MySQL 5.1 Configuration Files & Options
Part II

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• Recognized Leader:
  • Global industry-leader in database infrastructure services for Oracle, Oracle Applications, MySQL and SQL Server
  • 150 current multinational companies such as Forbes.com, Fox Sports and Western Union to help manage their complex IT deployments

• Expertise:
  • One of the world’s largest concentrations of dedicated, full-time DBA expertise.

• Global Reach & Scalability:
  • 24/7/365 global remote support for DBA and consulting, systems administration, special projects or emergency response
INSERT DELAYED

- `max_delayed_threads` (20)
  - if 0, INSERT DELAYED is disabled
- `Delayed_insert_threads` (0)
- `Delayed_writes` (0), `Delayed_errors` (0)
- `Not_flushed_delayed_rows` (0)
INSERT DELAYED

- delayed_insert_limit (100)
- delayed_insert_timeout (300)
- delayed_queue_size (1000)
- max_insert_delayed_threads (20)
  - max_delayed_threads
  - Delayed_insert_threads
Timeouts

- back_log (50)
- net_read_timeout (30)
  - net_retry_count (10)
- net_write_timeout (60)
More Timeouts

- `connect_timeout` (10)
- `wait_timeout` (28800)
- `interactive_timeout` (28800)
Non-InnoDB Disk I/O

• **flush (OFF)**
  - Sync changes to disk after every SQL statement
  - If ON, write changes to disk; let OS handle sync

• **flush_time (0)**
  - Close tables and sync data to disk every x seconds
  - 0 = disabled
  - Enable for systems with very few resources
OS-Related Variables

- `skip_external_locking` (ON)
- `thread_handling` (one-thread-per-connection)
- `Open_streams` (0)
Linux Parameters

- **large_files_support (ON)**
  - Use files >2Gb

- **large_pages (OFF)**
  - Use pages >4Kb

- **large_page_size**
  - Size of memory pages if large pages are used
File Descriptors

- `table_open_cache (8,128)`
  - Independent of `innodb_open_files`

- `Open_tables (224)`

- `Opened_tables (519)`
File Descriptor Usage

- Open_files (152)
- Opened_files (974,785)
- open_files_limit (25,000)
TCP/Networking

- skip_networking (OFF)

- max_allowed_packet (24M)
  - net_buffer_length
Locking Status Variables

- `Table_locks_immediate` (52,016,680)
- `Table_locks_waited` (4)
- `Com_lock_tables` (0)
- `Com_unlock_tables` (400)
Locking System Variables

- sql_buffer_result (OFF)
- low_priority_updates (OFF)
  - sql_low_priority_updates
- max_write_lock_count (4,294,967,295)
Storage Engines

- have_csv (YES)
- have_innodb (YES)
- have_ndbcluster (NO)
MyISAM-specific

- concurrent_insert (2)
- delay_key_write (ON)
- keep_files_on_create (OFF)
MyISAM-specific

- myisam_data_pointer_size (6)
- myisam_stats_method (nulls_unequal)
- myisam_use_mmap (OFF)
Repairing MyISAM Tables

- myisam_recover_options (FORCE, BACKUP)
- myisam_repair_threads (1)
  - multi-threaded repair by sorting is beta-quality
MyISAM Index Sorting

- Done with REPAIR TABLE, ALTER TABLE, LOAD DATA INFILE, CREATE INDEX

- myisam_sort_buffer_size (56M)

- myisam_max_sort_file_size (10G)
FULLTEXT search

- MyISAM only
- `ft_min_word_len` (4)
- `ft_max_word_len` (84)
- `ft_stopword_file` (built-in)
FULLTEXT search

- \texttt{ft\_boolean\_syntax (+ ->\(<()\sim\ast:\"\"\&\|\))}

- \texttt{ft\_query\_expansion\_limit (20)}
MyISAM Key Cache

• Can have more than one
  • CACHE INDEX IN .....  

• key_buffer_size (16M)

• key_cache_block_size (1024)
MyISAM Key Cache

- Uses LRU; hot/warm sub-chains
- key_cache_age_threshold (300)
- key_cache_division_limit (100)
MyISAM Key Cache Sizing

- Percentage used for all key caches:
  - $1 - \left(\frac{\text{Key\_blocks\_unused} \times \text{key\_cache\_block\_size}}{\text{key\_buffer\_size}}\right)$
  - $1 - \left(\frac{13360 \times 1024}{16\times1024\times1024}\right) = 0.1846$ bytes

- Key\_blocks\_used(36)
  - max used at any time

- Key\_blocks\_not\_flushed (0)
MyISAM Key Cache Efficiency

- Cache miss %
  - Key_reads (from disk) / Key_read_requests * 100
  - \( \frac{34}{254122} \times 100 = 0.01\% \)

