



# **MariaDB 10.2 New Features**

## **SLAC 2018**

### **Oli Sennhauser**

Senior MySQL Consultant at FromDual GmbH

<https://www.fromdual.com/presentations>



# About FromDual GmbH

[www.fromdual.com](http://www.fromdual.com)

**Training**



**on-site  
Consulting**



**remote-DBA**



**Enterprise  
Support**





# Contents

## MariaDB 10.2 – New Features

- › **History**
- › **New Features for Devs**
- › **New Features for Ops**
- › **Outlook to MariaDB 10.3**

# Now we are in the mess...

## My mysql got replaced with MariaDB

about 14 hours ago 46 MySQL UBUNTU 16.04

Hello, my mysql got replaced with mariadb, trying to install mysql-server gives me that:

```
root@BananasOnFire:~# sudo apt-get install mysql-server
Reading package lists... Done
Building dependency tree
Reading state information... Done
Package mysql-server is not available, but is referred to by another package.
This may mean that the package is missing, has been obsoleted, or
is only available from another source
However the following packages replace it:
  mariadb-server-10.2:i386 mariadb-server-10.2

E: Package 'mysql-server' has no installation candidate
root@BananasOnFire:~#
```

going to: [bananasonfire.tk/phpmyadmin](http://bananasonfire.tk/phpmyadmin) says:

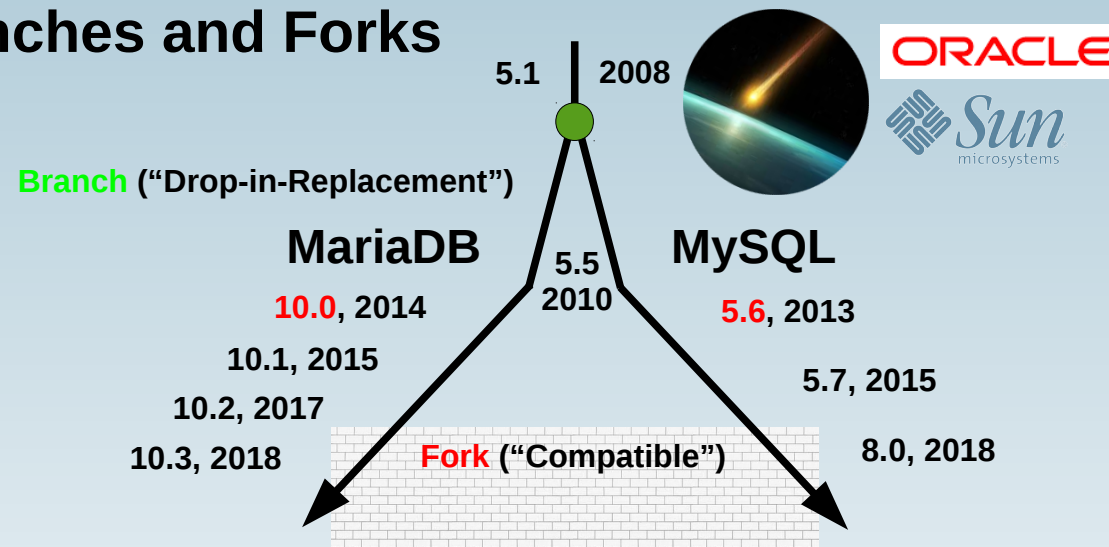
```
Not Found
The requested URL /phpmyadmin was not found on this server.

Apache/2.4.18 (Ubuntu) Server at bananasonfire.tk Port 80
```

I lost all my databases :(

# Branches and Forks

- MariaDB and MySQL are Open Source (GPL v2)
  - This means everybody is allowed to DiY
  - → Branches and Forks



- Who uses a MariaDB/MySQL in here?
  - Chaos will happen! :-)
  - See Sybase ASE vs. MicroSoft SQL Server (1995(v6.0)-2005)
  - Examples: Replication, Protocol X, SE: MariaDB CS, etc., Window Functions, Virtual Columns, JSON, CTE, ...

