



MySQL 5.7

New Features

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Support



Consulting



remote-DBA

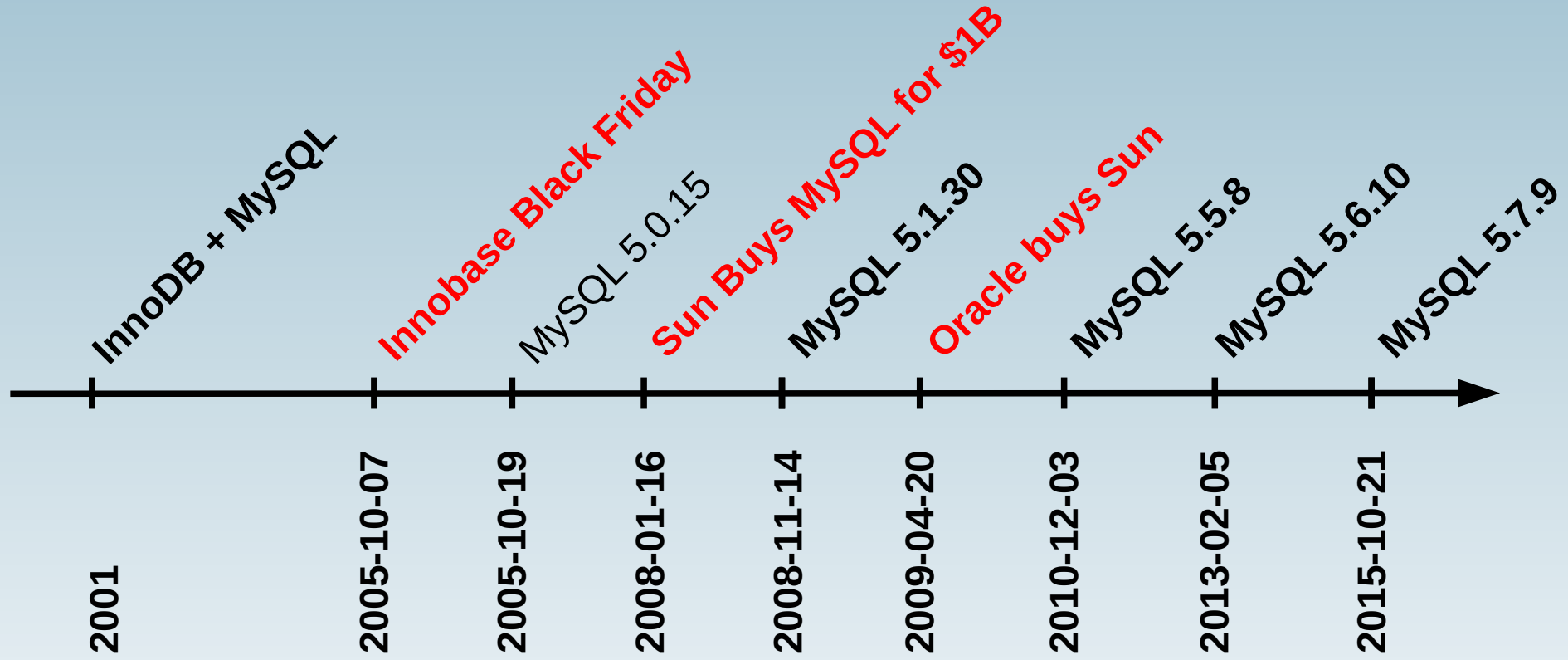


Training





MySQL (Release) History



Which release?

- MySQL: ~~4.x~~, ~~5.0~~, ~~5.1~~, ~~5.5~~, 5.6, 5.7, 5.8
- Now (2016) we should be on MySQL 5.6 and think about 5.7 upgrade!!!
- New projects with MySQL 5.7!

