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MySQL Idiosyncrasies that BITE

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PERCONA LIVE MySQL Conference & Expo

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DEFINITIONS

idiosyncrasy

[id-ee-uh-sing-kruh-see, -sin-] –noun,plural-sies.

A characteristic, habit, mannerism, or the like, that is **peculiar** to ...

http://dictionary.com

ABOUT THE AUTHOR

- 2011-12 Effective MySQL Book Series
- 2010 - Oracle ACE Director (first in MySQL)
- 2009 - MySQL Community member of the year
- Co Author of Expert PHP & MySQL
- Top individual blog contributor on Planet MySQL
- Employee - MySQL Inc (06-08), Oracle Corp (96-99)

- Provide independent consulting - Available NOW

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MySQL Idiosyncrasies that BITE by Ronald Bradford - Slides at http://j.mp/EM-Bite
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ORACLE != MYSQL

- Product Age
- Development philosophies
- Target audience
- Developer practices
- Installed versions

RDBMS CHARACTERISTICS

- Data Integrity
- Transactions
- ACID
- Data Security
- ANSI SQL

WARNING !!!

These RDBMS characteristics are NOT enabled by default in MySQL

MYSQL TERMINOLOGY

- Storage Engines
  - MyISAM - Default
  - InnoDB - Default from MySQL 5.5
- Transactions
  - Non Transactional Engine(s)
  - Transactional Engine(s)

1. Data Integrity

DATA INTEGRITY
EXPECTED

```
CREATE TABLE orders (
  qty TINYINT UNSIGNED NOT NULL,
  created TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP
) ENGINE=InnoDB DEFAULT CHARSET latin1;

INSERT INTO orders(qty) VALUES (0), (100), (255);

SELECT * FROM orders;
+-----+---------------------+
| qty | created             |
+-----+---------------------+
|   0 | 2010-10-25 12:22:22 |
| 100 | 2010-10-25 12:22:22 |
| 255 | 2010-10-25 12:22:22 |
+-----+---------------------+
```

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DATA INTEGRITY
UNEXPECTED

```
mysql> INSERT INTO orders (qty) VALUES (-1), (9000);

mysql> SELECT * FROM orders;
+-----+---------------------+
| qty | created             |
+-----+---------------------+
|   0 | 2010-10-25 12:22:22 |
| 100 | 2010-10-25 12:22:22 |
| 255 | 2010-10-25 12:22:22 |
|   0 | 2010-10-25 12:23:06 |
| 255 | 2010-10-25 12:23:06 |
+-----+---------------------+

//CREATE TABLE orders (
//  qty TINYINT UNSIGNED NOT NULL,
```

TINYINT is 1 byte. UNSIGNED supports values 0-255

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DATA INTEGRITY
WARNINGS

```
mysql> INSERT INTO orders (qty) VALUES (-1), (9000);
Query OK, 2 rows affected, 2 warnings (0.05 sec)

mysql> SHOW WARNINGS;
+---------+------+-----------------------------------------------+
| Level   | Code | Message                                       |
+---------+------+-----------------------------------------------+
| Warning | 1264 | Out of range value for column 'qty' at row 1 |
| Warning | 1264 | Out of range value for column 'qty' at row 2 |
+---------+------+-----------------------------------------------+
```

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DATA INTEGRITY
UNEXPECTED

```
mysql> INSERT INTO customers (name)
    -> VALUES ('RONALD BRADFORD'),
    ->        ('FRANCISCO MUNOZ ALVAREZ');

mysql> SELECT * FROM customers;
+----------------------+
| name                 |
+----------------------+
| RONALD BRADFORD      |
| FRANCISCO MUNOZ ALVA |
+----------------------+
2 rows in set (0.00 sec)
```


DATA INTEGRITY
WARNINGS

```
INSERT INTO customers (name) VALUES ('RONALD BRADFORD'),
('FRANCISCO MUNOZ ALVAREZ');
Query OK, 2 rows affected, 1 warning (0.29 sec)

mysql> SHOW WARNINGS;
+---------+------+-----------------------------------------+
| Level   | Code | Message                                 |
+---------+------+-----------------------------------------+
| Warning | 1265 | Data truncated for column 'name' at row 2 |
+---------+------+-----------------------------------------+
```


DATA INTEGRITY
WARNINGS

```
mysql> INSERT INTO sample_date (d) VALUES ('2010-02-31');
Query OK, 1 row affected, 1 warning (0.00 sec)
mysql> SHOW WARNINGS;
+---------+------+---------------------------------------+
| Level   | Code | Message                               |
+---------+------+---------------------------------------+
| Warning | 1265 | Data truncated for column 'd' at row 1 |
+---------+------+---------------------------------------+
mysql> SELECT * FROM sample_date;
+------------+
| d          |
+------------+
| 0000-00-00 |
+------------+
```


