MySQL for Oracle
DBAs and Developers
MySQL for Oracle Dudes

How can you tell an Oracle DBA has touched your MySQL Installation?
MySQL for Oracle Dudes

MYSQL_HOME=/home/oracle/products/mysql-version

mysqld_safe --user=oracle &
MySQL for Oracle Dudes

Outline

- DBA Tips, Tricks, Gotcha's & Tools
- Key Differences for Developers
- Migrating from Oracle to MySQL
- Questions & Answers
My Background

- 18 years in Database Technologies (1989)
- 10 years Oracle Experience (1996)
- 8 years MySQL Experience (1999)
- Active in MySQL, Java, XP User Groups
MySQL for Oracle Dudes

DBA
Important DBA Stuff

- Terminology
- Installation
- Directories
- Log Files
- Processes
- Ports & Sockets

- MySQL Data Dictionary
- Backup
- Tools
- Inherited LAMP Stack
MySQL for Oracle Dudes

Terminology

Database (files) -> Database Server Instance
Database Instance (memory) -> Database Server Instance
Schema User -> Database
User -> User
Table Space -> Table Space
-> Storage Engine
MySQL Installation

- OS packages place files in many areas and varies
  - e.g. /usr/lib, /var/lib, /var/log, /etc
- Recommend installing using .tar.gz
  - Centrally Manageable e.g. /opt/mysql-version
  - Upgradeable
  - Multiple Versions possible
- `$MYSQL_HOME`

Tip
MySQL Configuration

- Multiple MySQL Instances
- `my.cnf`
  - Watch out for `/etc/my.cnf`, `/etc/mysql/my.cnf`
  - Best Practice `$MYSQL_HOME/my.cnf`
  - `--defaults-file=<file>`

GOTCHA

MySQL Directories

- **basedir** ($MYSQL_HOME)
  - e.g. /opt/mysql-5.1.16-beta-linux-i686-glib23
- **datadir** (defaults to $MYSQL_HOME/data)
- **tmpdir** (important as mysql behaves unpredictability if full)
- **innodb_[...}_home_dir**
  - mysql> SHOW GLOBAL VARIABLES LIKE '%dir'
MySQL for Oracle Dudes

MySQL Ports & Sockets

- Configured to listen on TCP/IP Port (default 3306)
- Additional Instances
  - Different Ports
  - Different IP's using default Port
- Local connection uses Socket
  - Even specifying Port, local client may use socket
MySQL Log Files

- **Error Log**
  - log-error

- **Binary Log**
  - log-bin (my.cnf or mysqld arg)

- **Slow Query Log**
  - log-slow-queries, slow-query-time, log-queries-not-using-indexes

- **General Log**
  - log

MySQL for Oracle Dudes

MySQL Meta Data

- mysql Database
  - general_log, slow_log (5.1)

```sql
mysql> SET GLOBAL GENERAL_LOG=1;
mysql> ...
mysql> SELECT * FROM mysql.general_log;
```

MySQL Data Dictionary

- INFORMATION_SCHEMA
  - TABLES, COLUMNS, VIEWS, USER_PRIVILEGES
  - PROCESSLIST (5.1)
  - [GLOBAL|SESSION]_[STATUS|VARIABLES] (5.1)

http://www.xcdsql.org/MySQL/information_schema/5.1/MySQL_5_1_INFORMATION_SCHEMA.html
MySQL for Oracle Dudes
MySQL Data Dictionary

- SQL Examples

```
SELECT TABLE_SCHEMA, SUM((DATA_LENGTH + INDEX_LENGTH) / (1024 * 1024)) AS SIZE_MB
FROM INFORMATION_SCHEMA.TABLES
GROUP BY TABLE_SCHEMA ORDER BY SIZE_MB DESC

SELECT ROUTINE_TYPE, ROUTINE_NAME FROM INFORMATION_SCHEMA.ROUTINES
WHERE ROUTINE_SCHEMA='dbname';

SELECT TRIGGER_NAME, EVENT_MANIPULATION, EVENT_OBJECT_TABLE, ACTION_STATEMENT
FROM INFORMATION_SCHEMA.TRIGGERS
WHERE TRIGGER_SCHEMA='dbname';

SELECT CONCAT('DROP TABLE ',table_name,';')
INTO OUTFILE '/sql/drop_tables.sql'
FROM INFORMATION_SCHEMA.TABLES
WHERE TABLE_SCHEMA = 'test';
```
MySQL Data Dictionary

