Looking for Tickets to See Your Favorite Sports Team, Musical Artist or Museum Exhibit? Find Them at Ticketmaster Powered by MySQL!

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Ticketmaster

**Over 9,000 Clients**
- 500 major arenas, auditoriums and convention centers
- 150 professional sports teams
- 500 amphitheaters
- 600 promoters

**Robust Infrastructure**
- > 60% ticket sales via the internet
- > 500,000 tickets sold on the internet in a single day
- > 11,000 tickets/minute sold for U2 (March 12th, 2005)
- > 135,000 tickets/hour for U2

**Unparalleled Distribution**
- Sold over 98 million tickets valued at $5 billion in 2004
- 16.9 million unique users per month to Ticketmaster.com
- 3,300 retail Ticket Centers
- 19 worldwide telephone call centers
MySQL at Ticketmaster

- Converted from MS SQL Server to MySQL in June, 2002 (for event data)
  - Leverage in-house expertise with open-source technologies
  - Improve performance
  - Faster/more reliable replication

- Event-centric data stored in MySQL:
  - Event information
    - Artists, categories (genres), onsale information
  - Venue information
    - Driving directions, seating_charts, images
  - Delivery
    - Ticketfast, delivery options, parking upsells, branding

- Converted from MS SQL Server to Oracle in December, 2002 (for order data)
MySQL at Ticketmaster

• Currently using MySQL v4.0.18 (upgraded in 2004 from MySQL v3.23.51) on Linux AS3

• Majority of tables are created as type InnoDB (for row-level locking, referential integrity, transactions)

• Using MyISAM tables for full-text searching and for LiveDaily (www.livedaily.com)

• Average size of “event” database is ~20GB:
  • Rely heavily on MySQL replication
  • 45K events visible
  • 35K events enabled for onsale
  • 9k venues
  • Event database: ~200 tables
InnoDB Performance

• Fast selects (using row-level locks)

• Replication is fast and reliable
  • Able to add new slaves with very little effort

• Using master-slave replication as well as master-master replication (on different sets of tables)

• InnoDB files stored on local disk and NetApp filers

• Utilizing RI for new databases
InnoDB Performance

• Use Drop table and Create table, not DELETE (avoid big disk-bound operations)

• Fragmentation causes decrease in InnoDB free-space over time. No easy way to defrag InnoDB files:
  • Mysqldump and restore
  • ALTER TABLE ‘tbl_name’ TYPE=InnoDB

• Avoid count(*) queries
  • InnoDB does not keep an internal count of rows in a table. To process a SELECT COUNT(*) FROM T statement, InnoDB scans an index of the table
InnoDB Performance

• Alter table add column (very slow)
  • Use alter table add column#1, add column#2 (add multiple columns in a single alter)

• SHOW TABLE STATUS does not give accurate stats for InnoDB tables.
  • row counts are rough estimate
  • physical size numbers are accurate

• Do not use autoextend with innodb_data_file_path (we monitor InnoDB space via scripts)
Ticketmaster and MySQL Replication

Core ticketing

STG1 Master

STG2 Master

LAX1

LAX1_1

LAX1_2

LAX1_3

LAX1_4

LAX2

LAX2_1

LAX2_2

LAX2_3

LAX2_4

ORD1

ORD1_1

ORD1_2

ORD1_3

ORD1_4

ORD2

ORD2_1

ORD2_2

ORD2_3

ORD2_4
MySQL Replication

• `innodb_flush_log_at_trx_commit=0` resulted in huge performance improvements with MySQL replication. Warning: you may lose some of the latest committed transactions.

• `log-slave-updates` (for MySQL databases used as a master and slave)

• `replicate-do-db = <database name>`
• `replicate-do-table = <table name>`
• `replicate-ignore-table = EVENTDB.promotion_answers`

**Ticketmaster wish-list:**
Multi-master replication (1 slave with > 1 master)
MySQL full-text search
MySQL Full Text Searches

• Allowed Ticketmaster to replace third-party search software

• MyISAM tables/ MySQL v4.0.18

• Ordering of fulltext keys has huge performance implications. The best indexes (i.e. best hit/ratio, highest cardinality) should be created first.