SHOW WARNINGS

http://dev.mysql.com/doc/refman/5.5/en/show-warnings.html

DATA INTEGRITY

Recommended Configuration

SQL_MODE =

STRICT_ALL_TABLES;

http://dev.mysql.com/doc/refman/5.5/en/server-sql-mode.html

DATA INTEGRITY

EXPECTED

```
mysql> SET SESSION SQL_MODE=STRICT_ALL_TABLES;
mysql> TRUNCATE TABLE sample_data;
mysql> INSERT INTO sample_data(i) VALUES (0), (100), (255);

mysql> INSERT INTO sample_data (i) VALUES (-1), (9000);
ERROR 1264 (22003): Out of range value for column 'i' at row 1

mysql> SELECT * FROM sample_data;
+-----+------+---------------------+
| i   | c    | t                   |
+-----+------+---------------------+
|   0 | NULL | 2010-06-06 14:39:48 |
| 100 | NULL | 2010-06-06 14:39:48 |
| 255 | NULL | 2010-06-06 14:39:48 |
+-----+------+---------------------+
3 rows in set (0.00 sec)
```


DATA INTEGRITY

EXPECTED

```
mysql> SET SESSION SQL_MODE=STRICT_ALL_TABLES;
mysql> INSERT INTO sample_date (d) VALUES ('2010-02-31');
ERROR 1292 (22007): Incorrect date value: '2010-02-31' for
column 'd' at row 1
```


DATA INTEGRITY

UNEXPECTED

```
mysql> INSERT INTO sample_date (d) VALUES ('2010-00-00');
mysql> INSERT INTO sample_date (d) VALUES ('2010-00-05');
mysql> INSERT INTO sample_date (d) VALUES ('0000-00-00');

mysql> SELECT * FROM sample_date;
+------------+
| d          |
+------------+
| 2010-00-00 |
| 2010-00-05 |
| 0000-00-00 |
+------------+
```

USING SQL_MODE

Recommended Configuration

```
SQL_MODE =
  STRICT_ALL_TABLES,
  NO_ZERO_DATE,
  NO_ZERO_IN_DATE;
```

http://dev.mysql.com/doc/refman/5.5/en/server-sql-mode.html

DATA INTEGRITY

EXPECTED

```
mysql> SET SESSION
SQL_MODE='STRICT_ALL_TABLES,NO_ZERO_IN_DATE,NO_ZERO_DATE';

mysql> TRUNCATE TABLE sample_date;

mysql> INSERT INTO sample_date (d) VALUES ('2010-00-00');
ERROR 1292 (22007): Incorrect date value: '2010-00-00' for column
'd' at row 1
mysql> INSERT INTO sample_date (d) VALUES ('2010-00-05');
ERROR 1292 (22007): Incorrect date value: '2010-00-05' for column
'd' at row 1
mysql> INSERT INTO sample_date (d) VALUES ('0000-00-00');
ERROR 1292 (22007): Incorrect date value: '0000-00-00' for column
'd' at row 1
mysql> SELECT * FROM sample_date;
Empty set (0.00 sec)
```

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2. Transactions

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TRANSACTIONS

EXAMPLE

```
DROP TABLE IF EXISTS parent;
CREATE TABLE parent (
  id    INT UNSIGNED NOT NULL AUTO_INCREMENT,
  val   VARCHAR(10) NOT NULL,
PRIMARY KEY (id),
UNIQUE KEY (val)
) ENGINE=InnoDB DEFAULT CHARSET latin1;
DROP TABLE IF EXISTS child;
CREATE TABLE child (
  id         INT UNSIGNED NOT NULL AUTO_INCREMENT,
  parent_id INT UNSIGNED NOT NULL,
  created    TIMESTAMP NOT NULL,
PRIMARY KEY (id),
INDEX (parent_id),
FOREIGN KEY (parent_id) REFERENCES parent(id)
) ENGINE=InnoDB DEFAULT CHARSET latin1;
```

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TRANSACTIONS
EXAMPLE

```
START TRANSACTION;
INSERT INTO parent(val) VALUES("a");
INSERT INTO child(parent_id,created)
           VALUES(LAST_INSERT_ID(),NOW());

# Expecting an error with next SQL
INSERT INTO parent(val) VALUES("a");
ROLLBACK;

SELECT * FROM parent;
SELECT * FROM child;
```


TRANSACTIONS
EXPECTED

```
...
mysql> INSERT INTO parent (val) VALUES("a");
ERROR 1062 (23000): Duplicate entry 'a' for key 'val'

mysql> ROLLBACK;

mysql> SELECT * FROM parent;
Empty set (0.00 sec)

mysql> SELECT * FROM child;
Empty set (0.00 sec)
```