- SQL Examples

```sql
SELECT s.schema_name, CONCAT(IFNULL(ROUND((SUM(t.data_length)+SUM(t.index_length))/1024/1024,2),0.00),'Mb') total_size, 
CONCAT(IFNULL(ROUND(((SUM(t.data_length)+SUM(t.index_length))-SUM(t.data_free))/1024/1024,2),0.00),'Mb') data_used, 
CONCAT(IFNULL(ROUND((SUM(data_free)/1024/1024,2),0.00),'Mb')) data_free, 
IFNULL(ROUND(((SUM(t.data_length)+SUM(t.index_length))-SUM(t.data_free))/SUM(t.data_length)*100),2),0) pct_used, 
COUNT(table_name) total_tables 
FROM information_schema.schemata s 
LEFT JOIN information_schema.tables t ON s.schema_name = t.table_schema 
WHERE s.schema_name != 'information_schema' 
GROUP BY s.schema_name ORDER BY pct_used DESC
```
MySQL for Oracle Dudes

SHOW Commands

- SHOW TABLES;
- SHOW WARNINGS;
- SHOW STATUS; FLUSH STATUS;
- SHOW VARIABLES;
- SHOW VARIABLES LIKE '%size%';
- SHOW VARIABLES LIKE 'sort_buffer_size';
- SHOW GLOBAL VARIABLES LIKE 'sort_buffer_size';
MySQL for Oracle Dudes

Backup

- Missing Functionality
  - Commercial strength – unbreakable (Planned 6.0)
- Storage Engine Driven
- Innodb
  - Hot Backup
    - mysqldump --single-transaction --master-data
    - InnoDB Hot Backup

Also PBXT, Falcon
MySQL for Oracle Dudes

Backup

- MyISAM Only
  - Cold Backup via File Copy
  - LVM Snapshot
- SE Mixture
  - Use Replication Slave
MySQL for Oracle Dudes

Online Backup/Recovery

- Cross-engine. All major internal engines supported.
- Online, non-blocking for DML. DDL still blocked.
- SQL-command driven. Run from any mysql client.
- Backup to local disk, tape or remote file system.
- Full Server, database, and point-in-time recovery.

MySQL 6.0 Demo
MySQL for Oracle Dudes

Tools

- Missing Functionality
  - Enterprise Level Monitoring
- SHOW PROFILE (5.0.38 - Community)
- Microsecond Patch (5.0.33 - Slow query granularity)
- mytop/innotop/ndbtop
- MySQL Toolkit  http://sourceforge.net/projects/mysqltoolkit
- phpMyAdmin
SHOW PROFILE

mysql> show profile SOURCE,MEMORY for query 4;
+
| Status             | Duration   | Source_function            | Source_file   | Source_line |
|--------------------+------------+---------------------------+---------------+-------------|
| Opening tables     | 0.00013200 | open_tables               | sql_base.cc   | 2106 |
| System lock        | 0.00001800 | mysql_lock_tables         | lock.cc       | 153  |
| Table lock         | 0.00000600 | mysql_lock_tables         | lock.cc       | 162  |
| init               | 0.00001300 | mysql_select              | sql_select.cc | 2073 |
| optimizing         | 0.00004800 | optimize                  | sql_select.cc | 617  |
| statistics         | 0.00002500 | optimize                  | sql_select.cc | 773  |
| preparing          | 0.00005200 | optimize                  | sql_select.cc | 783  |
| executing          | 0.00002200 | exec                      | sql_select.cc | 1407 |
| Sending data       | 0.00005200 | execute                   | sql_select.cc | 1925 |
| end                | 0.00786600 | mysql_select              | sql_select.cc | 2118 |
| query end          | 0.00001400 | mysql_execute_command     | sql_parse.cc  | 5085 |
| freeing items      | 0.00000700 | mysql_parse               | sql_parse.cc  | 5973 |
| closing tables     | 0.00001900 | dispatch_command          | sql_parse.cc  | 2120 |
| logging slow query | 0.00001000 | log_slow_statement        | sql_parse.cc  | 2178 |
| cleaning up        | 0.00000500 | dispatch_command          | sql_parse.cc  | 2143 |
|                    |            |                           |               |     |
+--------------------+------------+---------------------------+---------------+-------------|
15 rows in set (0.01 sec)

