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MySQL 性能调优工具介绍与应用

DBA 王洪权

mydbalife@gmail.com

美河学习在线 www.eimhe.com

内容概要

- 一 mysql awr报告（简单的AWR,mysqltuner.pl,tuning-primer.sh pt-query-digest,pt-variable-advisor）
- 二 性能分析工具介绍（mytop,innotop,orzdba,tcpdump,pt-query-digest,tbdba-slow-picker.pl,iotop,io-profile,nicstat,mpstat,iostat,vmstat,tcprstat,dstat,oprofile,vmtouch）
- 三 主从复制延时解决（relay-fetch 介绍）
- 问答

工具化的启发

- 工具化的重要性（熟练运用已有的工具，可以快速对数据库进行诊断，时刻了解你的数据库的运行状况）

mysqltuner.pl 给mysql做个简单报告

```
[root@yz2037 ~]# ./mysqltuner.pl --socket /tmp/mysql_user.sock

 >>  MySQLTuner 1.2.0 - Major Hayden <major@mhtx.net>
 >>  Bug reports, feature requests, and downloads at http://mysqltuner.com/
 >>  Run with '--help' for additional options and output filtering
[!!] Successfully authenticated with no password - SECURITY RISK!

-------- General Statistics --------------------------------------------------
[--] Skipped version check for MySQLTuner script
[OK] Currently running supported MySQL version 5.5.12-log
[OK] Operating on 64-bit architecture

-------- Storage Engine Statistics -------------------------------------------
[--] Status: +Archive -BDB -Federated +InnoDB -ISAM -NDBCluster
[--] Data in MyISAM tables: 33G (Tables: 320)
[--] Data in MRG_MYISAM tables: 14G (Tables: 3)
[--] Data in InnoDB tables: 15G (Tables: 32)
[--] Data in PERFORMANCE_SCHEMA tables: 0B (Tables: 17)
[--] Data in MEMORY tables: 3M (Tables: 5)
[!!] Total fragmented tables: 89

-------- Security Recommendations  -------------------------------------------
[!!] User '@localhost' has no password set.
[!!] User '@yz2037.puppetclient.163.com' has no password set.
[!!] User 'root@127.0.0.1' has no password set.
[!!] User 'root@::1' has no password set.
[!!] User 'root@localhost' has no password set.
[!!] User 'root@yz2037.puppetclient.163.com' has no password set.
```

mysqltuner.pl 给mysql做个简单报告

```
[--] Reads / Writes: 72% / 28%
[--] Total buffers: 6.0G global + 16.4M per thread (1000 max threads)
[!!] Maximum possible memory usage: 22.0G (282% of installed RAM)
[OK] Slow queries: 0% (60K/2B)
[!!] Highest connection usage: 100%  (1001/1000)
[OK] Key buffer size / total MyISAM indexes: 4.0G/13.8G
[OK] Key buffer hit rate: 100.0% (58B cached / 26M reads)
[!!] Query cache is disabled
[OK] Sorts requiring temporary tables: 0% (0 temp sorts / 320M sorts)
[OK] Temporary tables created on disk: 0% (27K on disk / 21M total)
[OK] Thread cache hit rate: 99% (5K created / 10M connections)
[!!] Table cache hit rate: 0% (5K open / 1M opened)
[OK] Open file limit used: 9% (6K/65K)
[OK] Table locks acquired immediately: 99% (10B immediate / 10B locks)
[!!] InnoDB data size / buffer pool: 15.1G/2.0G

-------- Recommendations -----------------------------------------------------
General recommendations:
    Run OPTIMIZE TABLE to defragment tables for better performance
    Reduce your overall MySQL memory footprint for system stability
    Reduce or eliminate persistent connections to reduce connection usage
    Increase table_cache gradually to avoid file descriptor limits
Variables to adjust:
  *** MySQL's maximum memory usage is dangerously high ***
  *** Add RAM before increasing MySQL buffer variables ***
    max_connections (> 1000)
    wait_timeout (< 28800)
    interactive_timeout (< 28800)
    query_cache_size (>= 8M)
    table_cache (> 6000)
    innodb_buffer_pool_size (>= 15G)
```

tuning-primer.sh

```
[root@yz2037 mysqlhome]# ./tuning-primer.sh

Using login values from ~/.my.cnf
- INITIAL LOGIN ATTEMPT FAILED -
Testing for stored webmin passwords:
 None Found
Could not auto detect login info!
Found potential sockets: /tmp/mysql_user.sock
Using: /tmp/mysql.sock
Would you like to provide a different socket?: [y/N] y
Socket: /tmp/mysql.sock
Do you have your login handy ? [y/N] : y
User: root
Password:

Would you like me to create a ~/.my.cnf file for you? [y/N] : y

         -- MYSQL PERFORMANCE TUNING PRIMER --
              - By: Matthew Montgomery -

MySQL Version 5.5.12-log x86_64

Uptime = 221 days 13 hrs 59 min 59 sec
Avg. qps = 144
Total Questions = 2767937822
Threads Connected = 48

Server has been running for over 48hrs.
It should be safe to follow these recommendations

To find out more information on how each of these
runtime variables effects performance visit:
http://dev.mysql.com/doc/refman/5.5/en/server-system-variables.html
Visit http://www.mysql.com/products/enterprise/advisors.html
for info about MySQL's Enterprise Monitoring and Advisory Service

SLOW QUERIES
The slow query log is enabled.
Current long_query_time = 3.000000 sec.
You have 60753 out of 2767937845 that take longer than 3.000000 sec. to complete
Your long_query_time seems to be fine

BINARY UPDATE LOG
The binary update log is enabled
Binlog sync is not enabled, you could loose binlog records during a server crash

WORKER THREADS
Current thread_cache_size = 256
Current threads_cached = 225
Current threads_per_sec = 0
Historic threads_per_sec = 0
Your thread_cache_size is fine
```

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tuning-primer.sh

```
MAX CONNECTIONS
Current max_connections = 1000
Current threads_connected = 48
Historic max_used_connections = 1001
The number of used connections is 100% of the configured maximum.
You should raise max_connections

INNODB STATUS
Current InnoDB index space = 2.99 G
Current InnoDB data space = 15.06 G
Current InnoDB buffer pool free = 0 %
Current innodb_buffer_pool_size = 2.00 G
Depending on how much space your innodb indexes take up it may be safe
to increase this value to up to 2 / 3 of total system memory

MEMORY USAGE
Max Memory Ever Allocated : 22.05 G
Configured Max Per-thread Buffers : 16.02 G
Configured Max Global Buffers : 6.01 G
Configured Max Memory Limit : 22.03 G
Physical Memory : 7.79 G

Max memory limit exceeds 90% of physical memory

KEY BUFFER
Current MyISAM index space = 13.77 G
Current key_buffer_size = 4.00 G
Key cache miss rate is 1 : 2186
Key buffer free ratio = 0 %
You could increase key_buffer_size
It is safe to raise this up to 1/4 of total system memory;
assuming this is a dedicated database server.

QUERY CACHE
Query cache is supported but not enabled
Perhaps you should set the query_cache_size

SORT OPERATIONS
Current sort_buffer_size = 4 M
Current read_rnd_buffer_size = 8 M
Sort buffer seems to be fine

JOINS
Current join_buffer_size = 132.00 K
You have had 31 queries where a join could not use an index properly
You should enable "log-queries-not-using-indexes"
Then look for non indexed joins in the slow query log.
If you are unable to optimize your queries you may want to increase your
join_buffer_size to accommodate larger joins in one pass.
```

```
Note! This script will still suggest raising the join_buffer_size when
ANY joins not using indexes are found.

OPEN FILES LIMIT
Current open_files_limit = 65536 files
The open_files_limit should typically be set to at least 2x-3x
that of table_cache if you have heavy MyISAM usage.
Your open_files_limit value seems to be fine

TABLE CACHE
Current table_open_cache = 6000 tables
Current table_definition_cache = 400 tables
You have a total of 401 tables
You have 5992 open tables.
Current table_cache hit rate is 0%
, while 99% of your table cache is in use
You should probably increase your table_cache
You should probably increase your table_definition_cache value.

TEMP TABLES
Current max_heap_table_size = 128 M
Current tmp_table_size = 32 M
Of 20999245 temp tables, 0% were created on disk
Created disk tmp tables ratio seems fine

TABLE SCANS
Current read_buffer_size = 4 M
Current table scan ratio = 2 : 1
read_buffer_size seems to be fine

TABLE LOCKING
Current Lock Wait ratio = 1 : 183
You may benefit from selective use of InnoDB.
If you have long running SELECT's against MyISAM tables and perform
frequent updates consider setting 'low_priority_updates=1'
```

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pt-variable-advisor 诊断你的参数设置是否合理

```
[root@yz2037 mysqlhome]# pt-variable-advisor localhost  --defaults-file=/home/mysql_user/mysqlhome/my.cnf --socket=/tmp/mysql_user.sock
# NOTE concurrent_insert: Holes (spaces left by deletes) in MyISAM tables might never be reused.
# WARN delay_key_write: MyISAM index blocks are never flushed until necessary.
# WARN innodb_flush_log_at_trx_commit-1: InnoDB is not configured in strictly ACID mode.
# WARN innodb_flush_log_at_trx_commit-2: Setting innodb_flush_log_at_trx_commit to 0 has no performance benefits over setting it to 2, and more
# NOTE innodb_max_dirty_pages_pct: The innodb_max_dirty_pages_pct is lower than the default.
# NOTE log_warnings-2: Log_warnings must be set greater than 1 to log unusual events such as aborted connections.
# NOTE max_connect_errors: max_connect_errors should probably be set as large as your platform allows.
# NOTE read_buffer_size-1: The read_buffer_size variable should generally be left at its default unless an expert determines it is necessary to
# NOTE read_rnd_buffer_size-1: The read_rnd_buffer_size variable should generally be left at its default unless an expert determines it is neces
# WARN read_rnd_buffer_size-2: The read_rnd_buffer_size variable should not be larger than 4M.
# WARN slave_net_timeout: This variable is set too high.
# NOTE sort_buffer_size-1: The sort_buffer_size variable should generally be left at its default unless an expert determines it is necessary to
# NOTE innodb_data_file_path: Auto-extending InnoDB files can consume a lot of disk space that is very difficult to reclaim later.
# NOTE innodb_flush_method: Most production database servers that use InnoDB should set innodb_flush_method to O_DIRECT to avoid double-bufferin
formance.
# WARN myisam_recover_options: myisam_recover_options should be set to some value such as BACKUP,FORCE to ensure that table corruption is notice
# WARN sync_binlog: Binary logging is enabled, but sync_binlog isn't configured so that every transaction is flushed to the binary log for durab
```

pt-qury-digest给mysql做个简单SQL报告

```
[root@yz2037 ~]# pt-query-digest /home/mysql_user/mysqlhome/data/yz2037-slow.log  >mysql_slow.log
/home/mysql_user/mysqlhome/data/yz2037-slow.log:  33% 00:59 remain
/home/mysql_user/mysqlhome/data/yz2037-slow.log:  69% 00:26 remain
```

```
# 87.1s user time, 290ms system time, 37.31M rss, 172.19M vsz
# Current date: Wed Mar 27 15:56:11 2013
# Hostname: yz2037.puppetclient.163.com
# Files: /home/mysql_user/mysqlhome/data/yz2037-slow.log
# Overall: 167.33k total, 187 unique, 0.00 QPS, 0.08x concurrency _________
# Time range: 2011-12-30 01:00:04 to 2013-03-27 15:52:23
# Attribute          total     min     max     avg     95%  stddev  median
# ============     ======= ======= ======= ======= ======= ======= =======
# Exec time        3139323s      1s   3710s     19s     76s     33s       5s
# Lock time        358244s       0   3349s      2s      13s     15s   131us
# Rows sent        785.12k       0 122.18k    4.80    0.99  317.91       0
# Rows examine     321.22M       0   1.09M   1.97k   2.27k  26.37k    0.99
# Query size        27.68M       6  15.68k  173.47  329.68  218.22  174.84

# Profile
# Rank Query ID           Response time      Calls R/Call   Apdx V/M   Ite
# ==== ================== ================== ===== ======== ==== ===== ===
#    1 0x43BA35DB0521B787 1512839.4555 48.2% 67048  22.5635 0.20 39.48 UPDATE user_?
#    2 0x5A05A89C6756219F  786573.4090 25.1% 35034  22.4517 0.18 42.21 UPDATE user_?
#    3 0x87B33B81E7E57B39  246176.7726  7.8%  4364  56.4108 0.01  8.30 UPDATE user_?
#    4 0x734D26A3413A4824  120404.1923  3.8%  3046  39.5286 0.01 22.92 SELECT message_?
#    5 0x9BEA09AA093499B0   76683.7247  2.4%  1774  43.2265 0.07 18.58 INSERT user_?
#    6 0x2BA7A75FC9BB6375   72448.1015  2.3%  7429   9.7521 0.10  6.72 SELECT message_?
#    7 0x4442F9145E25FF51   64241.0485  2.0%  1742  36.8778 0.01  9.30 INSERT SELECT message_? user
#    8 0xE3C520B1594F06B5   30527.4246  1.0%  8075   3.7805 0.36  3.13 INSERT police.post_history
#    9 0x675A1D1F60F05CE7   22420.5229  0.7%  8717   2.5720 0.46  5.48 INSERT user_base_all
#   10 0x924FC1BF88DE6F5E   18810.7858  0.6%  3202   5.8747 0.29 11.38 INSERT message_?
#   11 0xF246A764B681590D   18407.5884  0.6%    28 657.4139 0.18 16... TRUNCATE TABLE img.img_acces
#   12 0xFE926C8DFF2A1BB5   15850.4181  0.5%  2207   7.1819 0.06  1.18 REPLACE img.img_post_stat
#   13 0xF71CA3C0D8C84DB9   14315.8803  0.5%  4417   3.2411 0.41  3.76 INSERT img.img_post
#   14 0xBA7A9E79453965FF   13488.9792  0.4%   467  28.8843 0.04 19.69 DELETE message_?
#   15 0xC92885DB7B97984F   10043.4878  0.3%   448  22.4185 0.02 11... DELETE reg_log
```