TRANSACTIONS
EXAMPLE

MyISAM is the current default if not specified before Version 5.5

```
DROP TABLE IF EXISTS parent;
CREATE TABLE parent (
  id    INT UNSIGNED NOT NULL AUTO_INCREMENT,
  val   VARCHAR(10) NOT NULL,
PRIMARY KEY (id),
UNIQUE KEY (val)
) ENGINE=MyISAM DEFAULT CHARSET latin1;

DROP TABLE IF EXISTS child;
CREATE TABLE child (
  id        INT UNSIGNED NOT NULL AUTO_INCREMENT,
  parent_id INT UNSIGNED NOT NULL,
  created   TIMESTAMP NOT NULL,
PRIMARY KEY (id),
INDEX (parent_id)
) ENGINE=MyISAM DEFAULT CHARSET latin1;
```


TRANSACTIONS
UNEXPECTED

```
mysql> INSERT INTO parent (val) VALUES("a");
ERROR 1062 (23000): Duplicate entry 'a' for key 'val'
mysql> ROLLBACK;
mysql> SELECT * FROM parent;
+----+-----+
| id | val |
+----+-----+
|  1 | a   |
+----+-----+
1 row in set (0.00 sec)
mysql> SELECT * FROM child;
+----+-----------+---------------------+
| id | parent_id | created             |
+----+-----------+---------------------+
|  1 |         1 | 2010-06-03 13:53:38 |
+----+-----------+---------------------+
1 row in set (0.00 sec)
```

TRANSACTIONS
WARNINGS

```
mysql> ROLLBACK;
Query OK, 0 rows affected, 1 warning (0.00 sec)

mysql> SHOW WARNINGS;
+---------+------+----------------------------------------
| Level   | Code | Message
|
+---------+------+----------------------------------------
| Warning | 1196 | Some non-transactional changed tables
couldn't be rolled back |
+---------+------+----------------------------------------
```


TRANSACTIONS

Recommended Configuration

```
mysql> SET GLOBAL storage_engine=InnoDB;


# my.cnf
[mysqld]
default-storage-engine=InnoDB

# NOTE: Requires server restart

$ /etc/init.d/mysqld stop
$ /etc/init.d/mysqld start
```

Now default in MySQL 5.5 for new config files

http://dev.mysql.com/doc/refman/5.5/en/server-options.html#option_mysqld_default-storage-engine

NON TRANSACTIONAL

- No transaction overhead
  - Much faster
  - Less disk writes
  - Lower disk space requirements
  - Less memory requirements

http://dev.mysql.com/doc/refman/5.5/en/storage-engine-compare-transactions.html

3. Variable Scope

VARIABLE SCOPE
EXAMPLE

```
mysql> CREATE TABLE test1(id INT UNSIGNED NOT NULL);

mysql> SHOW CREATE TABLE test1\G
CREATE TABLE `test1` (
  `id` int(10) unsigned NOT NULL
) ENGINE=MyISAM DEFAULT CHARSET=latin1
```

MyISAM is the current default if not specified before Version 5.5

VARIABLE SCOPE
EXAMPLE

```
mysql> SHOW GLOBAL VARIABLES LIKE 'storage_engine';
+----------------+--------+
| Variable_name  | Value  |
+----------------+--------+
| storage_engine | MyISAM |
+----------------+--------+

mysql> SET GLOBAL storage_engine='InnoDB';
mysql> SHOW GLOBAL VARIABLES LIKE 'storage_engine';
+----------------+--------+
| Variable_name  | Value  |
+----------------+--------+
| storage_engine | InnoDB |
+----------------+--------+
```

Default in MySQL 5.5

VARIABLE SCOPE
UNEXPECTED

```
mysql> SHOW GLOBAL VARIABLES LIKE 'storage_engine';
+----------------+--------+
| Variable_name  | Value  |
+----------------+--------+
| storage_engine | InnoDB |
+----------------+--------+

mysql> DROP TABLE test1;
mysql> CREATE TABLE test1(id INT UNSIGNED NOT NULL);

mysql> SHOW CREATE TABLE test1\G
CREATE TABLE `test1` (
  `id` int(10) unsigned NOT NULL
) ENGINE=MyISAM DEFAULT CHARSET=latin1
```


VARIABLE SCOPE
EXAMPLE

```
mysql> SHOW GLOBAL VARIABLES LIKE 'storage_engine';
+----------------+--------+
| Variable_name  | Value  |
+----------------+--------+
| storage_engine | InnoDB |
+----------------+--------+
```

VARIABLE SCOPE
EXAMPLE

```
mysql> SHOW GLOBAL VARIABLES LIKE 'storage_engine';
+----------------+--------+
| Variable_name  | Value  |
+----------------+--------+
| storage_engine | InnoDB |
+----------------+--------+

mysql> SHOW SESSION VARIABLES LIKE 'storage_engine';
+----------------+--------+
| Variable_name  | Value  |
+----------------+--------+
| storage_engine | MyISAM |
+----------------+--------+
```

MySQL Variables have two scopes. SESSION & GLOBAL

SCOPE SYNTAX

- SHOW [GLOBAL | SESSION] VARIABLES;
- SET [GLOBAL | SESSION] variable = value;
- Default is GLOBAL since 5.0.2

http://dev.mysql.com/doc/refman/5.5/en/set-option.html
http://dev.mysql.com/doc/refman/5.5/en/user-variables.html

VARIABLE SCOPE

Be careful of existing connections!