# MariaDB and Linux Distros

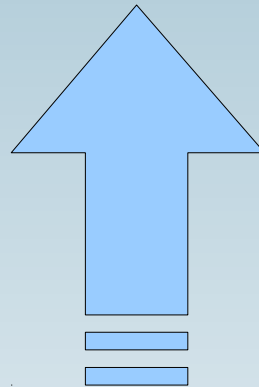
- **Redhat/CentOS:**
  - 6 → MySQL 5.1,
  - 7 → **MariaDB 5.5**
- **Ubuntu:**
  - 14.04 → MySQL 5.5,
  - 16.04 → **MySQL 5.7,**
  - 18.04 → **MySQL 5.7 (MariaDB 10.1)**
- **Debian:**
  - 8 → MySQL 5.5,
  - 9 → **MariaDB 10.1**
- **SuSE SLE / OpenSuSE:**
  - 11 SP2/3 → MySQL 5.1,
  - 12 → **MariaDB 10.0**
  - **Leap 42.3 → MariaDB 10.0, Leap 15.0, → MariaDB 10.2 Tumbleweed → MariaDB 10.2**

# MariaDB History

- **5.1 ... 5.5**
  - **New Storage Engines: Aria, XtraDB, PBXT, Federated-X, OQGRAPH**
  - **Plug-ins (Authentication, Thread Pool)**
  - **Optimizer improvements**
  - **Virtual Columns**
- **10.0**
  - **Parallel Replication, GTID, Multi Source Replication**
  - **Storage Engines: Cassandra, CONNECT, Spider, TokuDB, Sequence**
  - **Mroonga (CJK) FTS**
  - **Roles, Audit Plug-in**
- **10.1**
  - **Galera ready by default**
  - **Table, Tablespace, Redo Log, Binary Log encryption**
  - **MariaDB Column Store**

# MariaDB 10.2 History

- MariaDB 10.2.15 **Stable: In Source only!?!**
- MariaDB 10.2.14 **Stable: 27 Mar 2018**
- MariaDB 10.2.13 **Stable: 13 Feb 2018**
- MariaDB 10.2.12 **Stable: 4 Jan 2018**
- MariaDB 10.2.11 **Stable: 28 Nov 2017**
- MariaDB 10.2.10 **Stable: 31 Oct 2017**
- MariaDB 10.2.9 **Stable: 27 Sep 2017**
- MariaDB 10.2.8 **Stable: 18 Aug 2017**
- MariaDB 10.2.7 **Stable: 12 Jul 2017**
- MariaDB 10.2.6 **Stable: 23 May 2017**
- MariaDB 10.2.5 **RC : 5 Apr 2017**
- MariaDB 10.2.4 **RC : 17 Feb 2017**
- MariaDB 10.2.3 **Beta : 24 Dec 2016**
- MariaDB 10.2.2 **Beta : 27 Sep 2016**
- MariaDB 10.2.1 **Alpha : 4 Jul 2016**
- MariaDB 10.2.0 **Alpha : 18 Apr 2016**



**Rule of thumb:  
Wait for about  
1/2 year...**



# Recent MariaDB 10.2?

## MariaDB Repository:

```
apt-get install software-properties-common
apt-key adv --recv-keys --keyserver \
    hkp://keyserver.ubuntu.com:80 0xF1656F24C74CD1D8
add-apt-repository 'deb [arch=amd64,i386,ppc64el] \
    http://mirrors.n-ix.net/mariadb/repo/10.2/ubuntu \
    xenial main'

apt update
apt install mariadb-server
```

- MariaDB DEB/RPM Packages
- MariaDB binary tar-ball
- Supported architectures
  - 32 and 64-bit Linux, 32- and 64-bit Windows, POWER8: ppc64 and ppc64le, (ARM not by MariaDB!)
- MariaDB 10.2 is the current major stable version. It will be supported until **May 2022**.

# InnoDB Storage Engine

- InnoDB from MySQL 5.7 ported
  - Before XtraDB 5.6 from Percona
  - On disk format is identical to XtraDB, so no upgrade problem is expected? → test carefully! (possibly dump/restore)
  - Most InnoDB 5.7 features should be available
- Variables changes
  - new, deprecated, removed, ignored, changed defaults
  - XtraDB specific variables are ignored
  - Check before upgrade, test upgrade!
- InnoDB Spatial Index support (GIS)
- Persistent `AUTO_INCREMENT` fix
- Crash recovery reporting, startup/shutdown more robust.