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mytop 查看你的mysql在做什么

```
? - display this screen
# - toggle short/long numbers (not yet implemented)
c - command summary view (based on Com_* counters)
d - show only a specific database
e - explain the query that a thread is running
f - show full query info for a given thread
F - unFilter the dispaly
h - show only a specifc host's connections
H - toggle the mytop header
i - toggle the display of idle (sleeping) threads
I - show innodb status
k - kill a thread
p - pause the display
m - switch [mode] to qps (queries/sec) scrolling view
o - reverse the sort order (toggle)
q - quit
r - reset the status counters (via FLUSH STATUS on your server)
s - change the delay between screen updates
t - switch to thread view (default)
u - show only a specific user
: - enter a command (not yet implemented)
```

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mytop 查看你的mysql在做什么

```
MySQL on localhost (5.5.12-log)                                                 up
 Queries: 2.6G   qps:  145 Slow:   59.3k          Se/In/Up/De(%):    49/13/05/00
           qps now:  231 Slow qps: 0.0  Threads:   47 (   4/ 226) 61/08/01/00
 Key Efficiency: 100.0%  Bps in/out: 16.9k/71.7k   Now in/out: 26.8k/115.8k

      Id      User         Host/IP         DB      Time    Cmd Query or State
       --      ----         -------          --      ----    --- ----------
 10485306    nextqq  192.168.51.220       user         0  Sleep
 10485433    nextqq  192.168.51.212       user         0  Sleep
 10485506    nextqq         profile       user         0  Sleep
 10485527    nextqq   10.100.21.202       user         0  Sleep
 10485549    nextqq  192.168.51.220       user         0  Sleep
 10485550    nextqq  192.168.51.133       user         0  Sleep
 10485551    nextqq         profile       user         0  Sleep
 10485553    nextqq   10.100.21.202       user         0  Sleep
 10485567    nextqq         profile       user         0  Sleep
 10485575    nextqq  192.168.51.181       user         0  Sleep
 10485591      root       localhost       test         0  Query show full processlist
 10485592    nextqq  192.168.51.181       user         0  Sleep
 10485593    nextqq  192.168.51.140       user         0  Sleep
 10485603    nextqq  192.168.51.133       user         0  Sleep
 10485605    nextqq  192.168.51.140       user         0  Sleep
```

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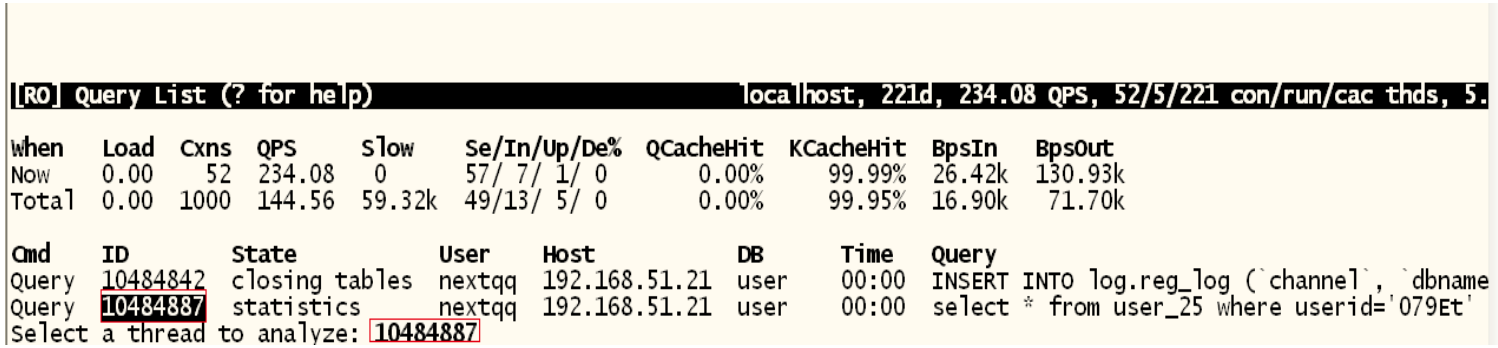
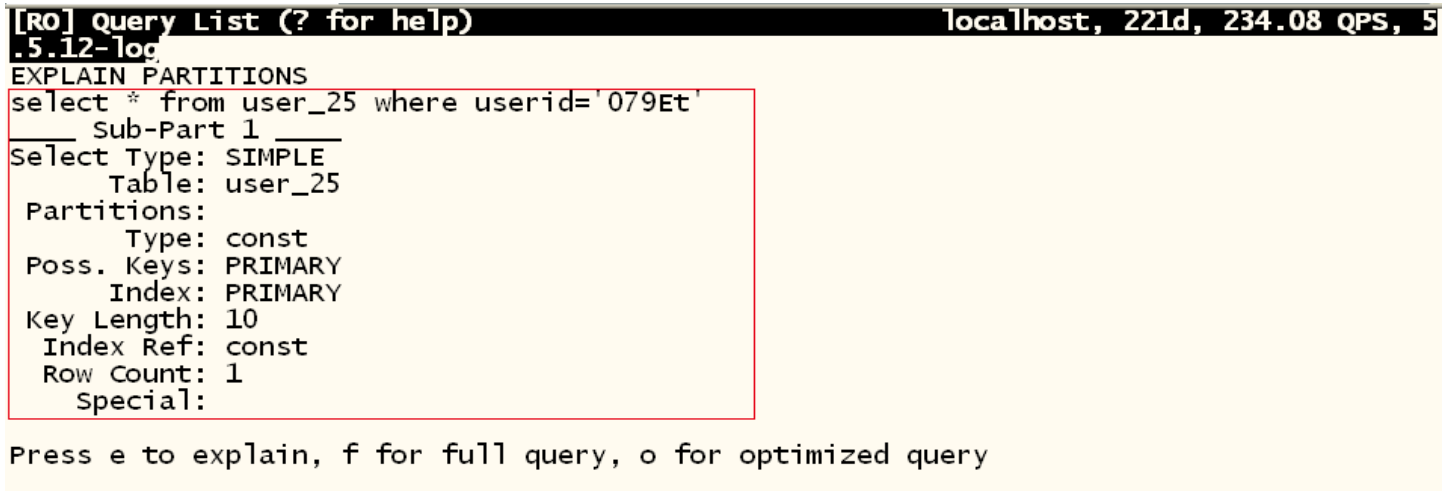
innotop 综合了解你的mysql（mytop加强版）

innotop -m Q





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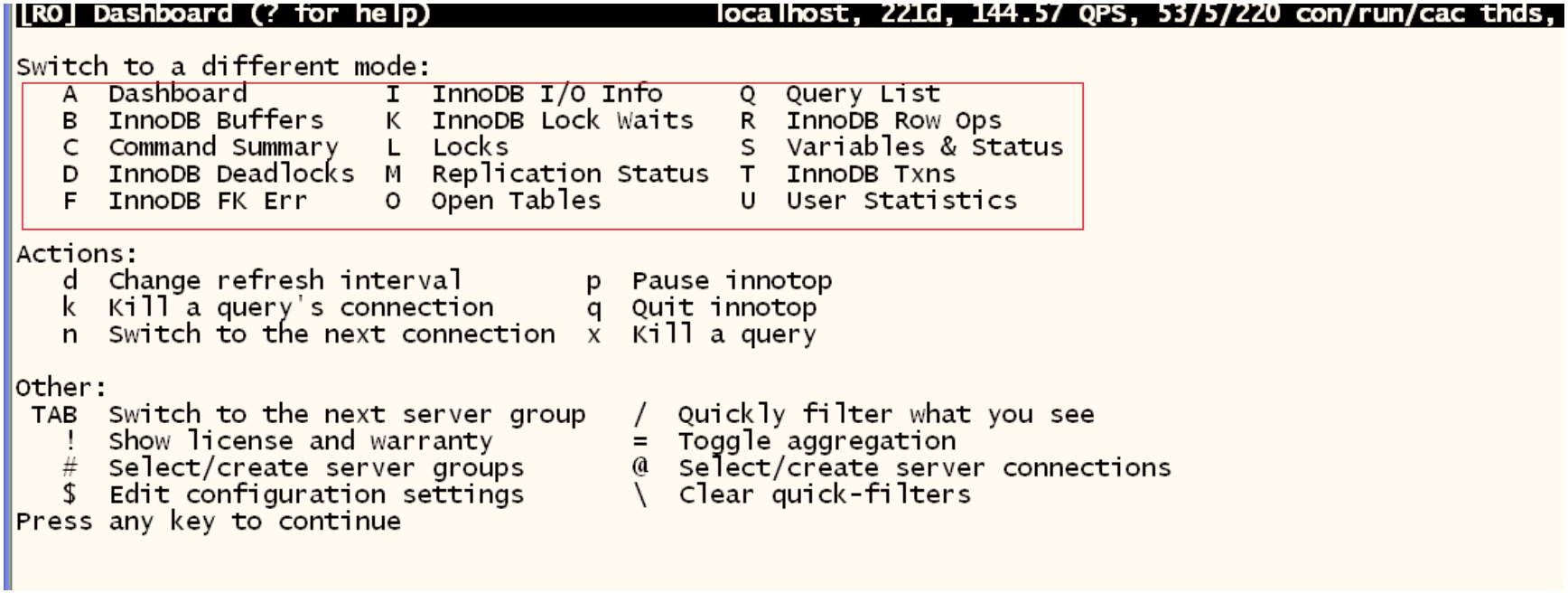
innotop 综合了解你的mysql（mytop加强版）



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orzdba 时刻了解你的数据库

```
[root@yz2037 mysqlhome]# orzdba -S /tmp/mysql_user.sock --mysql

.================================================.
|       Welcome to use the orzdba tool !         |
|          Yep...Chinese English~                |
'=============== Date : 2013-03-27 ===============

HOST: yz2037.puppetclient.163.com   IP: 10.100.20.37
DB  : img|log|mail|performance_schema|police|test_bbs|user
Var : binlog_format[STATEMENT] max_binlog_cache_size[17179869184G] max_binlog_size[1G]
      max_connect_errors[10] max_connections[1000] max_user_connections[0]
      open_files_limit[65536] sync_binlog[0] table_definition_cache[400]
      table_open_cache[6000] thread_cache_size[256]

      innodb_adaptive_flushing[ON] innodb_adaptive_hash_index[ON] innodb_buffer_pool_size[2G]
      innodb_file_per_table[OFF] innodb_flush_log_at_trx_commit[0] innodb_flush_method[]
      innodb_io_capacity[200] innodb_lock_wait_timeout[50] innodb_log_buffer_size[8M]
      innodb_log_file_size[512M] innodb_log_files_in_group[2] innodb_max_dirty_pages_pct[50]
      innodb_open_files[300] innodb_read_io_threads[4] innodb_thread_concurrency[0]
      innodb_write_io_threads[4]

--------                          -QPS- -TPS-          -Hit%- ------threads------ -----bytes----
  time   |  ins   upd   del     sel   iud|     lor     hit| run  con  cre  cac|    recv    send|
16:48:46|    0     0     0       0     0|       0  100.00|   0    0    0    0|       0       0|
16:48:47|   15     4     0     142    19|     128   99.22|   3   51    0  222|     28k    141k|
16:48:48|   21     4     0     177    25|     181   96.69|   4   50    0  223|     38k    188k|
16:48:49|   19     4     0     127    23|     471   99.15|   3   50    0  223|     24k    110k|
16:48:50|   20     2     0     146    22|     123   99.19|   4   50    0  223|     29k    141k|
16:48:52|   23     7     0     217    30|     242   97.52|   4   50    0  223|     42k    211k|
16:48:53|   17     2     0      59    19|      91   96.70|   3   50    0  223|     14k     78k|
16:48:54|   14     1     0     156    15|      94   98.94|   3   50    0  223|     22k    122k|
16:48:55|   27     2     0     264    29|     100   98.00|   4   49    0  224|     44k    203k|
16:48:56|   18     5     0     193    23|     133   99.25|   3   49    0  224|     31k    143k|
```