- Persistent connections (e.g. Java)
- Replication SQL_THREAD

4. Storage Engines

SE CREATION
EXAMPLE

```
CREATE TABLE test1 (
  id INT UNSIGNED NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET latin1;

SHOW CREATE TABLE test1\G
*************************** 1. row *************
Table: test1
Create Table: CREATE TABLE `test1` (
  `id` int(10) unsigned NOT NULL
) ENGINE=MyISAM DEFAULT CHARSET=latin1
```

Even specified the storage engine reverted to the default

STORAGE ENGINES
WARNINGS

```
CREATE TABLE test1 (
  id INT UNSIGNED NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET latin1;
Query OK, 0 rows affected, 2 warnings (0.13 sec)
SHOW WARNINGS;
+---------+------+-------------------------------------------------+
| Level   | Code | Message                                         |
+---------+------+-------------------------------------------------+
| Warning | 1286 | Unknown table engine 'InnoDB'                   |
| Warning | 1266 | Using storage engine MyISAM for table 'test1' |
+---------+------+-------------------------------------------------+
2 rows in set (0.00 sec)
```


STORAGE ENGINES
CAUSE

```
mysql> SHOW ENGINES;
+------------+---------+------------------------+--------------+
| Engine     | Support | Comment                | Transactions |
+------------+---------+------------------------+--------------+
| InnoDB     | NO      | Supports transaction... | NULL         |
| MEMORY     | YES     | Hash based, stored i... | NO           |
| MyISAM     | DEFAULT | Default engine as  ...  | NO           |
```


STORAGE ENGINES
EXAMPLE

```
mysql> CREATE TABLE test1
id INT UNSIGNED NOT NULL
) ENGINE=InnDB DEFAULT CHARSET latin1;
Query OK, 0 rows affected, 2 warnings (0.11 sec)

mysql> SHOW WARNINGS;
+---------+------+-------------------------------------------------+
| Level   | Code | Message                                         |
+---------+------+-------------------------------------------------+
| Warning | 1286 | Unknown table engine 'InnDB'                    |
| Warning | 1266 | Using storage engine MyISAM for table 'test1' |
+---------+------+-------------------------------------------------+
```

Be careful of spelling mistakes as well.

SQL_MODE

Recommended Configuration

```
SQL_MODE =
  STRICT_ALL_TABLES,
  NO_ZERO_DATE,
  NO_ZERO_IN_DATE,
  NO_ENGINE_SUBSTITUTION;
```

http://dev.mysql.com/doc/refman/5.5/en/server-sql-mode.html

STORAGE ENGINES

EXPECTED

```
SET SESSION SQL_MODE=NO_ENGINE_SUBSTITUTION;

DROP TABLE IF EXISTS test3;
CREATE TABLE test3 (
  id INT UNSIGNED NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET latin1;

ERROR 1286 (42000): Unknown table engine 'InnoDB'
```


5. ACID

Atomicity - All or nothing

ATOMICITY
TABLE EXAMPLE

```
DROP TABLE IF EXISTS accounts;
CREATE TABLE accounts(
  id INT UNSIGNED NOT NULL AUTO_INCREMENT,
  username VARCHAR(10) NOT NULL,
  PRIMARY KEY (id),
  UNIQUE KEY (username)
) ENGINE=MyISAM DEFAULT CHARSET latin1;
```


ATOMICITY
DATA EXAMPLE

```
INSERT INTO accounts (username)
VALUES('jane'),('jo'),('joe'),('joel'),('jame'),
('jamel');

mysql> SELECT * FROM accounts;
+----+----------+
| id | username |
+----+----------+
|  1 | jane     |
|  2 | jo       |
|  3 | joe      |
|  4 | joel     |
|  5 | jame     |
|  6 | jamel    |
+----+----------+
6 rows in set (0.00 sec)
```


ATOMICITY
UNEXPECTED

```
mysql> UPDATE accounts SET username=CONCAT(username,'l');
ERROR 1062 (23000): Duplicate entry 'joel' for key
'username'
mysql> SELECT * FROM accounts;
+----+----------+
| id | username |
+----+----------+
|  1 | janel    |
|  2 | jol      |
|  3 | joe      |
|  4 | joel     |
|  5 | jame     |
|  6 | jamel    |
+----+----------+
6 rows in set (0.01 sec)
```