ORACLE LIFETIME SUPPORT FOR MYSQL RELEASES

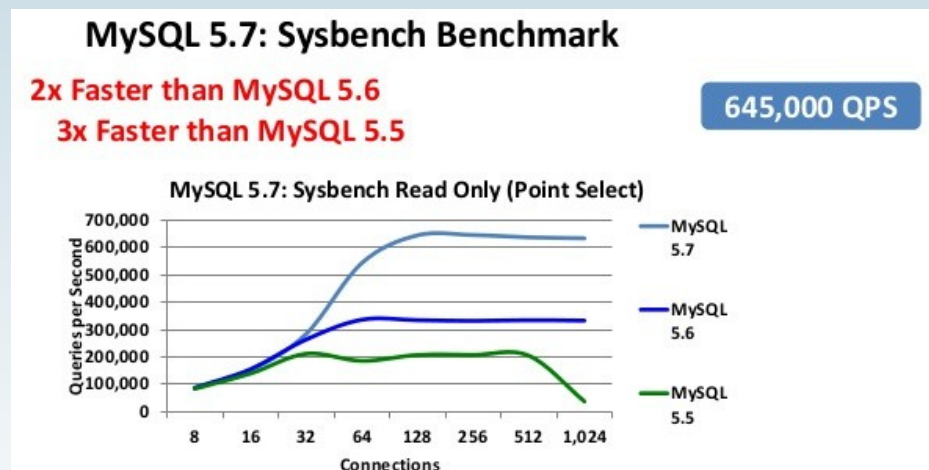
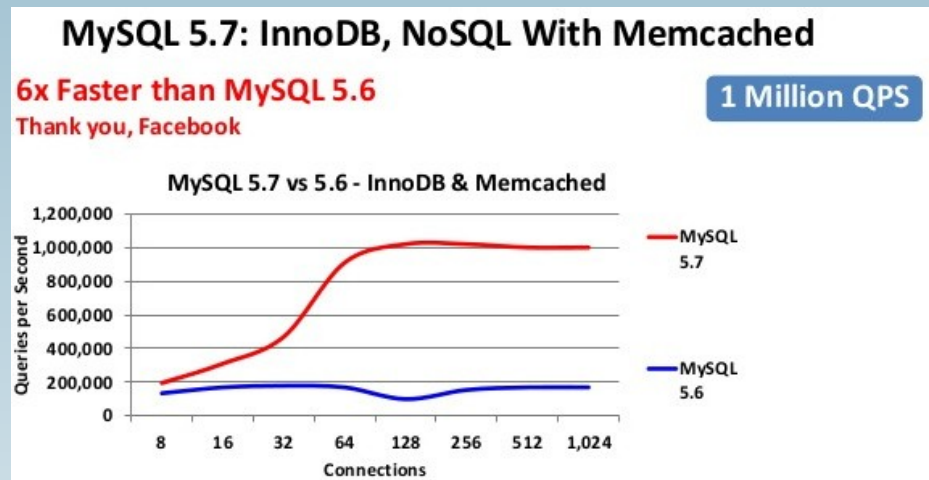
RELEASE	GA DATE	SUPPORT END	EXT. SUPPORT END
MySQL Database 5.0	Oct 2005	Dec 2011	n.a.
MySQL Database 5.1	Dec 2008	Dec 2013	n.a.
MySQL Database 5.5	Dec 2010	Dec 2015	Dec 2018
MySQL Database 5.6	Feb 2013	Feb 2018	Feb 2021
MySQL Database 5.7	Oct 2015	Oct 2020	Oct 2023
MySQL Database 5.8	expected 2017	unknown	unknown



Why MySQL 5.7?

- **Scalability + Performance**
- **Security improvements**
- **Features**
 - **JSON support**
 - **GIS (spatial) features**
 - **Generated columns**
 - **Optimizer**
 - **Multi-source replication**
- **Operations**
- **Clean-up**