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orzdba 时刻了解你的数据库

```
[root@yz2037 mysqlhome]# orzdba -S /tmp/mysql_user.sock --innodb

.================================================.
|       Welcome to use the orzdba tool !         |
|          Yep...Chinese English~                |
'=============== Date : 2013-03-27 ===============

HOST: yz2037.puppetclient.163.com   IP: 10.100.20.37
DB  : img|log|mail|performance_schema|police|test_bbs|user
Var : binlog_format[STATEMENT] max_binlog_cache_size[17179869184G] max_binlog_size[1G]
      max_connect_errors[10] max_connections[1000] max_user_connections[0]
      open_files_limit[65536] sync_binlog[0] table_definition_cache[400]
      table_open_cache[6000] thread_cache_size[256]

      innodb_adaptive_flushing[ON] innodb_adaptive_hash_index[ON] innodb_buffer_pool_size[2G]
      innodb_file_per_table[OFF] innodb_flush_log_at_trx_commit[0] innodb_flush_method[]
      innodb_io_capacity[200] innodb_lock_wait_timeout[50] innodb_log_buffer_size[8M]
      innodb_log_file_size[512M] innodb_log_files_in_group[2] innodb_max_dirty_pages_pct[50]
      innodb_open_files[300] innodb_read_io_threads[4] innodb_thread_concurrency[0]
      innodb_write_io_threads[4]

-------- ---innodb bp pages status-- -----innodb data status---- --innodb log--   his --log(byte)--  read ---query---
  time   |    data   free  dirty flush| reads writes  read written|fsyncs written| list uflush  uckpt  view inside  que|
16:49:58|       0      0      0     0|     0      0     0       0|     0       0|    0      0      0     0      0    0|
16:49:59| 127920      1    135     0|     5      1    80k     4k|     1      4k| 2846     34     27k     1      0    0|
16:50:00| 127920      0    157     0|     1      1    16k     3k|     1      3k| 2850     1k     31k     1      0    0|
16:50:01| 127921      0    167     0|     5      1    80k     3k|     1      3k| 2852    746     32k     1      0    0|
16:50:02| 127920      1    171     0|     3      1    48k     2k|     1      2k| 2853     76     33k     1      0    0|
16:50:03| 127921      0    175     0|     1      1    16k    512|     1    512| 2854    978     34k     1      0    0|
16:50:04| 127921      0    182     0|     2      1    32k     2k|     1      2k| 2854     2k     35k     1      0    0|
16:50:05| 127921      0    184     0|     0      1     0      2k|     1      2k| 2856      0     35k     1      0    0|
16:50:06| 127921      0    188     0|     2      0    32k      0|     0       0| 2857    638     36k     1      0    0|
16:50:07| 127921      0     76     0|     2    131    32k   4.0m|     1      3k| 2860    590     38k     1      0    0|
```

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tcpdump抓包

```
[root@yz2037 ~]# tcpdump -i eth1 port 3306 -l -s 0 -w - | strings | grep -A 5 se
lect|less
tcpdump: listening on eth1, link-type EN10MB (Ethernet), capture size 65535 byte
s
     select uid, userid, nickname, email, birthday, fromurl, usertype, chinese
   from user_base_all                where                (
        email =             'zjjzb1976@163.com'
    )
UTQN
user
user_base_all
user_base_all
user
--
         select userid, nickname, sex, money, popo, email, regtime, lastlogin,
lastip, password,       birthyear, birthday, totalpoint, point, grade, alias, on
linetime, postcount, mytitle, style,       pageview, pageviewold, sysgroup, page
viewplace, userdesc, lastpost, usertype, chinese,       del, codetype, directory
, pagesize, starttime, replystarttime, movetime, lastactive, face,       city, p
```

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tcpdump + pt-query-digest
抓包捕捉瞬时sql

```
[root@yz2037 ~]# tcpdump -s 65535 -x -nn -q -tttt -i any -c 1000 port 3306 > mysql.tcp.txt
tcpdump: WARNING: Promiscuous mode not supported on the "any" device
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on any, link-type LINUX_SLL (Linux cooked), capture size 65535 bytes
1000 packets captured
1002 packets received by filter
0 packets dropped by kernel
```

```
[root@yz2037 ~]# head -n20  mysql.tcp.txt
2013-03-27 15:43:44.861921 IP 192.168.51.220.36925 > [redacted]3306: tcp 104
        0x0000:  4500 009c 616f 4000 fd06 08df c0a8 33dc
        0x0010:  0a64 1425 903d 0cea 454c d9a8 b7e7 6aae
        0x0020:  8018 b500 7ee8 0000 0101 080a 5a9f 35d5
        0x0030:  6616 f350 6400 0000 0373 656c 6563 7420
        0x0040:  636f 756e 7428 2a29 206e 756d 2066 726f
        0x0050:  6d20 6d65 7373 6167 655f 3139 2066 6f72
        0x0060:  6365 206b 6579 2875 7365 7269 645f 6973
        0x0070:  6e65 775f 6964 7829 2077 6865 7265 2075
        0x0080:  7365 7269 643d 2732 5746 4f49 2720 616e
        0x0090:  6420 6973 6e65 773d 2779 273b
2013-03-27 15:43:44.862087 IP [redacted].3306 > 192.168.51.220.36925: tcp 58
        0x0000:  4508 006e b123 4000 ff06 b750 0a64 1425
        0x0010:  c0a8 33dc 0cea 903d b7e7 6aae 454c da10
        0x0020:  8018 b85c 136e 0000 0101 080a 6617 0007
        0x0030:  5a9f 35d5 0100 0001 0119 0000 0203 6465
        0x0040:  6600 0000 036e 756d 000c 3f00 1500 0000
        0x0050:  0881 0000 0000 0500 0003 fe00 0002 0002
        0x0060:  0000 0401 3405 0000 05fe 0000 0200
2013-03-27 15:43:44.862800 IP 192.168.51.220.36925 > [redacted].3306: tcp 0
```

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tcpdump + pt-query-digest
抓包捕捉瞬时sql

```
[root@yz2037 ~]# pt-query-digest --type tcpdump mysql.tcp.txt

# 1.2s user time, 70ms system time, 25.75M rss, 160.57M vsz
# Current date: Wed Mar 27 15:48:03 2013
# Hostname: yz2037.puppetclient.163.com
# Files: mysql.tcp.txt
# Overall: 358 total, 17 unique, 455.04 QPS, 1.26x concurrency _____________
# Time range: 2013-03-27 15:43:44.862087 to 15:43:45.648823
# Attribute          total     min     max     avg     95%  stddev  median
# ============     ======= ======= ======= ======= ======= ======= =======
# Exec time          988ms     39us     36ms      3ms     14ms      5ms    515us
# Rows affecte          19        0        1     0.05     0.99     0.22        0
# Query size        45.75k        8      477   130.87   441.81   112.76   107.34
# Warning coun           0        0        0        0        0        0        0

# Profile
# Rank Query ID           Response time Calls R/Call Apdx V/M   Item
# ==== ================== ============= ===== ====== ==== ===== ==========
#    1 0x5D3240AD4AD2C153  0.7296 73.8%   111 0.0066 1.00  0.01 SELECT img.img_?
#    2 0x0BD58CAA4BD89C1B  0.0578  5.8%    47 0.0012 1.00  0.00 SELECT img.img_link_?
#    3 0xD9540E2C2802AE94  0.0578  5.8%    16 0.0036 1.00  0.00 SELECT user_base_all
#    4 0xB1CAD156510D7E7E  0.0374  3.8%     9 0.0042 1.00  0.00 SELECT user_base_all
#    5 0xD9AC12191A483C96  0.0221  2.2%     8 0.0028 1.00  0.00 SELECT img.img_post_stat
#    6 0xA6E33CF3B798DC2C  0.0184  1.9%    10 0.0018 1.00  0.01 SELECT user_?
#    7 0x7CA310C0D0C0A735  0.0180  1.8%     3 0.0060 1.00  0.00 SELECT img.img_post
# MISC 0xMISC              0.0471  4.8%   154 0.0003   NS   0.0 <10 ITEMS>
```

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tcpdump + pt-query-digest
抓包捕捉瞬时sql

```
# Query 1: 143.10 QPS, 0.94x concurrency, ID 0x5D3240AD4AD2C153 at byte 620752
# Scores: Apdex = 1.00 [1.0], V/M = 0.01
# Query_time sparkline: |  ^_.   |
# Time range: 2013-03-27 15:43:44.869638 to 15:43:45.645295
# Attribute    pct   total     min     max     avg     95%  stddev  median
# ============ === ======= ======= ======= ======= ======= ======= =======
# Count         31     111
# Exec time     73    730ms    249us     36ms      7ms     20ms      7ms      4ms
# Rows affecte   0       0       0       0       0       0       0       0
# Query size    43  19.89k     127     477  183.48  363.48   83.48  124.25
# Warning coun   0       0       0       0       0       0       0       0
# String:
# Errors       none
# Hosts        192.168.51.220 (48/43%), 10.100.20.179 (42/37%)... 1 more
# Query_time distribution
#   1us
#  10us
# 100us  ################################################################
#   1ms  ##############################
#  10ms  ##########################################
# 100ms
#    1s
#  10s+
# Tables
#    SHOW TABLE STATUS FROM `img` LIKE 'img_18'\G
#    SHOW CREATE TABLE `img`.`img_18`\G
# EXPLAIN /*!50100 PARTITIONS*/
select id,post_img_url,src_img_url,photo_img_url,thumbnail_url  from img.img_18 where id in('b287be
875','7277065b3eb08eda9fac517379504399','92036f0db0c19e520acc1c562d28ec35','d2f3eb1c7a85cc1acabee13
3112847c9cfaf235aeab6','52f58509d36ba5045db11d1fa92bff17','92a4bd4398ba902f515092522a385aa3') \G
```

./dba-slow-picker.pl（诊断异常时刻SQL）

```
[root@yz2037 tools]# ./dba-slow-picker.pl --start "2013-03-15 04:30:00" -until "2013-03-15 12:40:00" -f /home/mysql_user/mysqlhome/data/yz2037-slow.log >1.log

start picking slow log from <2013-03-15 04:30:00> to <2013-03-15 12:40:00>
 13.33% finished; Total speed  3.4 MB/s, now speed  3.4 MB/s; Remain time:   13 seconds
 26.84% finished; Total speed  4.4 MB/s, now speed  6.2 MB/s; Remain time:    8 seconds
 40.37% finished; Total speed  4.8 MB/s, now speed  5.8 MB/s; Remain time:    6 seconds
 54.93% finished; Total speed  5.3 MB/s, now speed  7.8 MB/s; Remain time:    4 seconds
 71.03% finished; Total speed  5.8 MB/s, now speed  8.4 MB/s; Remain time:    2 seconds
 83.74% finished; Total speed  5.9 MB/s, now speed  6.8 MB/s; Remain time:    1 seconds
 97.76% finished; Total speed  5.9 MB/s, now speed  5.9 MB/s; Remain time:    0 seconds
```

```
[root@yz2037 tools]# grep -i start 1.log
# Start:  2013-03-15 04:52:03 Done:  2013-03-15 04:52:07;QueryTime:   3.852124; Rows examin:    1030
# Start:  2013-03-15 06:47:00 Done:  2013-03-15 06:47:04;QueryTime:   3.477942; Rows examin:    1909
# Start:  2013-03-15 08:31:05 Done:  2013-03-15 08:31:09;QueryTime:   3.044173; Rows examin:    1140
# Start:  2013-03-15 08:43:33 Done:  2013-03-15 08:43:38;QueryTime:   4.266011; Rows examin:    1446
# Start:  2013-03-15 08:44:21 Done:  2013-03-15 08:44:26;QueryTime:   4.444918; Rows examin:    1968
# Start:  2013-03-15 09:07:03 Done:  2013-03-15 09:07:13;QueryTime:   9.461413; Rows examin:    3399
# Start:  2013-03-15 09:11:03 Done:  2013-03-15 09:11:07;QueryTime:   3.705507; Rows examin:     638
# Start:  2013-03-15 09:12:24 Done:  2013-03-15 09:12:28;QueryTime:   3.755848; Rows examin:    2095
# Start:  2013-03-15 09:42:50 Done:  2013-03-15 09:42:54;QueryTime:   3.726412; Rows examin:    1337
# Start:  2013-03-15 09:45:21 Done:  2013-03-15 09:45:25;QueryTime:   3.887645; Rows examin:    1414
# Start:  2013-03-15 10:01:41 Done:  2013-03-15 10:01:53;QueryTime:  11.411844; Rows examin:    6773
# Start:  2013-03-15 10:08:07 Done:  2013-03-15 10:08:23;QueryTime:  15.030762; Rows examin:   10716
# Start:  2013-03-15 10:31:39 Done:  2013-03-15 10:31:44;QueryTime:   4.123594; Rows examin:     897
# Start:  2013-03-15 10:34:41 Done:  2013-03-15 10:34:57;QueryTime:  15.811398; Rows examin:    4480
# Start:  2013-03-15 10:52:45 Done:  2013-03-15 10:52:51;QueryTime:   5.517688; Rows examin:    1546
# Start:  2013-03-15 11:11:22 Done:  2013-03-15 11:11:28;QueryTime:   5.422679; Rows examin:    2291
# Start:  2013-03-15 11:12:03 Done:  2013-03-15 11:12:25;QueryTime:  21.690007; Rows examin:   15490
# Start:  2013-03-15 11:52:49 Done:  2013-03-15 11:53:01;QueryTime:  11.030045; Rows examin:    4375
# Start:  2013-03-15 12:15:56 Done:  2013-03-15 12:16:00;QueryTime:   3.030871; Rows examin:     757
# Start:  2013-03-15 12:22:23 Done:  2013-03-15 12:22:28;QueryTime:   4.635803; Rows examin:    1660
# Start:  2013-03-15 12:22:54 Done:  2013-03-15 12:23:06;QueryTime:  11.773823; Rows examin:    5870
```