ATOMICITY
UNEXPECTED

```
mysql> ROLLBACK;
Query OK, 0 rows affected (0.00 sec)

mysql> SELECT * FROM accounts;
+----+----------+
| id | username |
+----+----------+
|  1 | janel    |
|  2 | jol      |
|  3 | joe      |
|  4 | joel     |
...
```

Rollback has no effect on non transactional tables

ATOMICITY
EXAMPLE

```
CREATE TABLE accounts(
  id INT UNSIGNED NOT NULL AUTO_INCREMENT,
  username VARCHAR(10) NOT NULL,
  PRIMARY KEY (id),   UNIQUE KEY (username)
) ENGINE=InnoDB DEFAULT CHARSET latin1;
INSERT INTO accounts (username) VALUES('jane'),('jo')...
UPDATE accounts SET username=CONCAT(username,'l');
ERROR 1062 (23000): Duplicate entry 'joel' for key 'username'
SELECT * FROM accounts;
+----+----------+
| id | username |
+----+----------+
|  1 | jane     |
|  2 | jo       |
|  3 | joe      |
|  4 | joel     |
|  5 | jame     |
|  6 | jamel    |
+----+----------+
```

Data remains unchanged

ATOMICITY
UNEXPECTED

```
mysql> ROLLBACK;
Query OK, 0 rows affected (0.00 sec)

mysql> SELECT * FROM accounts;
+----+----------+
| id | username |
+----+----------+
|  1 | jane     |
|  2 | jo       |
|  3 | joe      |
|  4 | joel     |
|  5 | jame     |
|  6 | jamel    |
+----+----------+
```

Data remains, INSERT was not rolled back?

ATOMICITY

```
mysql> SHOW GLOBAL VARIABLES LIKE 'autocommit';
+---------------+-------+
| Variable_name | Value |
+---------------+-------+
| autocommit    | ON    |
+---------------+-------+
```

The default for autocommit is ON. Great care is needed to change the default.

ATOMICITY

Recommended Practice

- Always wrap SQL in transactions
  - START TRANSACTION | BEGIN [WORK]
  - COMMIT

Consistency -
Data integrity is maintained

CONSISTENCY
SCHEMA

```
DROP TABLE IF EXISTS parent;
CREATE TABLE parent (
  id   INT UNSIGNED NOT NULL AUTO_INCREMENT,
  val  VARCHAR(10) NOT NULL,
PRIMARY KEY (id),
UNIQUE KEY (val)
) ENGINE=InnoDB DEFAULT CHARSET latin1;
DROP TABLE IF EXISTS child;
CREATE TABLE child (
  id        INT UNSIGNED NOT NULL AUTO_INCREMENT,
  parent_id INT UNSIGNED NOT NULL,
  created   TIMESTAMP NOT NULL,
PRIMARY KEY (id),
INDEX (parent_id),
FOREIGN KEY (parent_id) REFERENCES parent(id)
) ENGINE=InnoDB DEFAULT CHARSET latin1;
```


CONSISTENCY
DATA

```
START TRANSACTION;
INSERT INTO parent VALUES (1,'ABC');
INSERT INTO child VALUES (1,1,NOW());
COMMIT;

INSERT INTO child VALUES (2,2,NOW());
ERROR 1452 (23000): Cannot add or update a child row: a
foreign key constraint fails (`test`.`child`, CONSTRAINT
`child_ibfk_1` FOREIGN KEY (`parent_id`) REFERENCES
`parent` (`id`))
```


CONSISTENCY
SCHEMA

```
DROP TABLE IF EXISTS parent;
CREATE TABLE parent (
  id   INT UNSIGNED NOT NULL AUTO_INCREMENT,
  val  VARCHAR(10) NOT NULL,
PRIMARY KEY (id),
UNIQUE KEY (val)
) ENGINE=MyISAM DEFAULT CHARSET latin1;
DROP TABLE IF EXISTS child;
CREATE TABLE child (
  id        INT UNSIGNED NOT NULL AUTO_INCREMENT,
  parent_id INT UNSIGNED NOT NULL,
  created   TIMESTAMP NOT NULL,
PRIMARY KEY (id),
INDEX (parent_id),
FOREIGN KEY (parent_id) REFERENCES parent(id)
) ENGINE=MyISAM DEFAULT CHARSET latin1;
```

No Warnings!!!

CONSISTENCY

DATA

```
mysql> START TRANSACTION;
Query OK, 0 rows affected (0.00 sec)
mysql> INSERT INTO parent VALUES (1,'ABC');
Query OK, 1 row affected (0.03 sec)
mysql> INSERT INTO child VALUES (1,1,NOW());
Query OK, 1 row affected (0.00 sec)
mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)

mysql> INSERT INTO child VALUES (2,2,NOW());
Query OK, 1 row affected (0.00 sec)
```

No Warnings!!!