- 95% time in one step
- Reference to Source Code
- “poor” Status names (internal code)
MySQL for Oracle Dudes

GUI Tools

- MySQL Administrator
- Quest Spotlight
- Toad
- MySQL Network Monitoring & Network Services
MySQL for Oracle Dudes

Tools

- mysqladmin -r -i 1 extended-status
  - Gives change in status variables per second
  - Lacks timestamp

- Monitor specifics
  - Com_*
  - Innodb_* , Innodb_buffer_pool_*
  - Connections
  - Created_tmp_*

TIP
Tools

- Idle

  - $ mysqladmin -r -i 1 extended-status | grep -v " | 0 "

<table>
<thead>
<tr>
<th>Variable_name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bytes_received</td>
<td>35</td>
</tr>
<tr>
<td>Bytes_sent</td>
<td>6155</td>
</tr>
<tr>
<td>Com_show_status</td>
<td>1</td>
</tr>
<tr>
<td>Created_tmp_tables</td>
<td>1</td>
</tr>
<tr>
<td>Handler_read_rnd_next</td>
<td>246</td>
</tr>
<tr>
<td>Handler_write</td>
<td>245</td>
</tr>
<tr>
<td>Questions</td>
<td>1</td>
</tr>
<tr>
<td>Select_scan</td>
<td>1</td>
</tr>
<tr>
<td>Uptime</td>
<td>1</td>
</tr>
</tbody>
</table>
MySQL for Oracle Dudes

Tools

- Under load
  - `$ mysqladmin -r -i 1 extended-status | grep -v " | 0 "`

<table>
<thead>
<tr>
<th>Variable_name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bytes_received</td>
<td>1020909</td>
</tr>
<tr>
<td>Bytes_sent</td>
<td>195358</td>
</tr>
<tr>
<td>Com_insert</td>
<td>274</td>
</tr>
<tr>
<td>Com_select</td>
<td>132</td>
</tr>
<tr>
<td>Com_set_option</td>
<td>264</td>
</tr>
<tr>
<td>Handler_read_key</td>
<td>505</td>
</tr>
<tr>
<td>Handler_update</td>
<td>252</td>
</tr>
<tr>
<td>Handler_write</td>
<td>519</td>
</tr>
<tr>
<td>Questions</td>
<td>1356</td>
</tr>
<tr>
<td>Table_locks_immediate</td>
<td>536</td>
</tr>
<tr>
<td>Table_locks_waited</td>
<td>2</td>
</tr>
</tbody>
</table>

Erroneous Commands Causing Round Trips

Buried in JDBC Usage
PreparedStatement
.setMaxRows()
Inherited LAMP Stack Product

- Problem: Frozen, some functions work
  - Lack of Free Disk Space
- Problem: Running slow
  - Increase Buffers
  - Change Storage Engine
- Problem: Can't connect
  - Connections
MySQL for Oracle Dudes

Inherited LAMP Stack Product

- A lot of products are non-transactional
- Not designed for large volume enterprises
Default Installation

- No 'root' user password
- Anonymous users mess with host based security
- Improve overall security

$ mysql_secure_installation

MySQL for Oracle Dudes

AUTO COMMIT

- By Default enabled in MySQL
  - Ops I deleted the wrong data, I'll just ROLLBACK
  - Non Transactional Storage Engines
  - `SET AUTOCOMMIT = {0 | 1};`