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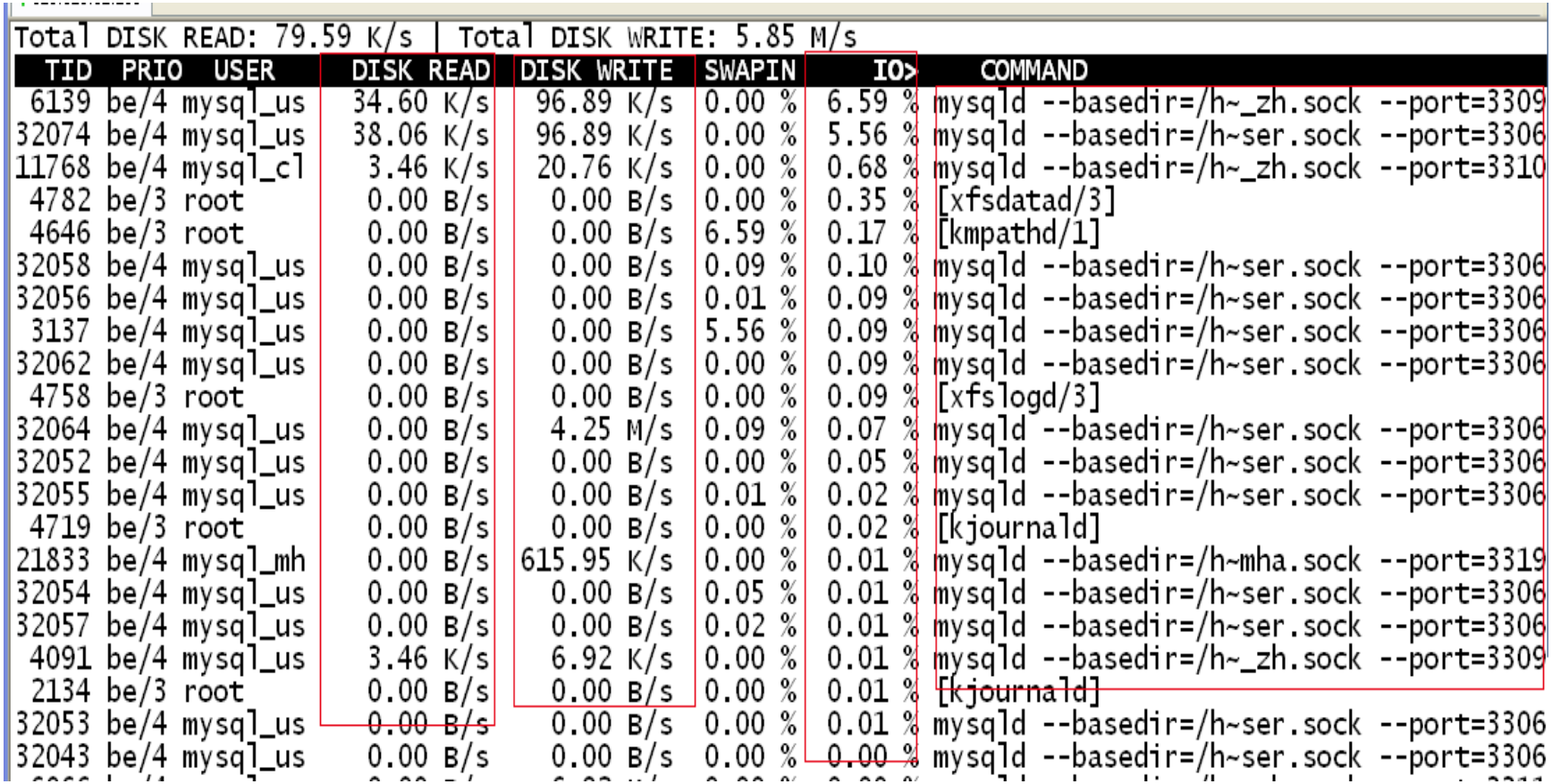
找寻哪个进程在磨你的磁盘

iotop



```
Total DISK READ: 79.59 K/s | Total DISK WRITE: 5.85 M/s
  TID  PRIO  USER     DISK READ  DISK WRITE  SWAPIN     IO>    COMMAND
 6139 be/4 mysql_us    34.60 K/s   96.89 K/s  0.00 %  6.59 % mysqld --basedir=/h~_zh.sock --port=3309
32074 be/4 mysql_us    38.06 K/s   96.89 K/s  0.00 %  5.56 % mysqld --basedir=/h~ser.sock --port=3306
11768 be/4 mysql_cl     3.46 K/s   20.76 K/s  0.00 %  0.68 % mysqld --basedir=/h~_zh.sock --port=3310
 4782 be/3 root         0.00 B/s    0.00 B/s  0.00 %  0.35 % [xfsdatad/3]
 4646 be/3 root         0.00 B/s    0.00 B/s  6.59 %  0.17 % [kmpathd/1]
32058 be/4 mysql_us     0.00 B/s    0.00 B/s  0.09 %  0.10 % mysqld --basedir=/h~ser.sock --port=3306
32056 be/4 mysql_us     0.00 B/s    0.00 B/s  0.01 %  0.09 % mysqld --basedir=/h~ser.sock --port=3306
 3137 be/4 mysql_us     0.00 B/s    0.00 B/s  5.56 %  0.09 % mysqld --basedir=/h~ser.sock --port=3306
32062 be/4 mysql_us     0.00 B/s    0.00 B/s  0.00 %  0.09 % mysqld --basedir=/h~ser.sock --port=3306
 4758 be/3 root         0.00 B/s    0.00 B/s  0.00 %  0.09 % [xfslogd/3]
32064 be/4 mysql_us     0.00 B/s    4.25 M/s  0.09 %  0.07 % mysqld --basedir=/h~ser.sock --port=3306
32052 be/4 mysql_us     0.00 B/s    0.00 B/s  0.00 %  0.05 % mysqld --basedir=/h~ser.sock --port=3306
32055 be/4 mysql_us     0.00 B/s    0.00 B/s  0.01 %  0.02 % mysqld --basedir=/h~ser.sock --port=3306
 4719 be/3 root         0.00 B/s    0.00 B/s  0.00 %  0.02 % [kjournald]
21833 be/4 mysql_mh     0.00 B/s  615.95 K/s  0.00 %  0.01 % mysqld --basedir=/h~mha.sock --port=3319
32054 be/4 mysql_us     0.00 B/s    0.00 B/s  0.05 %  0.01 % mysqld --basedir=/h~ser.sock --port=3306
32057 be/4 mysql_us     0.00 B/s    0.00 B/s  0.02 %  0.01 % mysqld --basedir=/h~ser.sock --port=3306
 4091 be/4 mysql_us     3.46 K/s    6.92 K/s  0.00 %  0.01 % mysqld --basedir=/h~_zh.sock --port=3309
 2134 be/3 root         0.00 B/s    0.00 B/s  0.00 %  0.01 % [kjournald]
32053 be/4 mysql_us     0.00 B/s    0.00 B/s  0.00 %  0.01 % mysqld --basedir=/h~ser.sock --port=3306
32043 be/4 mysql_us     0.00 B/s    0.00 B/s  0.00 %  0.00 % mysqld --basedir=/h~ser.sock --port=3306
```

ioprofile 查看IO情况的利器

```
mysql> show slave status\G;
*************************** 1. row ***************************
               Slave_IO_State: Waiting for master to send event
                  Master_Host: videolib2_db_w.163.com
                  Master_User: bizme_slave
                  Master_Port: 3306
                Connect_Retry: 60
              Master_Log_File: log_bin.000456
          Read_Master_Log_Pos: 158750958
               Relay_Log_File: relay_log.002427
                Relay_Log_Pos: 158325263
        Relay_Master_Log_File: log_bin.000456
             Slave_IO_Running: Yes
            Slave_SQL_Running: Yes
              Replicate_Do_DB: videolib2
          Replicate_Ignore_DB:
           Replicate_Do_Table:
       Replicate_Ignore_Table:
      Replicate_Wild_Do_Table:
  Replicate_Wild_Ignore_Table:
                   Last_Errno: 0
                   Last_Error:
                 Skip_Counter: 0
          Exec_Master_Log_Pos: 158325120
              Relay_Log_Space: 158751291
              Until_Condition: None
               Until_Log_File:
                Until_Log_Pos: 0
           Master_SSL_Allowed: No
           Master_SSL_CA_File:
           Master_SSL_CA_Path:
              Master_SSL_Cert:
            Master_SSL_Cipher:
               Master_SSL_Key:
        Seconds_Behind_Master: 27
Master_SSL_Verify_Server_Cert: No
                Last_IO_Errno: 0
                Last_IO_Error:
               Last_SQL_Errno: 0
               Last_SQL_Error:
1 row in set (0.01 sec)
```

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ioprofile 查看IO情况的利器

```
top - 19:00:05 up 479 days, 21:34,  2 users,  load average: 0.28, 0.28, 0.28
Tasks:  97 total,   2 running,  95 sleeping,   0 stopped,   0 zombie
Cpu(s):  2.6%us,  1.7%sy,  0.0%ni, 93.7%id,  1.7%wa,  0.0%hi,  0.3%si,  0.0%st
Mem:   4091932k total,  3895768k used,   196164k free,    28872k buffers
Swap:  2104472k total,      128k used,  2104344k free,  1260620k cached

  PID USER      PR  NI  VIRT  RES  SHR S %CPU %MEM    TIME+  COMMAND
 4821 mysql     20   0 2456m 2.2g 5996 S   62 57.6  89293:40 mysqld
 1672 root      20   0  6680 1560 1252 S    2  0.0   0:00.04 sendmail
 1643 root      20   0  2564 1176  924 R    1  0.0   0:00.12 top
    1 root      20   0  2068  636  552 S    0  0.0   6:12.78 init
    2 root      15  -5     0    0    0 S    0  0.0   0:38.37 kthreadd
    3 root      RT  -5     0    0    0 S    0  0.0   4:17.98 migration/0
    4 root      15  -5     0    0    0 S    0  0.0 882:50.29 ksoftirqd/0
    5 root      RT  -5     0    0    0 S    0  0.0   0:40.36 watchdog/0
    6 root      RT  -5     0    0    0 S    0  0.0   0:15.28 migration/1
    7 root      15  -5     0    0    0 S    0  0.0  52:33.12 ksoftirqd/1
    8 root      RT  -5     0    0    0 S    0  0.0   0:02.22 watchdog/1
    9 root      RT  -5     0    0    0 S    0  0.0   0:14.06 migration/2
   10 root      15  -5     0    0    0 S    0  0.0  71:46.71 ksoftirqd/2
   11 root      RT  -5     0    0    0 S    0  0.0   0:06.48 watchdog/2
   12 root      RT  -5     0    0    0 S    0  0.0   0:25.00 migration/3
   13 root      15  -5     0    0    0 S    0  0.0  65:37.80 ksoftirqd/3
   14 root      RT  -5     0    0    0 S    0  0.0   0:01.56 watchdog/3
   15 root      15  -5     0    0    0 S    0  0.0  30:17.13 events/0
   16 root      15  -5     0    0    0 S    0  0.0  21:12.89 events/1
   17 root      15  -5     0    0    0 S    0  0.0  32:38.11 events/2
   18 root      15  -5     0    0    0 S    0  0.0  30:56.50 events/3
   19 root      15  -5     0    0    0 S    0  0.0   0:00.00 khelper
   54 root      15  -5     0    0    0 S    0  0.0   9:02.81 kblockd/0
   55 root      15  -5     0    0    0 S    0  0.0   0:12.40 kblockd/1
   56 root      15  -5     0    0    0 S    0  0.0   2:16.24 kblockd/2
   57 root      15  -5     0    0    0 S    0  0.0   0:27.24 kblockd/3
   59 root      15  -5     0    0    0 S    0  0.0   0:00.00 kacpid
   60 root      15  -5     0    0    0 S    0  0.0   0:00.00 kacpi_notify
  158 root      15  -5     0    0    0 S    0  0.0   0:00.00 kseriod
  195 root      15  -5     0    0    0 S    0  0.0 362:20.45 kswapd0
  196 root      15  -5     0    0    0 S    0  0.0   0:00.00 aio/0
  197 root      15  -5     0    0    0 S    0  0.0   0:00.00 aio/1
  198 root      15  -5     0    0    0 S    0  0.0   0:00.00 aio/2
  199 root      15  -5     0    0    0 S    0  0.0   0:00.00 aio/3
  739 root      15  -5     0    0    0 S    0  0.0   0:00.00 ksuspend_usbd
  742 root      15  -5     0    0    0 S    0  0.0   0:00.00 khubd
```