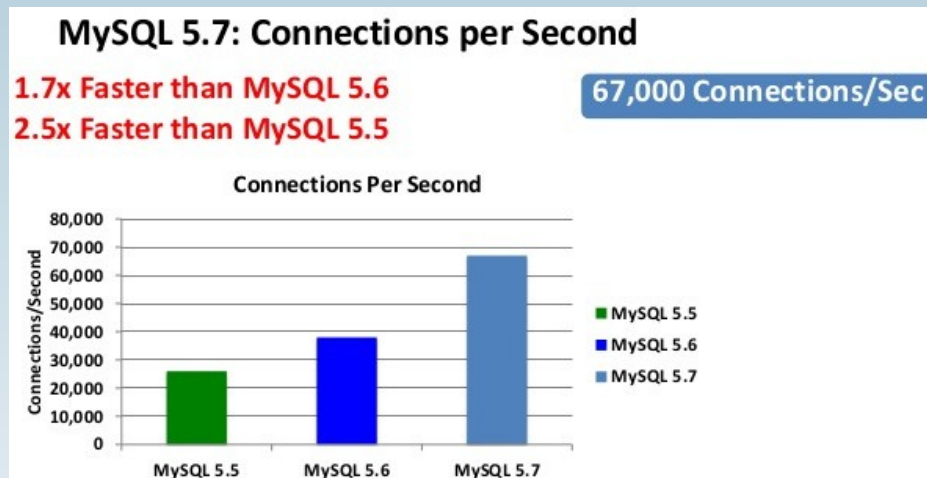
Scalability



- Who runs 16 – 32 or more parallel queries?
- 100 – 200k Qps?
- Who here is from FB or similar?
- **Single query performance gets worse!!!**

Performance

- TCP timeout 120s?
 - 400 – 800 conn/s
 - 32'000 ports
- SSL new default!
 - Impact on connection rate?



Security improvements

- **Secure by default!**
 - **We all know it means less KISS!**
- **SSL by default (slower and more expensive)**
- **Tablespace encryption (does it make sense?)**
- **Password expiration policy**
- **Password strength policy**
 - **Dropped column in `mysql.user` table :-(
 - **Old application might not work any more?****
- **`sql_mode` more strict (good!)**

InnoDB tablespace encryption

```
SELECT plugin_name, plugin_status FROM information_schema.plugins
WHERE plugin_name='keyring_file';
```

```
+-----+-----+
| PLUGIN_NAME | PLUGIN_STATUS |
+-----+-----+
| keyring_file | ACTIVE        |
+-----+-----+
```

```
+-----+-----+
| Variable_name | Value |
+-----+-----+
| innodb_file_per_table | ON |
+-----+-----+
```

```
SHOW GLOBAL VARIABLES LIKE 'keyring%';
```

```
+-----+-----+
| Variable_name | Value |
+-----+-----+
| keyring_file_data | /usr/local/mysql/keyring/keyring |
+-----+-----+
```

```
ERROR 3185 (HY000): Can't find master key from keyring,
please check keyring plugin is loaded.
```

InnoDB tablespace encryption

```
strings test.ibd
infimum
supremum
secret dataV
secret dataV
secret dataV
secret dataV
```

```
ALTER TABLE TEST ENCRYPTION = 'y';
```

```
strings test.ibd
VBw1?"sh
Pk- {
`dIO
...
```

Generated columns

```
CREATE TABLE product (
  id          INT UNSIGNED NOT NULL AUTO_INCREMENT
, product_id  VARCHAR(40)
, product_id_norm INT AS (SUBSTR(product_id,3)) VIRTUAL
, PRIMARY KEY (id)
, INDEX (product_id_norm)
);
```

```
SELECT * FROM product WHERE product_id_norm = 1;
```

```
+-----+-----+-----+
| id | product_id | product_id_norm |
+-----+-----+-----+
| 1 | 550000001 | 1 |
+-----+-----+-----+
```

```
+-----+-----+-----+-----+-----+
| table  | type  | possible_keys  | key          | ref  |
+-----+-----+-----+-----+-----+
| product | ref  | product_id_norm | product_id_norm | const |
+-----+-----+-----+-----+-----+
```

JSON support

- JSON data type
 - Automatic validation of JSON documents
 - Optimized storage format for quick read
 - Up to `max_allowed_packet` size

```
CREATE TABLE t1 (  
  id INT UNSIGNED NOT NULL AUTO_INCREMENT PRIMARY KEY  
, jdoc JSON);  
  
INSERT INTO t1 VALUES(NULL, '{"key1": "value1", "key2": "value2"}');
```

```
SELECT * FROM t1;
```