GOTCHA
MySQL for Oracle Dudes

SQL*Plus Reporting

- No Alternative
- Nice Feature- Vertical Output Display
  - SELECT columns FROM table \G
- Write your own in MySQL Source
MySQL for Oracle Dudes

Nice MySQL Features

- SELECT INTO OUTFILE ...
- LOAD DATA FILE ...
- DROP [object] IF EXISTS ...
- ALTER TABLE .. ADD ... AFTER [column]
- Query Cache
Query Cache

- SELECT Cache (great for high read environments)
  - Being Added to Oracle v11

# MySQL for Oracle Dudes

## Contrasting Buffers

<table>
<thead>
<tr>
<th>Area</th>
<th>MySQL</th>
<th>Oracle</th>
<th>Microsoft SQL Server</th>
</tr>
</thead>
</table>
| Memory Caches | • MyISAM key caches  
• InnoDB data cache  
• InnoDB log cache  
• Dictionary cache  
• Falcon caches  
• Query Cache  
• User caches | • Data cache (variants)  
• Log buffer  
• Shared Pool  
• Java Pool  
• Large Pool  
• PGA | • Buffer cache  
• SQL cache  
• Misc caches (lock, connection, workspace, etc.) |
| Redo/Undo Logs| • InnoDB Undo Space  
• InnoDB Logs  
• Falcon Log  
• Binary Log | • Undo Tablespace (9i+)  
• Redo Logs  
• Archive Logs | • TempDB (2005+)  
• Transaction Logs |
| Data Storage  | • Tablespaces  
• Table/Index Files  
• Format files | • Tablespaces  
• Datafiles | • Filegroups  
• Files |
| Optimizer     | • Cost-based | • Cost-based | • Cost-based |
MySQL for Oracle Dudes

Important Developer Stuff

- Sequence Replacement
- No DUAL Necessary
- Data Comparison
- DDL Syntax
- Stored Procedures
- Locking

- SQL_MODE
- TIMESTAMP Data Type
- New things
Sequences Replacement

- **AUTO_INCREMENT**
  
e.g. id INT NOT NULL AUTO_INCREMENT,
- Must be tied to a [table].[column]
- Only one per table
- No system wide capability
- LAST_INSERT_ID()
- No get next capability
Optional Table Name

- DUAL IS NOT REQUIRED
  - e.g. SELECT 1+1

- Provided for Oracle Compatibility
  - e.g. SELECT 1+1 FROM DUAL
  - e.g. SELECT DUMMY FROM DUAL  *** Fails
MySQL for Oracle Dudes

Data Comparison

- LIKE compares data case-insensitive
  - Character Set/Collation dependent
  e.g. SELECT title FROM film WHERE title LIKE 'A%'
    Returns rows starting with 'ALIEN' and 'alien'

- BINARY DDL syntax
  e.g. title VARCHAR(100) NOT NULL BINARY
DDL Syntax

- Escaped Reserved Words are allowed
  
e.g. CREATE TABLE `group` (...);
  
e.g. CREATE TABLE "insert" (...) ;  * sql_mode

- Tables/Columns/Triggers/Stored Procedures

- Space and other special characters allowed
  Operating System Dependent
  
e.g. CREATE TABLE `My Table Name` (...);
Stored Procedures

- Earlier Session
  “Using Stored Routines for MySQL Administration”

- Not a PL/SQL Replacement

- Missing Functionality
  - Types, Overloading, named parameters, pinning, packages
  - Built-in Packages
MySQL for Oracle Dudes

Stored Procedures

- MySQL Stored Routines Library
  - Globals
  - Arrays
  - Named Parameters

MySQL for Oracle Dudes

Locking

- Storage Engine Specific
  - MyISAM/Memory – Table
  - InnoDB/Falcon/PBXT/Solid – Row
  - Nitro – quasi nothing
MySQL for Oracle Dudes

**SQL_MODE**

- `SET SQL_MODE=TRADITIONAL,ORACLE`

MySQL for Oracle Dudes

SQL_MODE

- String Concatenation
  - SELECT CONCAT('A','B');
  - SELECT CONCAT_WS('','a','b','c','d');