# Other Storage Engines I

- **Aria**
  - `aria_recover` → `aria_recover_options = BACKUP, QUICK`
- **TokuDB**
  - Percona TokuDB, ACID, Fractal Trees, heavy write load
  - Own package, updated to newer release
- **CONNECT**
  - Updated to newer release
  - Zip Files Tables support added
  - JDBC Table Type support added
  - MongoDB support added MONGO table type

# Other Storage Engines II

- **MongoDB**
  - Beta support added
  - Bases on CONNECT SE
  - 4 Drivers: MongoDB C, MongoDB Java, MongoDB JDBC, JSON table
- **MyRocks / RocksDB / MariaRocks**
  - From Facebook, LSM-tree database, for Flash, I/O and space efficient
  - Gamma Quality (10.2.14)
- **Galera**
  - Updated to (25.)3.23
  - SST method mariabackup
- **Mroonga CJK FTS**
  - Updated to newer release
  - Split into separate package

# Window Functions

- **What is it?**
  - **Buzzwords: Reporting, DWH, OLAP, Cube, Business Intelligence, Analytics, Big Data**
  - **SQL:2003 – SQL:2011**
  - **MariaDB 10.2 does not support full standard yet**
- **Seems to be compatible with MySQL**
- **`window_function(expression) OVER ( PARTITION BY ... ORDER BY ... )`**
- **Window Functions are computed after all WHERE, GROUP BY and HAVING clauses, right before ORDER BY**

# Available Window Functions

- **Ranking, Bucketing**
  - `DENSE_RANK`, `NTILE`, `NTH_VALUE`, `PERCENTILE_CONT`, `PERCENTILE_DISC`, `PERCENT_RANK`, `RANK`, `ROW_NUMBER`
- **References other rows/data**
  - `LAG`, `LAST_VALUE`, `LEAD`
- **Statistics**
  - `CUME_DIST`, `MEDIAN`
- **Aggregate Functions to be used as Window Functions:**
  - `AVG`, `BIT_AND`, `BIT_OR`, `BIT_XOR`, `COUNT`, `SUM`
- **MariaDB 10.2 also supports Window Frames**
  - `{ RANGE | ROWS } BETWEEN frame_start AND frame_end`  
`frame = {value PRECEDING | CURRENT ROW | value FOLLOWING}`
- **MariaDB Column Store seems to support more functions!**

# Window Functions Example

- Top 3 earners of each department and compare salaries with the average salary

```

SELECT *
  FROM (
    SELECT RANK() OVER (PARTITION BY dept ORDER BY salary DESC) AS ranking
           , dept, name, salary
           , ROUND(AVG(salary) OVER (PARTITION BY dept), 2) AS avg_salary
      FROM employee_salaries
    ) AS salary_ranks
 WHERE ranking <= 3;

```

ranking	dept	name	salary	avg_salary
1	Engineering	Dharma	3500	2633.33
2	Engineering	Binh	3000	2633.33
3	Engineering	Adalynn	2800	2633.33
1	Sales	Carbry	500	325.00
2	Sales	Clytemnestra	400	325.00
3	Sales	Juraj	300	325.00
3	Sales	Kalpana	300	325.00



# Window Functions Example

```

SELECT SUBSTR(event_name, 11) AS event
      , ROUND(timer_wait/1000/1000, 3) AS time_us
  FROM performance_schema.events_stages_history_long
 WHERE nesting_event_id = 212
 ORDER BY event_id ASC

```

```

;
+-----+-----+
| event          | time_us |
+-----+-----+
| init           | 37.567  |
| checking permissions | 3.614   |
| Opening tables | 36.098  |
| After opening tables | 0.446   |
| System lock    | 0.181   |
| Table lock     | 0.747   |
| ..            |         |
| Sending data   | 15.270  |
| end            | 2.125   |
| query end      | 1.458   |
| closing tables | 0.431   |
| removing tmp table | 15.401  |
| Unlocking tables | 0.968   |
| freeing items  | 3.087   |
| cleaning up    | 1.228   |
+-----+-----+

