ff42e862ef | HIVE_JOB | select E. t_ind_cd, count(1) | 2 | 1 | 504 sec |
| 2011-11-01 22:154 .0 | 2011 10122155 .4 -4 | VE_ B | REAT ABL IF N EX S 7 | | | 254 sec |
| 2011-11-01 22:19: 5.0 | 2011 10122195 ce575 2- 1 -48 1 3 db 4c 188 | IVE_ B | CREATE ABLE I N IST 2 6 | | | 247 sec |
| 2011-11-01 22:11:11.0 | nexr_20111101221111_da5771a4-c8c4-4f33- d9d-7ae11e8cfd16 | HIVE_JOB | CREATE TABLE Z_SQD_WCD L_CU | 58 | 17 | 240 sec |
| 2011-11-01 22:28:23.0 | nexr_20111101222828_ad246f78-1170-429d-9807-de443c358699 | HIVE_JOB | CREATE TABLE z_ipas_sbf_sqd_dd | 678 | 182 | 220 sec |
| 2011-11-01 22:06:58.0 | nexr_20111101220606_05b94957-9017-41a0-a21d-708e437c2028 | HIVE_JOB | CREATE TABLE z_sqd_call_ncn | 130 | 37 | 194 sec |
| 2011-11-01 10:30:07.0 | nexr_20111101103030_e65e08a1-5cda-48ff-a34f-b11d04936b30 | HIVE_JOB | select E.net_ind_cd, count(1) | 3 | 2 | 170 sec |
| 2011-11-01 22:25:58.0 | nexr_20111101222525_fc192ca7-dab1-4165-94c7-16162574271d | HIVE_JOB | CREATE TABLE IF NOT EXISTS z_v | 33 | 9 | 145 sec |
| 2011-11-01 19:15:29.0 | nexr_20111101191515_4f4b2e30-1517-4481-b24f-6d50d472f236 | HIVE_JOB | SELECT COUNT(1) cnt FROM ( SEL | 34 | 10 | 94 sec |

## Which hive queries ran longest yesterday ?

# Future Works

- GUI based hawk tool

- Integrate with meerkat for system monitoring

- Monitoring hive lock manager

- Performance Event alarm

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