No Integrity check

Isolation - Transactions do not affect other

TX ISOLATION

- READ-UNCOMMITTED
- READ-COMMITTED
- REPEATABLE-READ
- SERIALIZABLE

MySQL supports 4 isolation levels

http://dev.mysql.com/doc/refman/5.5/en/set-transaction.html
http://ronaldbradford.com/blog/understanding-mysql-innodb-transaction-isolation-2009-09-24/

TX ISOLATION DEFAULT

- The default is
  - REPEATABLE-READ
- `SET GLOBAL tx_isolation = 'READ-COMMITTED';`
- This is a mistake

Common mistake by Oracle DBA's supporting MySQL

http://ronaldbradford.com/blog/dont-assume-common-terminology-2010-03-03/

Oracle READ COMMITTED != MySQL READ-COMMITTED

TX ISOLATION ISSUES

```
SET GLOBAL tx_isolation='READ-COMMITTED';
Query OK, 0 rows affected (0.00 sec)

mysql> insert into test1 values (1,'x');
ERROR 1598 (HY000): Binary logging not possible.
Message: Transaction level 'READ-COMMITTED' in InnoDB is
not safe for binlog mode 'STATEMENT'
```

Beware of ORM's especially Java that add READ-COMMITTED

As of 5.1 this requires further configuration considerations

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Durability - No committed transactions are lost

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DATA SAFETY

- MyISAM writes/flushes data every statement
  - Does not flush indexes (*)
- InnoDB can relax durability
  - flush all transactions per second
- innodb_flush_log_at_trx_commit
- sync_binlog
- innodb_support_xa

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AUTO RECOVERY

- InnoDB has it
- MyISAM does not - (*) Indexes

- `MYISAM-RECOVER=FORCE,BACKUP`
- `REPAIR TABLE`
- `myisamchk`

RECOVERY TIME

- InnoDB is consistent
  - Redo Log file size
  - Slow performance in Undo (*)
- MyISAM grows with data volume

INNODB AUTO RECOVERY

EXAMPLE

```
InnoDB: Log scan progressed past the checkpoint lsn 0 188755039
100624 16:37:44  InnoDB: Database was not shut down normally!
InnoDB: Starting crash recovery.
InnoDB: Reading tablespace information from the .ibd files...
InnoDB: Restoring possible half-written data pages from the doublewrite
InnoDB: buffer...
InnoDB: Doing recovery: scanned up to log sequence number 0 193997824
InnoDB: Doing recovery: scanned up to log sequence number 0 195151897
InnoDB: 1 transaction(s) which must be rolled back or cleaned up
InnoDB: in total 105565 row operations to undo
InnoDB: Trx id counter is 0 18688
100624 16:37:45  InnoDB: Starting an apply batch of log records to the
database...
InnoDB: Progress in percents: 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
19 ... 99
InnoDB: Apply batch completed
InnoDB: Last MySQL binlog file position 0 12051, file name ./binary-log.
000003
InnoDB: Starting in background the rollback of uncommitted transactions
...
```


MYISAM REPAIR

ISSUES

```
100126 22:44:35 [ERROR] /var/lib/mysql5/bin/mysqld: Table './XXX/
descriptions' is marked as crashed and should be repaired
100126 22:44:35 [Warning] Checking table:   './XXX/descriptions'
100126 22:44:35 [ERROR] /var/lib/mysql5/bin/mysqld: Table './XXX/tbl1' is
marked as crashed and should be repaired
100126 22:44:35 [Warning] Checking table:   './XXX/taggings'
100126 22:44:35 [ERROR] /var/lib/mysql5/bin/mysqld: Table './XXX/tbl2' is
marked as crashed and should be repaired
```

Database still starts.
User access starts.
Some tables unavailable

6. Data Security

USER PRIVILEGES

Best Practice

```
CREATE USER goodguy@localhost IDENTIFIED BY 'sakila';
GRANT CREATE,SELECT,INSERT,UPDATE,DELETE ON prod.* TO
goodguy@localhost;
```

Normal Practice

```
CREATE USER superman@'%';
GRANT ALL ON *.* TO superman@'%';
```

http://dev.mysql.com/doc/refman/5.5/en/create-user.html
http://dev.mysql.com/doc/refman/5.5/en/grant.html