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ioprofile 查看IO情况的利器

```
ZW:/home/percona-toolkit-2.1.5/bin# iostat -xkdz 1
Linux 2.6.26-1-686 (ZW)         2013年03月26日  _i686_  (4 CPU)

Device:         rrqm/s   wrqm/s     r/s     w/s    rkB/s    wkB/s avgrq-sz avgqu-sz   await  svctm  %util
sda               0.05    84.34    6.72   46.74    47.04    43.09     3.37     0.03    0.58   0.64   3.43
sdb               0.00     0.00    0.00    0.00     0.00     0.00    26.42     0.00   13.16  13.08   0.00

Device:         rrqm/s   wrqm/s     r/s     w/s    rkB/s    wkB/s avgrq-sz avgqu-sz   await  svctm  %util
sda               0.00     0.00    7.00  130.00    28.00   418.00     6.51     0.86    6.25   6.25  85.60

Device:         rrqm/s   wrqm/s     r/s     w/s    rkB/s    wkB/s avgrq-sz avgqu-sz   await  svctm  %util
sda               0.00     0.00    4.00   92.00    16.00   292.00     6.42     0.99   10.21  10.33  99.20

Device:         rrqm/s   wrqm/s     r/s     w/s    rkB/s    wkB/s avgrq-sz avgqu-sz   await  svctm  %util
sda               0.00     0.00    4.00  106.00    16.00   334.00     6.36     1.00    9.24   9.09 100.00

Device:         rrqm/s   wrqm/s     r/s     w/s    rkB/s    wkB/s avgrq-sz avgqu-sz   await  svctm  %util
sda               0.00     0.00    6.00  142.00    24.00   450.00     6.41     0.90    6.05   6.05  89.60

Device:         rrqm/s   wrqm/s     r/s     w/s    rkB/s    wkB/s avgrq-sz avgqu-sz   await  svctm  %util
sda               0.00     0.00    5.00  105.00    20.00   334.00     6.44     1.00    9.13   9.09 100.00

Device:         rrqm/s   wrqm/s     r/s     w/s    rkB/s    wkB/s avgrq-sz avgqu-sz   await  svctm  %util
sda               0.00     8.00    5.00  110.00    20.00   395.00     7.22     1.04    9.01   8.66  99.60

Device:         rrqm/s   wrqm/s     r/s     w/s    rkB/s    wkB/s avgrq-sz avgqu-sz   await  svctm  %util
sda               0.00     0.00    5.00  115.00    20.00  1038.00    17.63     1.11    9.13   7.53  90.40
```

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ioprofile 查看IO情况的利器

```
^C
ZW:/home/percona-toolkit-2.1.5/bin# vmstat 1
procs -----------memory---------- ---swap-- -----io---- -system-- ----cpu----
 r  b   swpd   free   buff  cache   si   so    bi    bo   in   cs us sy id wa
 0  0    128 126500  28664 1331940    0    0     0     0    0    0  6  1 89  4
 0  0    128 126492  28664 1331956    0    0     4    44   75  203  0  0 100  0
 0  1    128 126392  28664 1331956    0    0     0  2529   87  336  0  0 97  2
 0  0    128 126368  28672 1332084    0    0    32  1425  117  466  0  0 92  7
 0  1    128 126368  28672 1332084    0    0     0  6329  227  831  1  1 88 10
 0  0    128 126368  28672 1332084    0    0     0  6484  262  966  1  1 82 16
 0  0    128 126368  28680 1332096    0    0     0    28   55  114  0  0 100  0
 0  1    128 126268  28680 1332100    0    0    96     0   85  160  0  0 100  0
 0  0    128 126120  28688 1332368    0    0   176    36   72  166  0  0 98  2
 0  0    128 126120  28688 1332372    0    0     0    36   73  129  0  0 100  0
 0  0    128 126120  28688 1332372    0    0     0     0   88  135  0  0 100  0
 0  0    128 126120  28688 1332428    0    0    52    44  127  238  1  0 99  1
 0  0    128 126120  28688 1332428    0    0     0     0   84  127  0  0 100  0
 0  0    128 125996  28688 1332508    0    0    80     5   76  140  0  0 99  1
 0  0    128 125772  28696 1332520    0    0    48    69   80  223  0  0 99  1
 0  0    128 125748  28696 1332552    0    0     0     0   42  105  0  0 100  0
 0  0    128 125748  28696 1332560    0    0     0     0   46  120  0  0 100  0
 0  0    128 125748  28696 1332560    0    0     0  2030  180  437  0  0 94  6
 0  0    128 125748  28696 1332560    0    0     0   743  128  210  0  0 98  2
 0  0    128 125748  28696 1332576    0    0    16     0  122  170  0  0 100  0
 0  0    128 125748  28708 1332576    0    0     0    40   50  161  0  0 99  0
 0  0    128 125748  28708 1332576    0    0    64     0   50  154  0  0 99  0
 0  0    128 125748  28708 1332640    0    0   100    39   85  234  0  0 99  1
```

ioprofile 透过进程发现写入状况

```
ZW:/home/percona-toolkit-2.1.5/bin# ./pt-ioprofile
2013年 03月 26日 星期二 18:39:48 CST
Tracing process ID 4821
     total    pread64       read      write   pwrite64      fsync       open      close     _llseek    fcntl64 filename
 24.653499   0.000000   0.000000   0.000000   0.255419  24.398080   0.000000   0.000000   0.000000   0.000000 /home/mysql/
data/ib_logfile1
  3.101464   2.848645   0.000000   0.000000   0.012166   0.240653   0.000000   0.000000   0.000000   0.000000 /home/mysql/
data/ibdata1
  0.337312   0.000000   0.102206   0.223178   0.000000   0.000000   0.000565   0.000355   0.010901   0.000107 /tmp/#sql_12
d5_1.MYD
  0.142474   0.000000   0.000000   0.078268   0.000000   0.000000   0.000000   0.000000   0.064206   0.000000 /home/mysql/
data/relay-log.info
  0.064081   0.000000   0.000000   0.000000   0.000112   0.063969   0.000000   0.000000   0.000000   0.000000 /home/mysql/
data/ib_logfile0
  0.008832   0.000000   0.003444   0.002947   0.000000   0.000000   0.000000   0.000000   0.002441   0.000000 /home/mysql/
data/relay_log.002427
  0.007029   0.000000   0.000248   0.005172   0.000342   0.000000   0.000513   0.000361   0.000199   0.000194 /tmp/#sql_12
d5_1.MYI
  0.005589   0.000000   0.000000   0.003052   0.000000   0.000000   0.000000   0.000000   0.002537   0.000000 /home/mysql/
data/master.info
  0.000553   0.000000   0.000197   0.000000   0.000000   0.000000   0.000100   0.000135   0.000000   0.000121 /etc/hosts
```

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ioprofile 产看IO情况的利器

```
mysql> set global innodb_flush_log_at_trx_commit=2;
Query OK, 0 rows affected (0.00 sec)

mysql>
```

```
mysql> show slave status\G;
*************************** 1. row ***************************
               Slave_IO_State: Waiting for master to send event
                  Master_Host: videolib2_db_w.163.com
                  Master_User: bizme_slave
                  Master_Port: 3306
                Connect_Retry: 60
              Master_Log_File: log_bin.000456
          Read_Master_Log_Pos: 160541211
               Relay_Log_File: relay_log.002427
                Relay_Log_Pos: 160541354
        Relay_Master_Log_File: log_bin.000456
             Slave_IO_Running: Yes
            Slave_SQL_Running: Yes
              Replicate_Do_DB: videolib2
          Replicate_Ignore_DB:
           Replicate_Do_Table:
       Replicate_Ignore_Table:
      Replicate_Wild_Do_Table:
  Replicate_Wild_Ignore_Table:
                   Last_Errno: 0
                   Last_Error:
                 Skip_Counter: 0
          Exec_Master_Log_Pos: 160541211
              Relay_Log_Space: 160541544
              Until_Condition: None
               Until_Log_File:
                Until_Log_Pos: 0
           Master_SSL_Allowed: No
           Master_SSL_CA_File:
           Master_SSL_CA_Path:
              Master_SSL_Cert:
            Master_SSL_Cipher:
               Master_SSL_Key:
        Seconds_Behind_Master: 0
Master_SSL_Verify_Server_Cert: No
                Last_IO_Errno: 0
                Last_IO_Error:
               Last_SQL_Errno: 0
               Last_SQL_Error:
1 row in set (0.00 sec)

ERROR:
No query specified

mysql>
```

ioprofile 产看IO情况的利器

```
ZW:/home/percona-toolkit-2.1.5/bin# ./pt-ioprofile
2013年 03月 26日 星期二 18:37:31 CST
Tracing process ID 4821
     total    pread64       read      write   pwrite64      fsync       open      close     _llseek    fcntl64 filename
  4.854712   0.000000   4.848218   0.005186   0.000205   0.000000   0.000288   0.000201   0.000143   0.000471 /tmp/#sql_12
d5_1.MYI
  1.986309   0.526231   0.000000   0.000000   0.046614   1.413464   0.000000   0.000000   0.000000   0.000000 /home/mysql/
data/ibdata1
  0.172204   0.000000   0.000000   0.000000   0.024733   0.147471   0.000000   0.000000   0.000000   0.000000 /home/mysql/
data/ib_logfile1
  0.068986   0.000000   0.000000   0.000000   0.000201   0.068785   0.000000   0.000000   0.000000   0.000000 /home/mysql/
data/ib_logfile0
  0.035163   0.000000   0.011355   0.021723   0.000000   0.000000   0.000218   0.000159   0.001708   0.000000 /tmp/#sql_12
d5_1.MYD
  0.009668   0.000000   0.001510   0.006516   0.000000   0.000000   0.000000   0.000000   0.001642   0.000000 /home/mysql/
data/relay_log.002427
  0.008734   0.000000   0.000000   0.003768   0.000000   0.000000   0.000000   0.000000   0.004966   0.000000 /home/mysql/
data/master.info
  0.002006   0.000000   0.000000   0.001113   0.000000   0.000000   0.000000   0.000000   0.000893   0.000000 /home/mysql/
data/relay-log.info
  0.000221   0.000000   0.000066   0.000000   0.000000   0.000000   0.000041   0.000063   0.000000   0.000051 /etc/hosts
```

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Tcprstat(通过响应时间判断数据库运行状况)

```
[root@yz2037 ~]# tcprstat -p 3306 -t 1 -n 0
timestamp       count   max     min     avg     med     stddev  95_max  95_avg  95_std  99_max  99_avg
1364292366      247     165708  41      1926    279     11817   3363    501     751     22018   789
1364292367      330     303027  46      7691    404     41394   9045    917     1426    267341  4142
1364292368      192     26926   48      1344    355     3508    7060    608     935     18242   1113
1364292369      343     160961  52      2291    455     9293    8454    1146    1744    19333   1647
1364292370      202     40301   50      2139    462     4997    9029    1190    1889    18167   1660
1364292371      325     65578   37      2178    446     5506    9427    1207    1961    21482   1726
1364292372      170     19060   46      941     136     2519    5720    429     788     12000   743
1364292373      82      24698   48      919     359     2897    1498    401     300     9525    625
1364292374      239     60565   47      3068    444     7656    17686   1640    3539    28645   2485
1364292375      107     2577117 55      25934   486     247815  10503   1260    2062    14277   1731
1364292376      246     138496  39      1868    358     11736   3132    502     604     12422   770
1364292377      90      10997   47      1577    437     2607    8215    1088    1689    10780   1471
1364292378      137     150468  70      5892    501     20057   45679   1655    5388    85154   4229
1364292379      212     17742   47      1610    436     2820    8048    1097    1723    10315   1428
1364292380      109     11403   48      972     405     2032    3128    539     645     10256   783
1364292381      130     8324    47      1024    512     1607    3213    691     718     7794    912
1364292382      226     21245   47      2020    385     3746    10026   1353    2371    15639   1779
```