- SET sql_mode='PIPES_AS_CONCAT';
  - SELECT 'A'||'B';

Emulate Oracle Behaviour

May break other tools
TIMESTAMP

- Remove DB level auditing via triggers
  - last_modified TIMESTAMP ON UPDATE CREATE_TIMESTAMP,
MySQL for Oracle Dudes

New things you may see

- Multi-record INSERT
- REPLACE
- LOW_PRORITY | HIGH PRIORITY
- INSERT DELAYED
MySQL for Oracle Dudes

MIGRATION
MySQL for Oracle Dudes

Migration

MYSQL = (DESCRIPTION=
       (ADDRESS=(PROTOCOL=tcp)(HOST=localhost)(PORT=1521))
       (CONNECT_DATA=(SID=MYSQL)) (HS=OK))

CREATE DATABASE LINK mysql
    CONNECT TO "my_user" IDENTIFIED BY "my_password"
    USING 'mysql';

The Easy Way: Simply read/write directly to MySQL :)

Presented by

Ronald Bradford, MySQL Inc
MySQL Conference & Expo 2007
MySQL for Oracle Dudes

Oracle Migration

- Good guide to identifying differences
- Schema
- Data
- Objects
- Application
MySQL for Oracle Dudes

Oracle Migration

- MySQL Migration Toolkit
  - Does
    - Tables/Views
    - Data
  - Does Not (yet)
    - Sequences
    - Stored Procedures
    - Triggers

http://www.mysql.com/products/tools/migration-toolkit/
Oracle Migration - Schema

- Case Sensitive Table Names
- Data Types
  - INT, FLOAT/D Double, NUMBER
  - UNSIGNED
  - BIT
- Sequences replacement – Auto Increment
- What's Missing
  - Snapshots, Check Constraints, Flashback queries, synonyms
Oracle Migration - Data

- Date Format – no NLS_DATE_FORMAT
- Silent conversions
  - Less likely due to Oracle as Source
- No Oracle Timestamp (no ms support)

- Data Verification necessary
  - COUNT(), SUM(), MD5()
Oracle Migration – Data Verification

- Numeric Precision/Rounding
- Character Sets (multi-byte data)
- CHAR usage
  - CHAR(5)
    - Oracle 'abc ' - 5 characters long
    - MySQL 'abc' - 3 characters long
Oracle Migration - Objects

- No Packages
- Restricted Triggers
  - Only one trigger per table per DML statement
  - Missing
    - INSTEAD,
    - INSERT OR UPDATE
    - OR REPLACE
    - Only for DML Statements
MySQL Migration - Application

- NVL() --> IFNULL()
- ROWNUM --> LIMIT
- SEQ.CURRVAL --> LAST_INSERT_ID()
- SEQ.NEXTVAL --> NULL
- NO DUAL necessary (SELECT NOW())
- NO DECODE() --> IF() CASE()
- JOIN (+) Syntax --> INNER|OUTER LEFT|RIGHT
Oracle Migration - Application

- Date Functions
  - CURDATE(), NOW()
- Data Formats
  - Default is YYYY-MM-DD
- Case insensitive searching
  - no UPPER(column) = UPPER(value)
  - Character Set/Collation specific
MySQL for Oracle Dudes

CLOSING
MySQL for Oracle Dudes

Pronunciation

"MySQL" is officially pronounced as

"My Ess Queue Ell"
MySQL for Oracle Dudes

References

- Developer Zone  http://dev.mysql.com
- Blog Aggregator http://planetmysql.org
- Source Forge    http://forge.mysql.com
- Forums          http://forums.mysql.com
- Lists           http://lists.mysql.com
- User Groups     http://dev.mysql.com/user-groups
- Training        http://www.mysql.com/training
MySQL for Oracle Dudes

Recommended Reading

- MySQL by Paul DuBois
MySQL for Oracle Dudes

Support Me

Buy a T-shirt!
MySQL for Oracle Dudes

Q & A