USER PRIVILEGES

- `GRANT ALL ON *.* TO user@'%'`
  - *.* gives you access to all tables in all schemas
  - @'%' give you access from any external location
  - ALL gives you
  - ALTER, ALTER ROUTINE, CREATE, CREATE ROUTINE, CREATE TEMPORARY TABLES, CREATE USER, CREATE VIEW, DELETE, DROP, EVENT, EXECUTE, FILE, INDEX, INSERT, LOCK TABLES, PROCESS, REFERENCES, RELOAD, REPLICATION CLIENT, REPLICATION SLAVE, SELECT, SHOW DATABASES, SHOW VIEW, SHUTDOWN, **SUPER**, TRIGGER, UPDATE, USAGE

WHY SUPER IS BAD

- SUPER
  - Bypasses read_only
  - Bypasses init_connect
  - Can Disable binary logging
  - Change configuration dynamically
  - No reserved connection

READ ONLY

```
$ mysql -ugoodguy -psakila prod
mysql> insert into test1(id) values(1);
ERROR 1290 (HY000): The MySQL server is running with th
--read-only option so it cannot execute this statement
```

```
$ mysql -usuperman prod
mysql> insert into test1(id) values(1);
Query OK, 1 row affected (0.01 sec)
```

Data inconsistency now exists

INIT CONNECT

Common configuration practice to support UTF8

```
#my.cnf
[client]
init_connect=SET NAMES utf8


This specifies to use UTF8 for communication with client
and data
```


INIT CONNECT

```
$ mysql -usuperman prod
$ mysql -ugoodguy -psakila prod
                                    l VARIABLES LIKE
mysql> SHOW SESSION VARIABLES LIKE 'ch%';
+--------------------------+----------+   --------+----------+
| Variable_name            | Value    |           | Value    |
+--------------------------+----------+   --------+----------+
| character_set_client     | utf8     |   ent     | latin1   |
| character_set_connection | utf8     |   nection | latin1   |
| character_set_database   | latin1   |   abase   | latin1   |
| character_set_filesystem | binary   |   esystem | binary   |
| character_set_results    | utf8     |   ults    | latin1   |
| character_set_server     | latin1   |   ver     | latin1   |
| character_set_system     | utf8     |   tem     |          |
+--------------------------+----------+   --------+----------+
```

Data integrity can be compromised

BINARY LOG

```
mysql> SHOW MASTER STATUS;
+------------------+----------+--------------+------------------+
| binary-log.000017 |     4488 |              |                  |
+------------------+----------+--------------+------------------+

mysql> DELETE FROM sales WHERE id=23;
mysql> SET SQL_LOG_BIN=0;
mysql> DELETE FROM sales WHERE id=80;
mysql> SET SQL_LOG_BIN=1;
mysql> DELETE FROM sales WHERE id=99;

mysql> SHOW MASTER STATUS;
+------------------+----------+--------------+------------------+
| File             | Position | Binlog_Do_DB | Binlog_Ignore_DB |
+------------------+----------+--------------+------------------+
| binary-log.000017 |     4580 |              |                  |
+------------------+----------+--------------+------------------+
1 row in set (0.00 sec)
```

BINARY LOG

```
# at 4488
#101025 12:57:24 server id 1  end_log_pos 4580  Query
   thread_id=1  exec_time=0  error_code=0
SET @@session.lc_time_names=0/*!*/;
SET @@session.collation_database=DEFAULT/*!*/;
DELETE FROM sales WHERE id=23
/*!*/;
# at 4580
#101025 13:01:26 server id 1  end_log_pos 4672  Query
   thread_id=1  exec_time=0  error_code=0
SET TIMESTAMP=1288018886/*!*/;
DELIMITER ;
```

Data auditability is now compromised

RESERVED CONNECTION

Application Error: Too Many Connections

```
$ mysql -uroot

mysql> show global variables like 'max_connections';
+-----------------+-------+
| Variable_name   | Value |
+-----------------+-------+
| max_connections | 3     |
+-----------------+-------+
1 row in set (0.07 sec)

mysql> show global status like 'threads_connected';
+-------------------+-------+
| Variable_name     | Value |
+-------------------+-------+
| Threads_connected | 4     |
+-------------------+-------+
```

When connected correctly, 1 connection is reserved for SUPER

NO RESERVED CONNECTION

```
$ mysql -uroot
ERROR 1040 (HY000): Too many connections

mysql> SHOW PROCESSLIST;
+----+------+-----------+-------+---------+------+-----------+---------------
| Id | User | Host      | db    | Command | Time | State     | Info
+----+------+-----------+-------+---------+------+-----------+---------------
| 13 | root | localhost | odtug | Query   |  144 | User sleep | UPDATE test1 ...
| 14 | root | localhost | odtug | Query   |  116 | Locked     | select * from test1
| 15 | root | localhost | odtug | Query   |   89 | Locked     | select * from test1
```

When application users all use SUPER, administrator can't diagnose problem

7. ANSI SQL

GROUP BY EXAMPLE

```
SELECT country, COUNT(*) AS color_count
FROM   flags
GROUP  BY country;
+-----------+-------------+
| country   | color_count |
+-----------+-------------+
| Australia |           3 |
| Canada    |           2 |
| Japan     |           2 |
| Sweden    |           2 |
| USA       |           3 |
+-----------+-------------+
```