每个请求时间在0.9ms~25.934ms

网络利器nicstat(充分了解你的网卡运行状况)

```
[root@bbs tools]# nicstat -z 1
    Time        Int   rKB/s   wKB/s   rPk/s   wPk/s    rAvs    wAvs %Util   Sat
18:10:32         lo    0.00    0.00    0.00    0.00   248.3   248.3  0.00  0.00
18:10:32       eth0   63.00    5.87   113.0   83.40   570.8   72.12  0.06  0.00
18:10:32       eth1   33.36   47.43   53.19   57.94   642.2   838.1  0.07  0.00
    Time        Int   rKB/s   wKB/s   rPk/s   wPk/s    rAvs    wAvs %Util   Sat
18:10:33       eth0   38.63    6.34   101.0   83.96   391.9   77.29  0.04  0.00
18:10:33       eth1   17.18    2.84   43.98   36.98   400.0   78.65  0.02  0.00
    Time        Int   rKB/s   wKB/s   rPk/s   wPk/s    rAvs    wAvs %Util   Sat
18:10:34       eth0   32.69    4.70   80.00   64.00   418.5   75.19  0.03  0.00
18:10:34       eth1   17.36    2.84   44.00   37.00   404.0   78.65  0.02  0.00
    Time        Int   rKB/s   wKB/s   rPk/s   wPk/s    rAvs    wAvs %Util   Sat
18:10:35       eth0   37.57    5.58   91.00   77.00   422.8   74.23  0.04  0.00
18:10:35       eth1   16.69    2.71   44.00   35.00   388.4   79.14  0.02  0.00
```

wKB/s,OutKB **#每秒写的千字节数(transmitted)**
rMbps,RdMbps **#每秒读的百万字节数K(received)**
%Util #接口的利用率百分比
Sat #每秒的错误数，接口接近饱和的一个指标

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dstat 充分了解你服务器的状况（vmstat）加强版

[root@bbs ~]# dstat -tclmdny 1

```
-----time----- ----total-cpu-usage---- ---load-avg--- ------memory-usage----- -dsk/total- -net/total- ---system--
  date/time   |usr sys idl wai hiq siq| 1m   5m   15m | used  buff  cach  free| read  writ| recv  send| int   csw
26-03 19:09:26|  0   0 100   0   0   0| 0.8  0.5  0.3 |  68G  336M   26G  243M|  80k   17M|  43k 5770B|1449  2327
26-03 19:09:27|  0   0 100   0   0   0| 0.8  0.5  0.3 |  68G  336M   26G  243M|   0    68k|  12k 2736B|1072  1016
26-03 19:09:28|  0   0 100   0   0   0| 0.8  0.5  0.3 |  68G  336M   26G  243M|  40k 3132k|  17k 2852B|1133  1288
26-03 19:09:29|  0   0 100   0   0   0| 0.8  0.5  0.3 |  68G  336M   26G  243M|8192B   76k|  13k 2572B|1050   932
26-03 19:09:30|  0   0 100   0   0   0| 0.7  0.5  0.3 |  68G  336M   26G  244M|   0   358k|5760B 1312B|1083  1014
26-03 19:09:31|  0   0 100   0   0   0| 0.7  0.5  0.3 |  68G  336M   26G  244M|8192B 1778k|  11k 2158B|1140  1067
26-03 19:09:32|  0   0 100   0   0   0| 0.7  0.5  0.3 |  68G  336M   26G  244M|  40k  129k|  25k 3856B|1106  1157
26-03 19:09:33|  0   0 100   0   0   0| 0.7  0.5  0.3 |  68G  336M   26G  244M|  24k   24M|  13k 2432B|1458  2007
26-03 19:09:34|  5   1  94   0   0   0| 0.7  0.5  0.3 |  68G  336M   26G  242M|   0    58k| 661k  114k|7788   23k
```

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mpstat 定位你的cpu

Var : innodb_buffer_pool_size[37G] innodb_flush_log_at_trx_commit[1] innodb_flush_method[O_DIRECT] i
t[60]

time	load-avg 1m	5m	15m	cpu-usage usr	sys	idl	iow	swap si	so	ins	upd	del	-QPS- sel	-TPS- iud	lor	-Hit%- hit
01:52:13	2.69	3.19	3.34	46	21	15	18	0	0	0	0	0	0	0	0	100.00
01:52:14	2.69	3.19	3.34	32	15	47	6	0	0	37	287	6	15097	330	155876	98.05
01:52:15	2.69	3.19	3.34	22	12	47	20	0	0	30	179	4	11373	213	123215	98.09
01:52:16	2.69	3.19	3.34	30	13	50	6	0	0	35	288	5	14876	328	153437	98.05
01:52:17	2.96	3.24	3.35	29	13	51	7	0	0	35	279	5	14689	319	151741	98.05
01:52:18	2.96	3.24	3.35	29	13	52	6	0	0	22	281	3	15199	306	156281	98.10
01:52:19	2.96	3.24	3.35	25	12	57	6	0	0	43	249	6	12678	298	132995	98.05
01:52:20	2.96	3.24	3.35	27	13	54	6	0	0	49	263	7	14351	319	146164	98.01
01:52:21	2.96	3.24	3.35	20	10	62	8	0	0	49	205	7	10032	261	105106	97.98
01:52:22	2.80	3.20	3.34	22	10	57	10	0	0	15	212	2	11462	229	118140	98.11
01:52:23	2.80	3.20	3.34	32	16	46	7	0	0	35	248	5	15028	288	155027	97.97
01:52:24	2.80	3.20	3.34	29	13	51	6	0	0	42	264	6	14693	312	158664	98.14
01:52:25	2.80	3.20	3.34	28	14	52	6	0	0	28	278	4	15142	310	154633	98.08
01:52:26	2.80	3.20	3.34	26	13	42	19	0	0	7	276	1	13420	284	138065	98.12
01:52:27	2.73	3.18	3.33	26	12	51	10	0	0	49	243	6	13409	298	138114	98.00
time	load-avg 1m	5m	15m	cpu-usage usr	sys	idl	iow	swap si	so	ins	upd	del	-QPS- sel	-TPS- iud	lor	-Hit%- hit
01:52:28	2.73	3.18	3.33	29	14	51	7	0	0	24	266	4	15031	294	155014	98.08

QPS在1.1W到1.5W之间波动

mpstat 定位你的cpu

timestamp	count	max	min	avg	med	stddev	95_max	95_avg	95_std	99_max	99_avg	99_std
1326822874	20769	137612	14	370	91	2196	786	177	187	3453	218	287
1326822875	22451	489446	15	431	100	4073	838	183	195	4582	234	349
1326822876	23096	517508	15	431	93	4117	930	182	196	5161	262	509
1326822877	23266	753552	15	445	98	9057	805	180	190	2856	221	284
1326822878	23711	3132978	14	523	84	22861	802	176	186	2619	217	283
1326822879	23403	5044837	15	795	104	43966	776	178	185	2114	213	257
1326822880	22004	5043647	15	1003	87	48279	844	181	194	5038	231	345
1326822881	23628	5032559	14	798	81	43658	832	177	189	3815	227	331
1326822882	22308	5051078	14	1741	81	82767	887	178	191	5084	248	458
1326822883	19939	5040366	14	880	96	36268	813	179	188	3069	221	289
1326822884	23047	5045386	13	1376	85	70086	832	180	193	3122	224	300
4c1326822885	0728											

但通过tcprstat观察到，响应时间不是非常稳定，会从0.3ms波动到1.9ms

mpstat 定位你的cpu软中断

01:48:46 AM	CPU	%usr	%nice	%sys	%iowait	%irq	%soft	%steal	%guest	%idle
01:48:47 AM	all	29.68	0.00	7.63	5.51	0.06	6.47	0.00	0.00	50.64
01:48:47 AM	0	42.86	0.00	13.27	5.10	0.00	8.16	0.00	0.00	30.61
01:48:47 AM	1	28.89	0.00	10.00	4.44	0.00	23.33	0.00	0.00	33.33
01:48:47 AM	2	37.37	0.00	10.10	9.09	0.00	4.04	0.00	0.00	39.39
01:48:47 AM	3	29.17	0.00	9.38	7.29	1.04	5.21	0.00	0.00	47.92
01:48:47 AM	4	50.00	0.00	7.29	2.08	0.00	33.33	0.00	0.00	7.29
01:48:47 AM	5	29.17	0.00	6.25	8.33	0.00	3.12	0.00	0.00	53.12
01:48:47 AM	6	35.35	0.00	7.07	7.07	0.00	5.05	0.00	0.00	45.45
01:48:47 AM	7	24.49	0.00	6.12	8.16	0.00	3.06	0.00	0.00	58.16
01:48:47 AM	8	35.05	0.00	8.25	3.09	0.00	2.06	0.00	0.00	51.55
01:48:47 AM	9	20.62	0.00	8.25	6.19	0.00	2.06	0.00	0.00	62.89
01:48:47 AM	10	26.32	0.00	5.26	4.21	0.00	3.16	0.00	0.00	61.05
01:48:47 AM	11	18.37	0.00	7.14	2.04	0.00	3.06	0.00	0.00	69.39
01:48:47 AM	12	49.49	0.00	10.10	3.03	0.00	5.05	0.00	0.00	32.32
01:48:47 AM	13	16.00	0.00	4.00	6.00	0.00	1.00	0.00	0.00	73.00
01:48:47 AM	14	22.00	0.00	5.00	9.00	0.00	2.00	0.00	0.00	62.00
01:48:47 AM	15	12.12	0.00	3.03	3.03	0.00	1.01	0.00	0.00	80.81

taskset -p 03 700

pid为700的进程绑定到第四颗CPU上面

vmtouch (is cool tools)

- 一 你是不是发现你的cache 在疯狂吃掉，明明很大的内存cache了很多，然而却很少free，很可能你备份的数据被cache住了，如何把这部分内存从cache中释放出来，那么万能工具vmtouch出现了。
- 二 试图从用户空间管理OS 的Paging Space
- 三 还支持把具体的文件，目录cache到pagecache中，加速访问速度

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vmtouch (is cool tools)

```
[root@olapappstd home]# free
             total       used       free     shared    buffers     cached
Mem:       3922112    2900604    1021508          0     517148     717864
-/+ buffers/cache:    1665592    2256520
Swap:      8388600       4628    8383972
```

```
[root@olapappstd home]# vmtouch -v /home/mysql_bak
/home/mysql_bak/all_2013-03-23.sql.gz
[oooooooooooooooooooooooooooooooooo] 67/67
/home/mysql_bak/all_2013-03-11.sql.gz
[oooooooooooooooooooooooooooooooooo] 67/67
/home/mysql_bak/all_2013-03-25.sql.gz
[oooooooooooooooooooooooooooooooooo] 67/67
/home/mysql_bak/all_2013-03-22.sql.gz
[oooooooooooooooooooooooooooooooooo] 67/67
/home/mysql_bak/all_2013-03-19.sql.gz
[oooooooooooooooooooooooooooooooooo] 67/67
/home/mysql_bak/dbbackup.sh
[o] 1/1
/home/mysql_bak/all_2013-03-20.sql.gz
[oooooooooooooooooooooooooooooooooo] 67/67
/home/mysql_bak/all_2013-03-27.sql.gz
[oooooooooooooooooooooooooooooooooo] 67/67
/home/mysql_bak/all_2013-03-24.sql.gz
[oooooooooooooooooooooooooooooooooo] 67/67
/home/mysql_bak/all_2013-03-21.sql.gz
[oooooooooooooooooooooooooooooooooo] 66/66
/home/mysql_bak/all_2013-03-13.sql.gz
[oooooooooooooooooooooooooooooooooo] 66/66
```

vmtouch (is cool tools)

```
/home/mysql_bak/all_2013-03-17.sql.gz
[OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO] 67/67
/home/mysql_bak/all_2013-03-18.sql.gz
[OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO] 67/67
/home/mysql_bak/all_2013-03-16.sql.gz
[OOOOOOOOOOOOOOoOOOOOOOOOOOOOOOOOOO] 66/67
/home/mysql_bak/all_2013-03-14.sql.gz
[OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO] 66/66
/home/mysql_bak/all_2013-03-26.sql
[OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO] 266/266
/home/mysql_bak/all_2013-03-15.sql.gz
[OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO] 66/66
/home/mysql_bak/all_2013-03-12.sql.gz
[OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO] 67/67

           Files: 20
     Directories: 1
  Resident Pages: 1334/1335  5M/5M  99.9%
         Elapsed: 0.001394 seconds
```