```



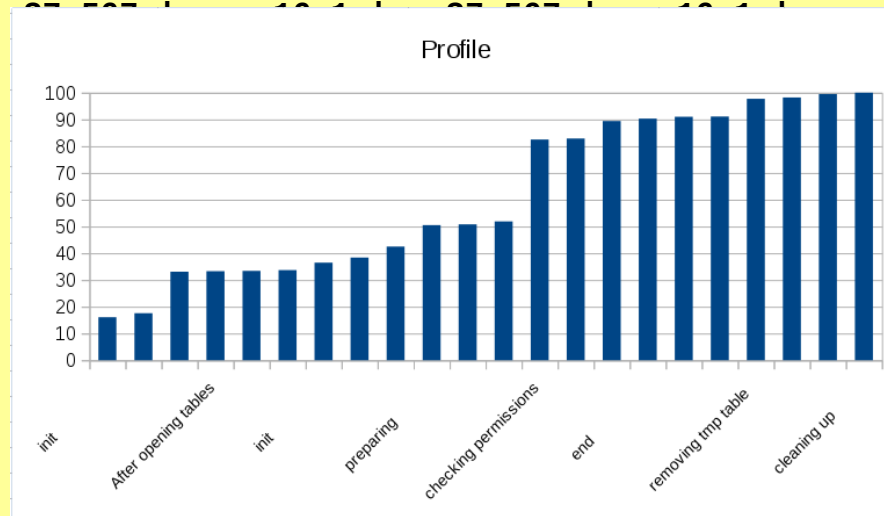
# Window Functions Example

```

SELECT RANK() OVER (ORDER BY event_id) AS rank
, SUBSTR(event_name, 11) AS event
, CAST(ROUND(timer_wait/1000/1000, 3) AS DOUBLE) AS time_us
, CAST(ROUND((timer_wait / SUM(timer_wait) OVER ()) * 100, 1) AS DOUBLE) AS time_pct
, CAST(ROUND((SUM(timer_wait)
OVER (ORDER BY event_id))/1000/1000, 3) AS DOUBLE) AS time_cum
, CAST(ROUND((SUM(timer_wait) OVER (ORDER BY event_id)
/ SUM(timer_wait) OVER ()) * 100, 1) AS DOUBLE) AS cum_pct
FROM performance_schema.events_stages_history_long
WHERE nesting_event_id = 212
ORDER BY event_id ASC;

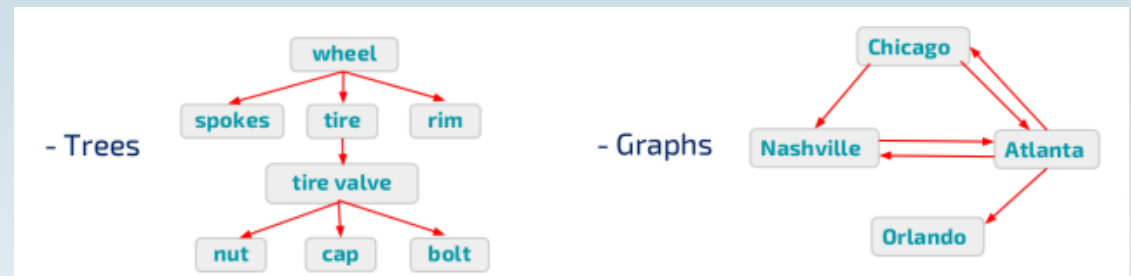
```

rank	event	time_us	time_pct	time_cum	cum_pct
1	init	07.507	10.4	07.507	10.4
2	checking permissions	10.4	14.1	17.907	23.5
3	Opening tables	14.1	18.8	32.007	42.3
4	After opening tables	18.8	25.2	50.807	66.5
5	System lock	25.2	33.5	76.007	100.0
6	Table lock	33.5	44.4	109.507	144.4
..					
15	Sending data	235.492	311.8	345.007	453.8
16	end	311.8	408.2	656.807	862.0
17	query end	408.2	537.6	1065.007	1403.6
18	closing tables	537.6	709.2	1602.607	2112.8
19	removing tmp table	709.2	927.6	2311.807	3040.4
20	Unlocking tables	927.6	1218.0	3239.407	4258.4
21	freeing items	1218.0	1596.0	4457.407	5854.4
22	cleaning up	1596.0	2097.6	6053.407	8052.0