Valid SQL in MySQL

```
SELECT country, COUNT(*)
FROM   flags;
+-----------+----------+
| country   | COUNT(*) |
+-----------+----------+
| Australia |       12 |
+-----------+----------+
```


GROUP BY EXAMPLE

EXPECTED

```
SET SESSION sql_mode=ONLY_FULL_GROUP_BY;

SELECT country, COUNT(*)
FROM   flags;

ERROR 1140 (42000): Mixing of GROUP columns (MIN(),MAX(),COUNT(),...)
   with no GROUP columns is illegal if there is no GROUP BY clause
```

http://ExpertPHPandMySQL.com Chapter 1 - Pg 31

SQL_MODE FOR ANSI SQL

Recommended Configuration

```
SQL_MODE =
  STRICT_ALL_TABLES,
  NO_ZERO_DATE,
  NO_ZERO_IN_DATE,
  NO_ENGINE_SUBSTITUTION,
  ONLY_FULL_GROUP_BY;
```


8. Case Sensitivity

STRING COMPARISON

```
SELECT 'ORACLE' = UPPER('Oracle') AS comparison;
+------------+
| comparison |
+------------+
|          1 |
+------------+

SELECT 'ORACLE' = 'ORACLE' AS same, 'ORACLE' = 'Oracle' as initcap,
'ORACLE' = 'oracle' as lowercase, 'ORACLE' = 'oracle' COLLATE
latin1_general_cs AS different;
+------+---------+-----------+-----------+
| same | initcap | lowercase | different |
+------+---------+-----------+-----------+
|    1 |       1 |         1 |         0 |
+------+---------+-----------+-----------+
```

```
SELECT name, address, email
FROM   customer
WHERE  name = UPPER('bradford')
```

This practice is unnecessary as does not utilize index if exists

TABLE NAMES

```
# Server 1

mysql> CREATE TABLE test1(id INT UNSIGNED NOT NULL);
mysql> INSERT INTO test1 VALUES(1);
mysql> INSERT INTO TEST1 VALUES(2);

# Server 2

mysql> CREATE TABLE test1(id INT UNSIGNED NOT NULL);
mysql> INSERT INTO test1 VALUES(1);
mysql> INSERT INTO TEST1 VALUES(2);
ERROR 1146 (42S02): Table 'test.TEST1' doesn't exist
```


TABLE NAMES

```
# Server 1  - Mac OS X / Windows Default
mysql> SHOW GLOBAL VARIABLES LIKE 'lower%';
+-------------------------+-------+
| Variable_name           | Value |
+-------------------------+-------+
| lower_case_file_system  | ON    |
| lower_case_table_names  | 2     |
+-------------------------+-------+

# Server 2 - Linux Default
mysql> SHOW GLOBAL VARIABLES LIKE 'lower%';
+-------------------------+-------+
| Variable_name           | Value |
+-------------------------+-------+
| lower_case_file_system  | OFF   |
| lower_case_table_names  | 0     |
+-------------------------+-------+
```

Be careful. This default varies depending on Operating System

Other Gotchas

OTHER FEATURES

- Character Sets
  - Data/Client/Application/Web
- Sub Queries
  - Rewrite as JOIN when possible
- Views
  - No always efficient
- Cascading Configuration Files
- SQL_MODE's not to use

Conclusion

DON'T ASSUME

SQL_MODE

- SQL_MODE =

ALLOW_INVALID_DATES,ANSI_QUOTES, ERROR_FOR_DIVISION_ZERO, HIGH_NOT_PRECEDENCE,IGNORE_SPACE,NO_AUTO_CREATE_USER, NO_AUTO_VALUE_ON_ZERO,NO_BACKSLASH_ESCAPES, NO_DIR_IN_CREATE,NO_ENGINE_SUBSTITUTION, NO_FIELD_OPTIONS,NO_KEY_OPTIONS,NO_TABLE_OPTIONS, NO_UNSIGNED_SUBTRACTION,NO_ZERO_DATE, NO_ZERO_IN_DATE,ONLY_FULL_GROUP_BY (5.1.11), PAD_CHAR_TO_FULL_LENGTH (5.1.20), PIPES_AS_CONCAT, REAL_AS_FLOAT,STRICT_ALL_TABLES, STRICT_TRANS_TABLES

ANSI, DB2, MAXDB, MSSQL, MYSQL323, MYSQL40, ORACLE, POSTGRESQL,TRADITIONAL

http://dev.mysql.com/doc/refman/5.1/en/server-sql-mode.html

Em=ps^n
Ronald Bradford
http://effectiveMySQL.com