Plans to upgrade to MySQL v4.1.x
• create database with default character set utf8
• bug fix in MySQL v4.1.7 (myisamchk --sort-keys where fulltext indexes)
MySQL Full Text Searches

MY.CNF settings:

- set-variable=ft_min_word_len=1
- set-variable=ft_stopword_file=/dev/null

Ticketmaster wish-list:
- InnoDB support for full-text searches
CREATE TABLE 'artists_search' (  'artist_id' int(11) NOT NULL default '0',  'lang_code' varchar(5) NOT NULL default '',  'name' varchar(128) NOT NULL default '',  'major_cat' varchar(255) NOT NULL default '',  'minor_cat' varchar(255) NOT NULL default '',  ..  ..  PRIMARY KEY ('artist_id','lang_code'),  KEY 'lang_code' ('lang_code'),  KEY 'team' ('team'),  FULLTEXT KEY 'keywords' ('keywords'),  FULLTEXT KEY 'name' ('name'),  FULLTEXT KEY 'dma_ids' ('dma_ids'),  FULLTEXT KEY 'minor_cat' ('minor_cat'),  FULLTEXT KEY 'national_ids' ('national_ids'),  FULLTEXT KEY 'major_cat' ('major_cat')  ) TYPE=MyISAM ;
$ mysqlbinlog edb1stg1-bin.1705 > edb1stg1-bin.1705_edp.txt

$ head edb1stg1-bin.1705_edp.txt
# at 4
# 031210 9:37:36 server id 70 Start: binlog v 1, server v 3.23.51-log created 031210 9:37:36
# at 73
# 031210 9:37:36 server id 70 Query thread_id=44993 exec_time=0 error_code=0
use EVENTDB;
SET TIMESTAMP=1071077856;
INSERT INTO event_onsale_info (event_id, operator_type_id, onsale_on, onsale_off) VALUES
('0000378AB16569CD',1,'00000000000000','00000000000000','00000000000000');

mysql> SLAVE STOP;

mysql> CHANGE MASTER TO
    MASTER_HOST='edb1.tmol.stg1.tm.tmcs',
    MASTER_USER='repl',
    MASTER_PASSWORD='xxxxxx',
    MASTER_PORT=3306,
    MASTER_LOG_FILE='edb1stg1-bin.1705',
    MASTER_LOG_POS=73;

mysql> SLAVE START ;
Ticketmaster uses **mysqldump** option for moving data between environments as well as for backups. Some flags of interest:

- **--opt**
  - bulk inserts (critical for performance)
- **--no-data**
  - DDL only
- **--complete-insert (-c)**
  - full insert statements
- **--tables**
  - specific tables
- **--add-drop-table**
  - adds "if exists then drop"
- **--no-create-info (-t)**
  - No create table statement

Sample **mysqldump** with WHERE condition

- `mysqldump -u tickuser -p events -c -w "method_id = 7" --tables event_method --opt > event_method.sql`
MySQL Monitoring Scripts

• total connections, active connections, select/second, update/second, delete/second
  • show status
    • Com_select, Com_insert, Com_update, Com_delete, Threads_connected, Threads_running, Uptime

• deviations in binary_log positions between master and slave
  • show master status
  • show slave status

• check InnoDB free-space
  • show table status (InnoDB KB free stored in the comment column)

• parse MySQL error log
  • grep for key words (mysqld ended | bug report | slave aborted)
MySQL General Tips

• Foreign Keys
Ticketmaster uses FOREIGN KEY constraints with InnoDB tables (new in MySQL 4.0.3)
  • SET FOREIGN_KEY_CHECKS=0;

• Flushing files to disk
Large amounts of network traffic resulted from:
  • set-variable=innodb_flush_method=O_DIRECT (Do NOT use this option if using NFS/NetApp filer storage)

• Forcing Recovery
Use this setting when you need to recover tables from a corrupt database (force the InnoDB storage engine to start up)
  • set-variable = innodb_force_recovery =0-6 (INSERT, UPDATE, or DELETE not allowed if value > 0)
MySQL General Tips

• MySQL general my.cnf settings
  • set-variable=max_connections=5500
    • version of glibc 2.3 on AS3 uses a stack_size ~ 256K (as compared to ~ 2MB per connection with Linux 7.2)

• set-variable=transaction-isolation=READ-COMMITTED
  • Committed updates are visible within another transaction. Identical queries within a transaction can return differing results.

• Slow query log
Use this setting to capture long running SQL:
  • set-variable=long_query_time=60
  • log-slow-queries=/mnt/class/mysql/edb1/sql_log/slow_query.log
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