# Common Table Expressions

- **WITH** → Common Table Expression (CTE)
  - Refer to a subquery expression many times
  - Like a temporary table per query
  - Temporary named result set / View
  - Seems to be compatible with MySQL (not with MS SQL Server)
  - Makes SQL more readable
  - Since SQL:1999
- Non-recursive CTE
- Recursive CTE



```
WITH [ RECURSIVE ] cte AS  
( SELECT * FROM test WHERE id = 42 )  
SELECT * FROM cte;
```

# Non-recursive CTE Example

```

WITH SalesCTE (SalesPersonID, SalesOrderID, SalesYear)
AS
(
    SELECT SalesPersonID, SalesOrderID
           , YEAR(OrderDate) AS SalesYear
      FROM SalesOrderHeader
     WHERE SalesPersonID IS NOT NULL
)
SELECT SalesPersonID, COUNT(SalesOrderID) AS TotalSales
   , SalesYear
  FROM SalesCTE
 GROUP BY SalesYear, SalesPersonID
  ORDER BY SalesPersonID, SalesYear;

```

SalesPersonID	TotalSales	SalesYear
1	2	2018
2	8	2018
3	1	2018

# Recursive CTE Example

```

WITH RECURSIVE DirectReports(Name, Title, EmployeeID, EmployeeLevel, Sort) AS
(
  SELECT CONCAT(e.FirstName, ' ', e.LastName),
         e.Title, e.EmployeeID, 1,
         CONCAT(e.FirstName, ' ', e.LastName)
    FROM MyEmployees AS e
   WHERE e.ManagerID IS NULL
  UNION ALL
  SELECT CONCAT(REPEAT('|   ', EmployeeLevel), e.FirstName, ' ', e.LastName),
         e.Title, e.EmployeeID, EmployeeLevel + 1,
         CONCAT(RTRIM(Sort), '|   ', FirstName, ' ', LastName)
    FROM MyEmployees AS e
   JOIN DirectReports AS d ON e.ManagerID = d.EmployeeID
)
SELECT EmployeeID, Name, Title, EmployeeLevel
  FROM DirectReports
 ORDER BY Sort;

```

EmployeeID	Name	Title	EmployeeLevel
1	Ken Sánchez	Chief Executive Officer	1
273	Brian Welcker	Vice President of Sales	2
16	David Bradley	Marketing Manager	3
23	Mary Gibson	Marketing Specialist	4
274	Stephen Jiang	North American Sales Manager	3
276	Linda Mitchell	Sales Representative	4
275	Michael Blythe	Sales Representative	4
285	Syed Abbas	Pacific Sales Manager	3
286	Lynn Tsoflias	Sales Representative	4

# Check Constraints

- Restricts data to add to a table → Error
- Before Columns defaults/constraints:
  - CURRENT\_TIMESTAMP
  - AUTO\_INCREMENT
  - PRIMARY KEY
  - DEFAULT something
  - UNIQUE
  - FOREIGN KEY
- Most deterministic functions and UDF
- I did not say this makes sense or is IMHO the correct way doing it...



# Check Constraint Example

```
CREATE TABLE Employees (  
  EmployeeID SMALLINT UNSIGNED AUTO_INCREMENT PRIMARY KEY  
  , FirstName VARCHAR(30) NOT NULL CHECK (CHAR_LENGTH(FirstName) > 2)  
  , LastName VARCHAR(40) NOT NULL  
  , Title VARCHAR(50) NOT NULL CHECK (Title != 'God')  
  , DeptID SMALLINT UNSIGNED NOT NULL  
  , ManagerID INT UNSIGNED NULL  
  , Salary DECIMAL(7,2) DEFAULT 0.0 CHECK (Salary < 10000.0)  
  , CONSTRAINT c_deptid CHECK (DeptID > 0)  
);
```

```
ALTER TABLE Employees  
  ADD CONSTRAINT c_mgr CHECK (ManagerId > 0);
```

```
ALTER TABLE Employees  
  ADD CONSTRAINT c_dpt CHECK (DeptID BETWEEN 1 AND 100);
```

```
ALTER TABLE Employees  
  ADD CONSTRAINT c_last CHECK (LastName = UPPER(LastName));
```



# DEFAULTS with expressions

- Support for **DEFAULT** for columns with expressions
- Most MariaDB functions are possible
- Referring to earlier columns in the **DEFAULT** expression is possible.
- The **DEFAULT** clause **CANNOT** contain any stored functions or subqueries.
- **BLOB** and **TEXT** fields can now have a **DEFAULT** value