- Key_write_requests (10)

- Key_writes (10)
Transaction Basics

- autocommit (ON)
- tx_isolation (READ-COMMITTED)
- completion-type (0)
Transaction Basics

- foreign_key_checks (ON, session only)
- transaction_prealloc_size (4 Kb)
  - Starting/ending size of a shared per-transaction memory pool
- transaction_alloc_block_size (8 Kb)
  - if a per-transaction memory pool needs more memory, increase by this much
InnoDB Basics

- `innodb_data_file_path`
  (ibdata_primary:128M:autoextend)

- `innodb_autoextend_increment` (8)

- `innodb_data_home_dir` ()
InnoDB Flags

• `ignore_builtin_innodb` (OFF)

• `innodb_flush_log_at_trx_commit` (1)

• `innodb_fast_shutdown` (1)
InnoDB Flags

- innodb_file_per_table (ON)
- innodb_locks_unsafe_for_binlog (OFF)
- innodb_stats_on_metadata (ON)
- innodb_use_legacy_cardinality_algorithm (ON)
InnoDB Flags

- `innodb_adaptive_hash_index` (ON)
- `innodb_checksums` (ON)
- `innodb_autoinc_lock_mode` (1)
InnoDB Flags

- `innodb_force_recovery` (0)
- `innodb_table_locks` (ON)
- `innodb_support_xa` (ON)
InnoDB Flags

- `innodb_lock_wait_timeout` (240)
  - `innodb_rollback_on_timeout` (OFF)
- `timed_mutexes` (OFF)
- `unique_checks` (ON)
InnoDB Doublewrite

- `innodb_doublewrite` (ON)
- `Innodb_dblwr_writes` (592,341)
- `Innodb_dblwr_pages_written` (4,537,224)
InnoDB Concurrency Variables

- `innodb_thread_concurrency` (16)
- `innodb_commit_concurrency` (0)
- `innodb_concurrency_tickets` (500)
- `innodb_sync_spin_loops` (20)
InnoDB Buffer Pool

- `innodb_buffer_pool_size` (8G)
  - innodb data/index cache
- `Innodb_page_size` (16 Kb)
- `Innodb_buffer_pool_pages_total` (524,288)
  - `Innodb_buffer_pool_pages_data` (46,905)
  - `Innodb_buffer_pool_pages_free` (477177)
  - `Innodb_buffer_pool_pages_misc` (206)
Dirty Pages

- `innodb_max_dirty_pages_pct` (90)
  - after this % is reached, wait while dirty pages are flushed to disk

- `Innodb_buffer_pool_wait_free` (0)

- `Innodb_buffer_pool_pages_dirty` (9)
  - Included in the `Innodb_buffer_pool_pages_data`
Flush / Sync

- `Innodb_buffer_pool_pages_flushed (4,537,224)`
  - counter of # times flushed

- `Innodb_data_fsyncs (10,201,211)`
  - `Innodb_data_pending_fsyncs (0)`
InnoDB Row Locks

- Innodb_row_lock_waits (269)
  - Innodb_row_lock_current_waits (0)

- Innodb_row_lock_time (31,637 ms)
  - Innodb_row_lock_time_avg (117 ms)
  - Innodb_row_lock_time_max (4,599 ms)
InnoDB Reads

- `Innodb_buffer_pool_read_requests` (1,360,965,036)

- `Innodb_buffer_pool_reads` (27,482)
  - reads buffer pool could not do & single page read

- `Innodb_data_reads` (28,754)
  - `Innodb_data_pending_reads` (0)
InnoDB Reads

- `Innodb_data_read (695.47 Mb)`
- `Innodb_pages_read (44,377)`
- `Innodb_rows_read (2,721,225,514)`
InnoDB Writes

- `Innodb_buffer_pool_write_requests` (47,307,349)
- `Innodb_data_writes` (12,468,811)
  - `Innodb_data_pending_writes` (0)
InnoDB Writes

- Innodb_data_written (153 Gb)
- Innodb_pages_written (4,537,224)
- Innodb_pages_created (3,664)
InnoDB Rows Written

- `Innodb_rows_inserted` (32,681)
- `Innodb_rows_deleted` (1,555,539)
- `Innodb_rows_updated` (3,908,062)
InnoDB Log Basics

- `innodb_log_file_size` (1G)
- `innodb_log_files_in_group` (3)
  - `innodb_mirrored_log_groups` (1)
- `innodb_log_group_home_dir` (./)
InnoDB Logs

- innodb_log_buffer_size (8M)
  - Innodb_log_waits (0)