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vmtouch (is cool tools)

```
[root@olapappstd mysql_bak]# du -sh *
268K    all_2013-03-11.sql.gz
268K    all_2013-03-12.sql.gz
264K    all_2013-03-13.sql.gz
264K    all_2013-03-14.sql.gz
264K    all_2013-03-15.sql.gz
268K    all_2013-03-16.sql.gz
268K    all_2013-03-17.sql.gz
268K    all_2013-03-18.sql.gz
268K    all_2013-03-19.sql.gz
268K    all_2013-03-20.sql.gz
264K    all_2013-03-21.sql.gz
268K    all_2013-03-22.sql.gz
268K    all_2013-03-23.sql.gz
268K    all_2013-03-24.sql.gz
268K    all_2013-03-25.sql.gz
1.1M    all_2013-03-26.sql
268K    all_2013-03-27.sql.gz
0       bakup.log
0       bakup.log.err
4.0K    dbbackup.sh
```

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vmtouch (is cool tools)

```
[root@olapappstd home]# vmtouch -ve /home/mysql_bak
Evicting /home/mysql_bak/all_2013-03-23.sql.gz
Evicting /home/mysql_bak/all_2013-03-11.sql.gz
Evicting /home/mysql_bak/all_2013-03-25.sql.gz
Evicting /home/mysql_bak/all_2013-03-22.sql.gz
Evicting /home/mysql_bak/all_2013-03-19.sql.gz
Evicting /home/mysql_bak/dbbackup.sh
Evicting /home/mysql_bak/all_2013-03-20.sql.gz
Evicting /home/mysql_bak/all_2013-03-27.sql.gz
Evicting /home/mysql_bak/all_2013-03-24.sql.gz
Evicting /home/mysql_bak/all_2013-03-21.sql.gz
Evicting /home/mysql_bak/all_2013-03-13.sql.gz
Evicting /home/mysql_bak/all_2013-03-17.sql.gz
Evicting /home/mysql_bak/all_2013-03-18.sql.gz
Evicting /home/mysql_bak/all_2013-03-16.sql.gz
Evicting /home/mysql_bak/all_2013-03-14.sql.gz
Evicting /home/mysql_bak/all_2013-03-26.sql
Evicting /home/mysql_bak/all_2013-03-15.sql.gz
Evicting /home/mysql_bak/all_2013-03-12.sql.gz

           Files: 20
     Directories: 1
   Evicted Pages: 1335 (5M)
         Elapsed: 0.00354 seconds
```

```
[root@olapappstd home]# free
             total       used       free     shared    buffers     cached
Mem:       3922112    2895016    1027096          0     517148     712528
-/+ buffers/cache:    1665340    2256772
Swap:      8388600       4628    8383972
```

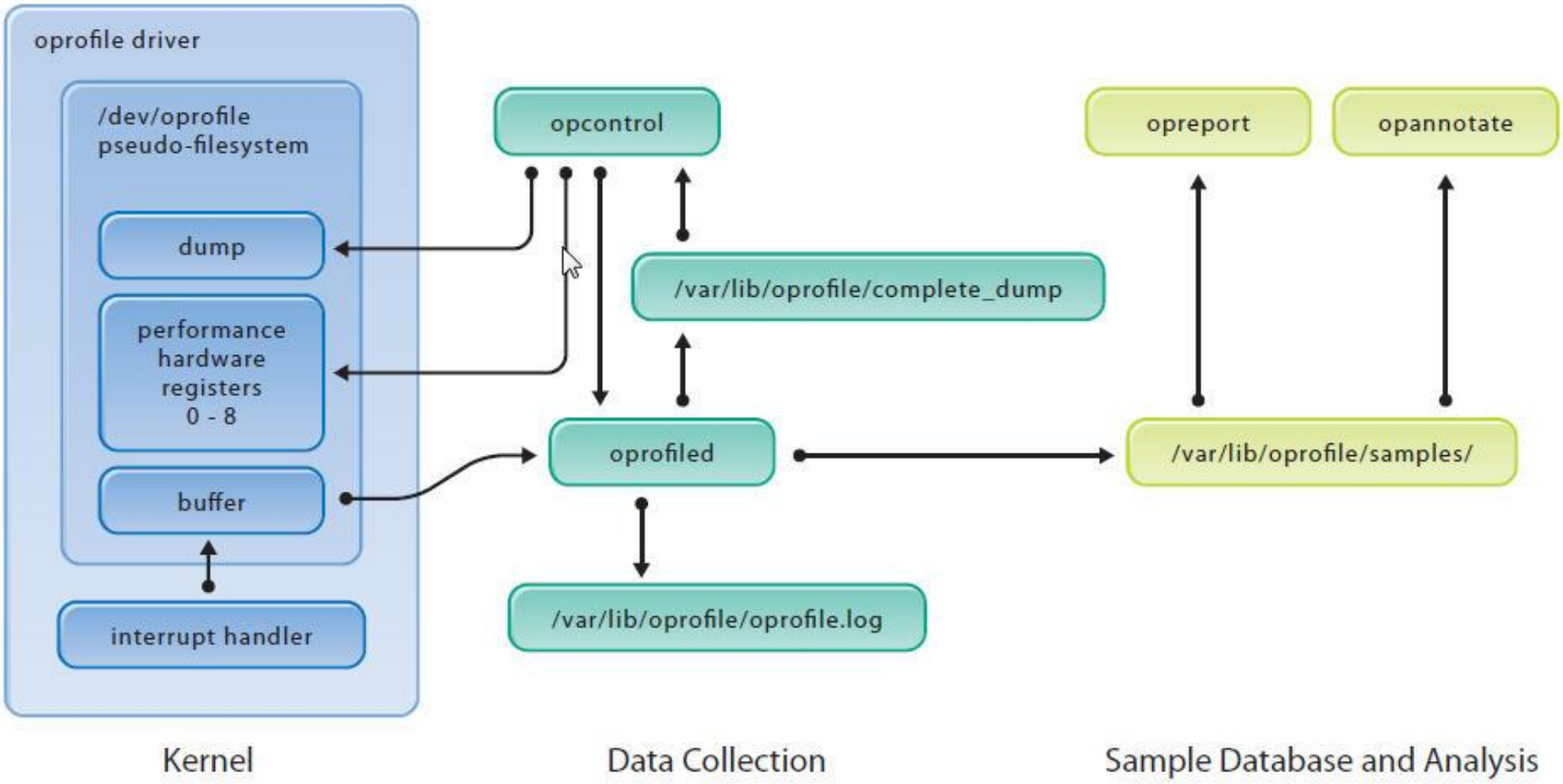
oprofile 介绍

- == oprofile 是什么 ==
- oprofile也是一个开源的profiling工具，它使用硬件调试寄存器来统计信息，进行profiling的开销比较小，而且可以对内核进行profiling。
- Oprofile 是一个全局的抽样统计工具
- Oprofile是一种细粒度的工具，可以为指令集或者为函数、系统调用或中断处理例程收集采样。Oprofile 通过取样来工作。使用收集到的评测数据，用户可以很容易地找出性能问题。

oprofile 使用场景

- cpu无端占用高？应用程序响应慢？苦于没有分析的工具？
- oprofile利用cpu硬件层面提供的性能计数器(performance counter)，通过计数采样，帮助我们从进程、函数、代码层面找出占用cpu的"罪魁祸首"。

Oprofile系统工作流图



oprofile使用

```
# 加载oprofile内核模块
opcontrol --init
#我们对内核的取样没兴趣
opcontrol --setup --no-vmlinux
#在开始收集采样数据前回顾下我们的设置
opcontrol --status
#清除上一次采样到的数据
opcontrol --reset
#启动oprofiled守护程序,从内核中拉出采样数据
opcontrol --start

#运行我们的程序

#收集采样数据
opcontrol --dump
#关闭守护程序, 同时准备好采样的数据
opcontrol --shutdown
```

oprofile获取采样信息

#系统级别的
opreport --long-filenames
#模块级别的
opreport image:foo -l
#源码级别的
opannotate image:foo -s

oprofile使用

opcontrol --deinit

modprobe oprofile timer=1

$dmesg|grep oprofile|tail -n 1

(oprofile: using timer interrupt.)

opcontrol --reset

pcontrol --separate=lib --no-vmlinux

--start --image=/home/mysql_user/mysqlhome/bin/mysqld

opcontrol --dump

opcontrol --shutdown

opreport -l /home/mysql_user/mysqlhome/bin/mysqld

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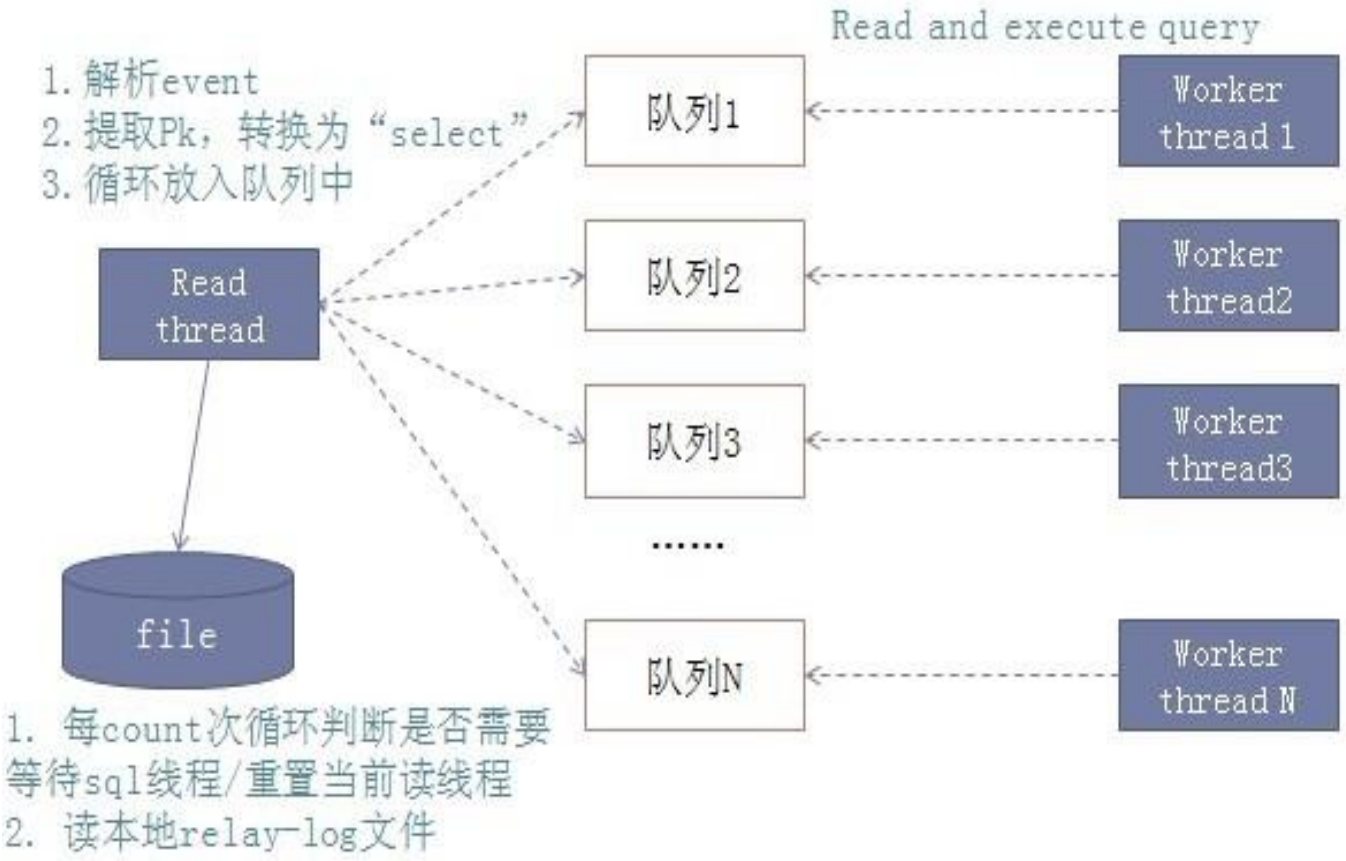
oprofile 诊断你的cpu异常

```
[root@yz2037 tools]# opreport -l  /home/mysql_user/mysqlhome/bin/mysqld|less
CPU: CPU with timer interrupt, speed 0 MHz (estimated)
Profiling through timer interrupt
samples  %        image name               symbol name
501      21.0504  mysqld                   find_key_block
140       5.8824  libc-2.5.so              memcpy
100       4.2017  mysqld                   MYSQLparse(void*)
82        3.4454  mysqld                   filesort(THD*, TABLE*, st_sort_field*, unsigned int,
 long, bool, unsigned long long*)
67        2.8151  mysqld                   _mi_get_binary_pack_key
53        2.2269  libc-2.5.so              memmove
41        1.7227  libc-2.5.so              _int_malloc
40        1.6807  mysqld                   ha_key_cmp
30        1.2605  mysqld                   unreg_request
29        1.2185  mysqld                   _ZL13lex_one_tokenPvS_
27        1.1345  mysqld                   mutex_delay
23        0.9664  mysqld                   my_pthread_fastmutex_lock
22        0.9244  mysqld                   dirname_length
21        0.8824  mysqld                   _mi_seq_search
20        0.8403  mysqld                   key_cache_read
18        0.7563  libc-2.5.so              _int_free
18        0.7563  libpthread-2.5.so        pthread_mutex_unlock
18        0.7563  mysqld                   MDL_context::find_ticket(MDL_request*, enum_mdl_dura
17        0.7143  mysqld                   _ZL15get_hash_symbolPKcjb
17        0.7143  mysqld                   buf_calc_page_new_checksum
17        0.7143  mysqld                   my_strnncoll_gbk_internal
16        0.6723  libpthread-2.5.so        pthread_mutex_trylock
```