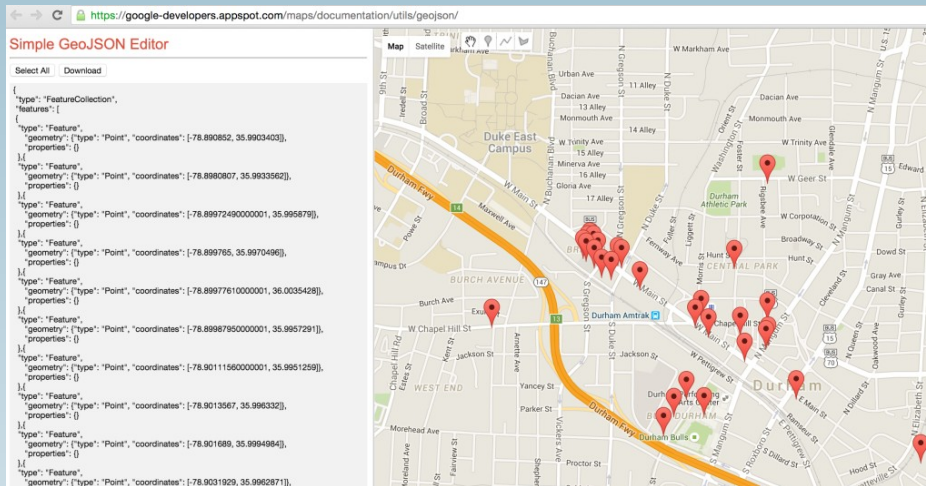
```
+-----+-----+  
| id | jdoc |  
+-----+-----+  
| 1 | {"key1": "value1", "key2": "value2"} |  
+-----+-----+
```

JSON functions

- **JSON_XXX**
 - APPEND, ARRAY, ARRAY_APPEND, ARRAY_INSERT, CONTAINS, DEPTH, EXTRACT, INSERT, KEYS, LENGTH, MERGE, OBJECT, QUOTE, REMOVE, REPLACE, SEARCH, SET, TYPE, UNQUOTE, VALID
- Indexing: Generated column

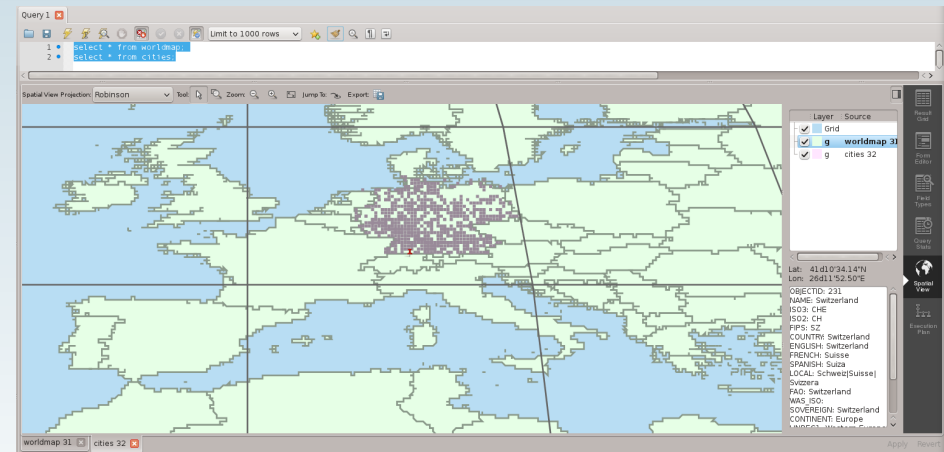
```
CREATE TABLE jsongen (  
  c JSON  
  , g INT GENERATED ALWAYS AS (JSON_EXTRACT(c, '$.id'))  
  , INDEX (g)  
);
```

GIS (spatial) indices



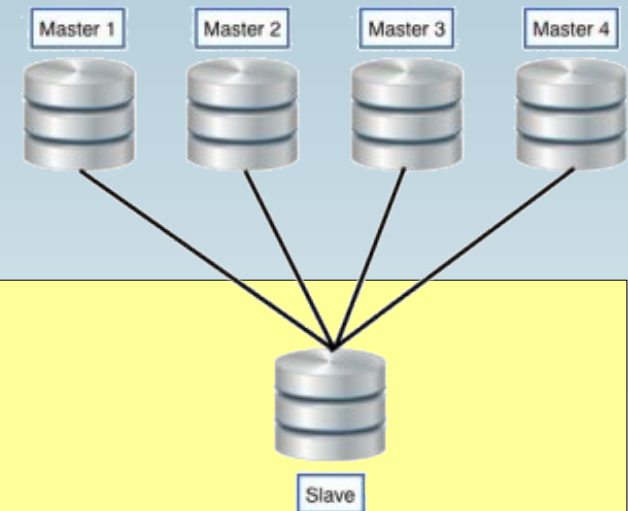
```
CREATE TABLE gis (
  id INT UNSIGNED NOT NULL
  , g GEOMETRY NOT NULL
  , PRIMARY KEY (id)
  , SPATIAL INDEX(g)
) ENGINE = InnoDB;
```