- Innodb_os_log_fsyncs (8,464,144)
  - Innodb_os_log_pending_fsyncs (0)
InnoDB Log Writes

- `Innodb_log_write_requests (26,175,407)`
- `Innodb_log_writes (8,166,171)`
  - `Innodb_os_log_pending_writes (0)`
- `Innodb_os_log_written (14.42 Gb)`
Other InnoDB Variables

- `innodb_additional_mem_pool_size` (16Mb)
- `innodb_open_files` (300)
- `innodb_thread_sleep_delay` (10,000 = .01 sec)
Advanced InnoDB Variables

- `innodb_flush_method ()`
- `innodb_max_purge_lag (0)`
InnoDB Status for Performance

- `Innodb_buffer_pool_read_ahead_rnd` (16)
- `Innodb_buffer_pool_read_ahead_seq` (286)
Percona patch extensions

- XtraDB

- Percona build of MySQL
  - (5.x.xx-percona-log)
  - Standard and InnoDB Plugin

- Slides are current up to 5.1.36-percona-log

I/O Extensions

- innodb_read_io_threads
- innodb_write_io_threads
- innodb_io_capacity
- innodb_use_purge_thread
More I/O extensions

- `innodb_ibuf_accel_rate`
- `innodb_ibuf_active_contract`
- `innodb_ibuf_max_size`
More I/O extensions

- `innodb_enable_unsafe_group_commit`

- `innodb_flush_neighbor_pages`

- `innodb_read_ahead`
  - none
  - random
  - linear
  - both
Checkpointing

- **innodb_adaptive_checkpoint**
- **innodb_checkpoint_age_target**
SHOW ENGINE INNODB STATUS

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BUFFER POOL AND MEMORY
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Total memory allocated 328830416; in additional pool allocated 2117120
+ Internal hash tables (constant factor + variable factor)
  + Adaptive hash index 4839388  (4425628 + 413760)
  + Page hash 138716
  + Dictionary cache 3383508  (3320220 + 63288)
  + File system 41848  (41336 + 512)
  + Lock system 332788  (332468 + 320)
  + Recovery system 0  (0 + 0)
  + Threads 41900  (41348 + 552)
  Buffer pool size 16384
  + Buffer pool size, bytes 268435456
  Free buffers 12396
  Database pages 3963
  Modified db pages 1510
  Pending reads 0
Statistics/Info

- `innodb_show_locks_held`
- `innodb_show_verbose_locks`
- `innodb_stats_auto_update`
- `innodb_stats_method`
- `innodb_stats_update_need_locks`
New in INFORMATION_SCHEMA

- `innodb_table_stats`
- `innodb_index_stats`
Recovery

- innodb_fast_recovery
- innodb_recovery_stats
## Recovery Stats

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**RECOVERY STATISTICS**

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Recovery time: 18 sec. (1 turns)

Data page IO statistics

<table>
<thead>
<tr>
<th>Requested pages:</th>
<th>9126</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read pages:</td>
<td>9126</td>
</tr>
<tr>
<td>Written pages:</td>
<td>7957</td>
</tr>
<tr>
<td>(Dirty blocks):</td>
<td>1156</td>
</tr>
</tbody>
</table>

Grouping IO [times]:

<table>
<thead>
<tr>
<th>Number of pages, read request neighbors (in 32 pages chunk), combined read IO, combined write IO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 32, 335, 548</td>
</tr>
<tr>
<td>2, 0, 121, 97</td>
</tr>
<tr>
<td>3, 7, 49, 44</td>
</tr>
<tr>
<td>4, 4, 43, 26</td>
</tr>
<tr>
<td>....</td>
</tr>
<tr>
<td>64, 0, 2, 25</td>
</tr>
</tbody>
</table>
Recovery Stats

Recovery process statistics
  Checked pages by doublewrite buffer: 128
  Overwritten pages from doublewrite: 0
  Recovered pages by io_thread: 9145
  Recovered pages by main thread: 0
  Parsed log records to apply: 2572491
    Sum of the length: 71274689
  Applied log records: 2376356
    Sum of the length: 68098300
  Pages which are already new enough: 93
  Oldest page's LSN: 926917970
  Newest page's LSN: 1526578232
Other Extensions

- `innodb_thread_concurrency_timer_based`
- `innodb_relax_table_creation`
- `innodb_extra_rsegments`
  - `INFORMATION_SCHEMA.innodb_rseg`
Other Extensions

- `innodb_dict_size_limit`
  - `Innodb_dict_tables`
- `innodbExpandImport`
- `innodb_extra_undoslots`
- `innodb_overwrite_relay_log_info`
Thank You.

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