relay-fetch 加速主从同步

- relayfetch是一个开源的mysql备库预热工具，通过解析本地relay log文件，在SQL线程执行到相应的位置之前预先将其需要的数据块加载到内存中，达到为备库slave线程进行预热的目的。在测试中，relayfetch为备库SQL复制线程带来了2-3倍的复制速度提升。目前已经在淘宝的一些备库延迟较大的线上备库上部署，效果非常明显。 目前relayfetch主要支持ROW模式，被预热的表需要有主键或唯一键。

relay-fetch 工作原理图



relayfetch使用多线程，包括1个reader线程和N个worker线程

relay-fetch 工作流程

1.reader线程的执行流程

1). 读取本地的relay log文件，获取日志中的事件；

2). 将row数据解析出来，获得其中的Primary key值；

3). 根据Primary key转换成对应库表的select语句，依次分发给N个队列（N可配置，也表示worker线程数）；

4). 每从relay log中读取count个事件（5000<count<10000，动态调整）后，会做如下判断：

a)当前备库延时secounds_behind_master低于设定值(使用–a指定，默认为1秒)时，进入sleep；

b)当前reader线程读relay log的位置超过SQL线程执行Position大于设定值时（使用-s指定，默认为1M），进入sleep

5). 当读到文件尾时（rotate事件），等待sql线程;

6). goto 1)。

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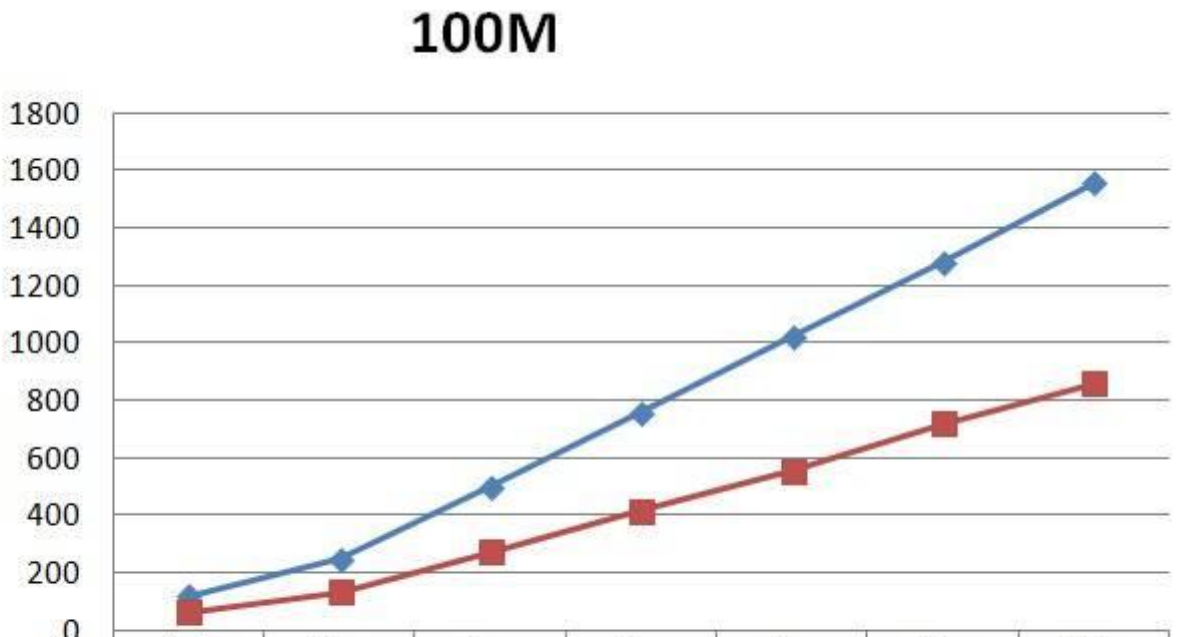
relay-fetch 测试

1. 测试环境 Mysql版本：5.1.48；
 b) 内存8G；CPU：4*2493.749
 c) 操作系统：Red Hat Enterprise Linux Server release 5.4；
 d) 使用sysbench,2000W数据。文件大小4.7G；

2. 测试方案 测试relayfetch在不同buffer pool size/data size比例值下，对sql线程执行速度有多大的提升

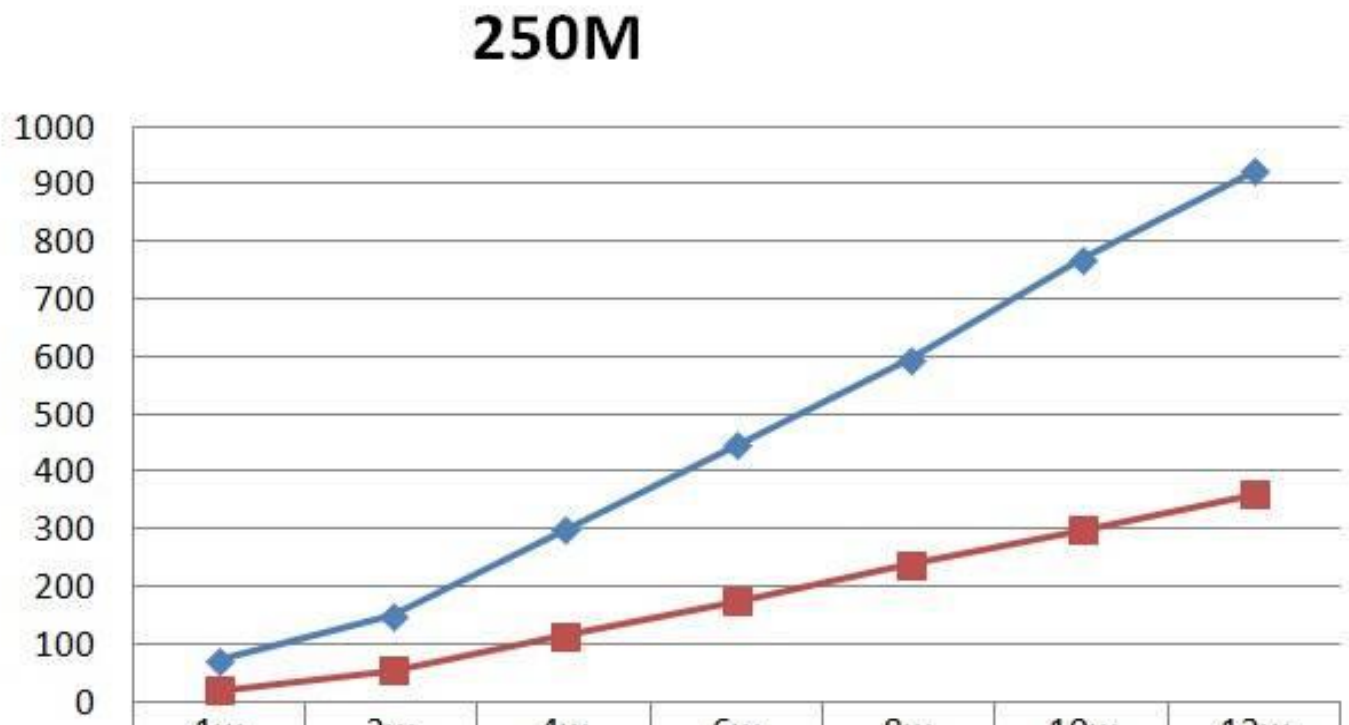
正常情况
 a) stop slave sql_thread
 b) 运行sysbench(max-requests:1W、2W、4W、6W、8W、10W、12W)
 c) 完成sysbench后start slave sql_thread
 d) 采集数据，等待执行完成
With relay-fetch
 a) stop slave sql_thread
 b) 运行sysbench
 c) 完成sysbench后start slave sql_thread 再运行 ./relayfetch -uroot
 d) 采集数据，等待执行完成

relay-fetch 测试



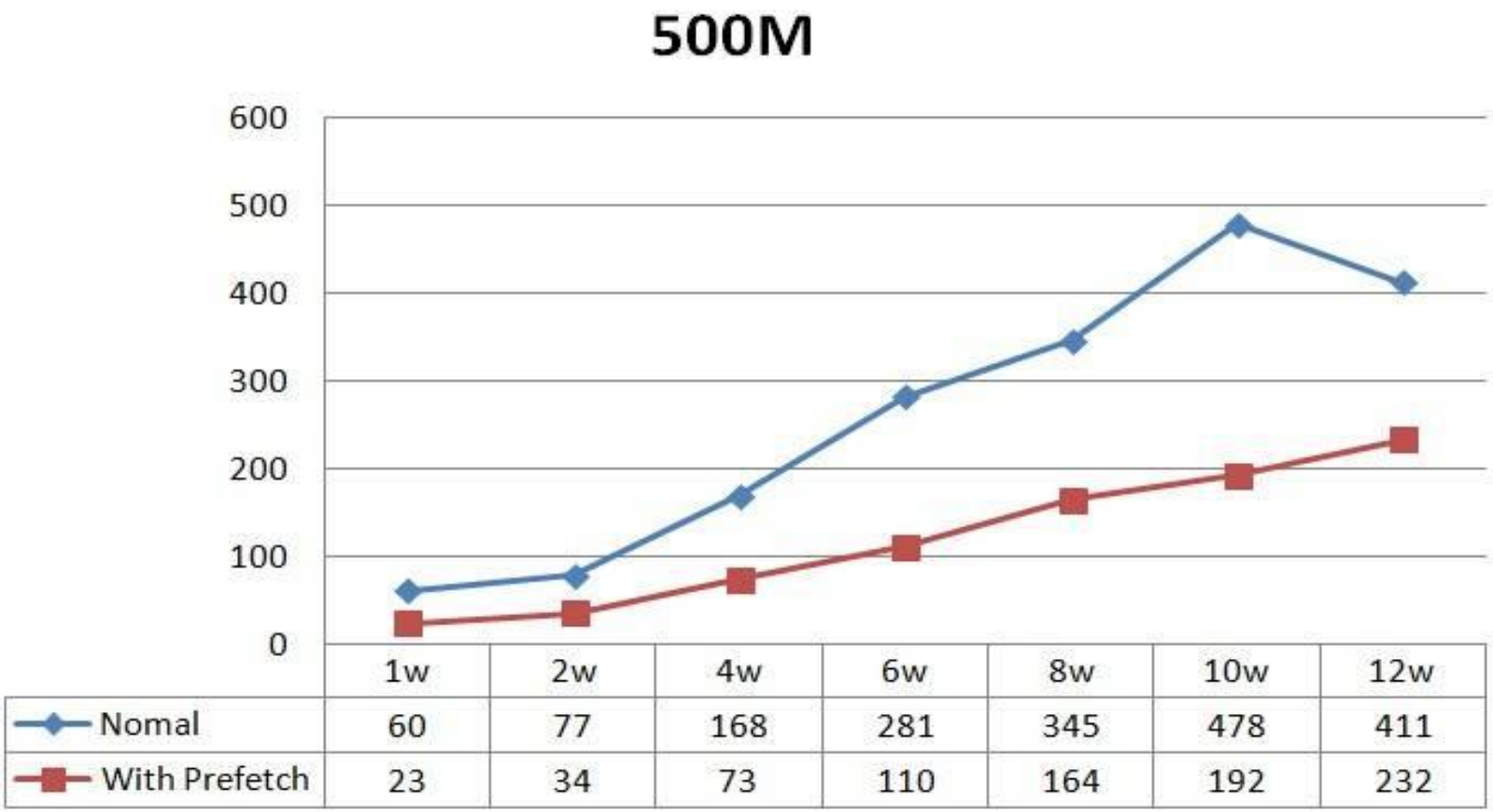
	1w	2w	4w	6w	8w	10w	12w
Nomal	119	245	496	757	1020	1280	1553
With Prefetch	63	133	271	414	554	718	858

relay-fetch 测试



	1w	2w	4w	6w	8w	10w	12w
Nomal	72	148	297	446	595	768	922
With Prefetch	19	53	114	174	238	298	359

relay-fetch 测试



	1w	2w	4w	6w	8w	10w	12w
Nomal	60	77	168	281	345	478	411
With Prefetch	23	34	73	110	164	192	232

Q & A