- Spatial Viewer in MySQL workbench
- Customer in Germany in less than 1 hour!
- Combine with JSON



Multi-source replication

- Fan-out replication (we have since long)
- Fan-in replication (many Master one Slave)
 - For aggregating/collecting
 - Replication Channel



```

master_info_repository      = TABLE
relay_log_info_repository  = TABLE
    
```

```

CHANGE MASTER
    
```

```

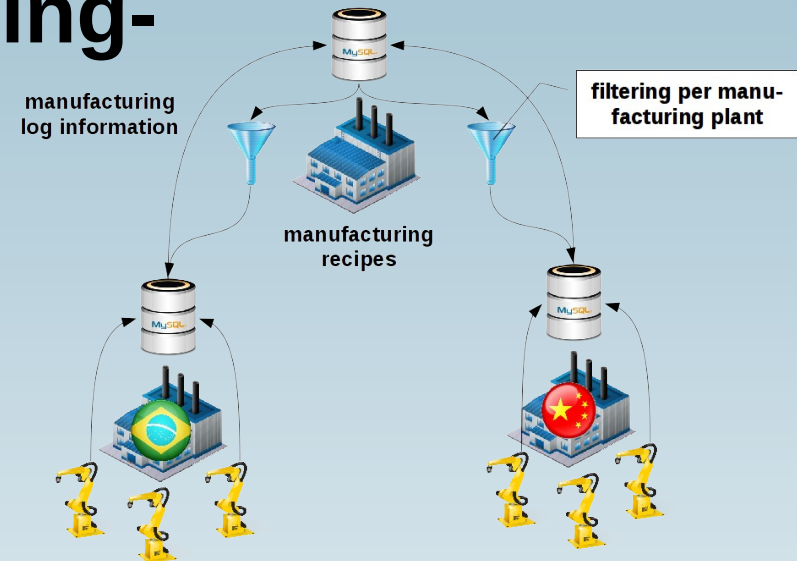
TO MASTER_HOST='master1', MASTER_USER='replication'
, MASTER_PASSWORD='secret'
, MASTER_LOG_FILE='master1-bin.000042', MASTER_LOG_POS=466918
FOR CHANNEL 'master1';
    
```

```

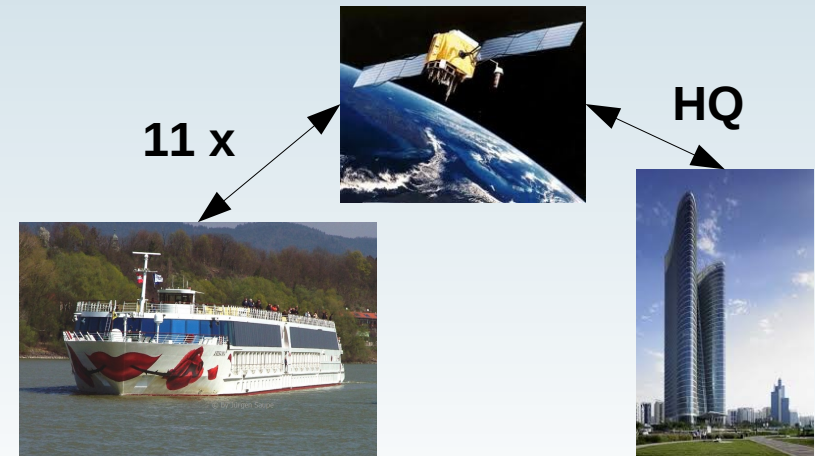
START SLAVE FOR CHANNEL 'master1';
    
```

Multi-Source replication use cases

- **World-wide manufacturing-
data-distribution**



- **Fleet-Management**



Flexible (general) tablespaces

- **Hoster/SaaS: multi-tenant applications**
 - **10'000 customers with 200 tables/schema**
 - **`innodb_file_per_table = 0 or 1 ???`**
 - **2 Mio tables!!!**
- **File Handles**
 - **Linux is not happy**
 - **MySQL is not happy**

Flexible (general) tablespaces

```

CREATE TABLESPACE customer0001
  ADD DATAFILE 'customer0001.ibd' ENGINE = InnoDB;

ALTER TABLE customer00001.invoices TABLESPACE = customer0001;

SELECT ts.space AS ts_id, ts.name AS ts_name, d.path
      , SUBSTRING_INDEX(t.name, '/', 1) AS t_schema
      , SUBSTRING_INDEX(t.name, '/', -1) AS t_name
FROM I_S.innodb_sys_tablespaces AS ts
JOIN I_S.innodb_sys_tables AS t ON t.space = ts.space
JOIN I_S.innodb_sys_datafiles AS d ON t.space = d.space
WHERE ts.space_type = 'General';

```

ts_id	ts_name	t_schema	t_name	path
30	my_ts	mysql	test2	./my_ts.ibd
186	customer0001	test	jsongen	./customer0001.ibd

Optimizer improvements

```
EXPLAIN FOR CONNECTION 42;
```

- New optimizer hints:

```
SELECT /*+ hint(<table> <index>) */ * FROM table;
```

- **NO_RANGE_OPTIMIZATION**, **NO_MRR**,
MAX_EXECUTION_TIME, **NO_ICP**
- New cost model
 - **mysql.engine_cost**, **mysql.server_cost**

sys Schema

- MySQL 5.7 by default (`mysql_upgrade`)
- Easy access to `PERFORMANCE_SCHEMA`
- Topics:
 - `host_*` → Activities grouped by host
 - `innodb_*` → InnoDB Information
 - `io_*` → I/O consumers grouped by file, bytes, latency
 - `memory_*` → Memory usage grouped by host, thread, user, type
 - `schema_*` → Various information about schema
 - `statement_*` → Statistics about statements
 - `user_*` → Information per user
 - `waits_*` → Wait event informations
- Use cases: <http://fromdual.com/mysql-performance-schema-hints>

Operational aspects

- InnoDB buffer pool online change:
 - `SET GLOBAL innodb_buffer_pool_size = 16 * CAST(POW(1024, 3) AS SIGNED);`
- `mysql_install_db` obsolete:
 - `mysqld --initialize / --initialize-insecure`
- Implicit create user not allowed:
 - `GRANT ALL ON *.* to 'nonexist'@'localhost';`
`ERROR 1133 (42000): Can't find any matching row in the user table`
 - → First: `CREATE USER ...` then `GRANT ...`
- Upgrade Master/Slave replication from 5.5 directly to 5.7 is NOT possible (Server UUID)!
- Error logging
 - Syslog native support
 - `SET GLOBAL log_verbosity = 1 - 3` (errors, warnings, notes)
- `super_read_only = 1`
- `SET GLOBAL offline_mode=1`
- `disabled_storage_engines="MyISAM"`

Deprecated and Removed

- **Deprecated features**
 - `innodb_install_db` → `mysqld -initialize`
 - Old variables like `innodb_file_format`, `innodb_large_prefix`
 - `GRANT USER` to create a user → `CREATE user`
 - Implicit `GROUP BY` sorting → `ORDER BY`
 - `--log-warnings` → `log_error_verbosity`
 - etc.
- **Removed features**
 - Old passwords!
 - `YEAR(2)` → Convert to `YEAR(4)` (expensive!)
 - `storage_engine` → `default_storage_engine`
 - `thread_concurrency`
 - `--key-buffer` → `--key-buffer-size`
 - `innodb_additional_mem_pool_size`
 - `INSERT DELAYED`
 - InnoDB Monitor and InnoDB Lock Monitor tables
 - MySQL utilities: `mysqlhotcopy`, etc.
- **Test upgrade carefully!!!**

Q & A

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



Questions ?

Discussions?

Halle 3, Stand D36 / 630

Slides are on-line:

www.fromdual.com/presentations