# DEFAULT Example

```
CREATE TABLE employee (
  id INT UNSIGNED NOT NULL AUTO_INCREMENT PRIMARY KEY
, short_uuid BIGINT UNSIGNED DEFAULT UUID_SHORT()
, first_name VARCHAR(30) NOT NULL
, last_name VARCHAR(40) NOT NULL
, salary DECIMAL(7,2) DEFAULT 1000.0
, bonus DECIMAL(7, 2) DEFAULT (salary * 0.1)
);
```

```
INSERT INTO employee
VALUES (DEFAULT, DEFAULT, 'oli', 'Sennhauser', 900.0, DEFAULT);
```

```
SELECT * FROM employee;
```

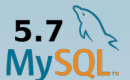
id	short_uuid	first_name	last_name	salary	bonus
1	601964996657676299	oli	Sennhauser	900.00	90.00

```
ALTER TABLE employee
MODIFY bonus DECIMAL(7, 2) DEFAULT (salary * 0.12);
```



# GeoJSON / JSON / GIS

- The JSON data type was introduced (alias for LONGTEXT)
- JSON functions added
  - `JSON_ARRAY`, `JSON_ARRAY_APPEND`, `JSON_ARRAY_INSERT`, `JSON_COMPACT`, `JSON_CONTAINS`, `JSON_CONTAINS_PATH`, `JSON_DEPTH`, `JSON_DETAILED`, `JSON_EXISTS`, `JSON_EXTRACT`, `JSON_INSERT`, `JSON_KEYS`, `JSON_LENGTH`, `JSON_LOOSE`, `JSON_MERGE`, `JSON_OBJECT`, `JSON_QUERY`, `JSON_QUOTE`, `JSON_REMOVE`, `JSON_REPLACE`, `JSON_SEARCH`, `JSON_SET`, `JSON_TYPE`, `JSON_UNQUOTE`, `JSON_VALID`, `JSON_VALUE`
- InnoDB support for spatial indices (GIS)
- GeoJSON support
  - <http://geojson.org/>
  - `ST_AsGeoJSON` and `ST_GeomFromGeoJSON` functions
  - For imported/exported using GeoJSON format



# JSON Example

```

CREATE TABLE geojson (
  id INT UNSIGNED NOT NULL AUTO_INCREMENT
, j JSON
, g GEOMETRY NOT NULL
, PRIMARY KEY (id)
, SPATIAL INDEX(g)
, CONSTRAINT c_json CHECK (JSON_VALID(j))
) ENGINE = InnoDB;

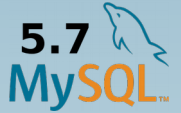
INSERT INTO geojson VALUES
(NULL, ST_AsGeoJSON(ST_GeomFromText('POINT(5.3 7.2)'))
, PointFromText('POINT(5.3 7.2)'));

SET @poly1 = ST_GeomFromText('Polygon((0 0,0 3,3 3,3 0,0 0))');
SET @poly2 = ST_GeomFromText('Polygon((5 5,5 8,8 8,5 8,5 5))');
SELECT id, j, ST_AsText(g)
, MBRContains(@poly1, g) AS 1
, MBRContains(@poly2, g) AS 2
FROM geojson;

```

id	j	ST_AsText(g)	1	2
1	{"type": "Point", "coordinates": [5.3, 7.2]}	POINT(5.3 7.2)	0	1

# Virtual Columns / VIEWS



- **VC exists since MariaDB 5.2**
  - **Generated and Persistent Columns**
- **Lots of restrictions lifted for Virtual computed columns**
  - **Expression > 252 Characters long**
  - **VC can base on other VC**
  - **Client depending functions, UDF**
  - **Deterministic functions for VC**
  - **Indexing VC**
- **VIEWS support subquery in FROM clause**
- **Optimizer Condition push down to VIEWS**

# Other features added

- **PREPARE Statement/Dynamic SQL** now understand most expressions
- Catchall for **LIST** partitions: **DEFAULT**
- Multiple **TRIGGERS** per table allowed
- **EXPLAIN FORMAT=JSON** various new information
- Optimizer fixes (Push down condition to non-mergeable **VIEWS**/derived tables)
- **ANALYZE TABLE** re-implemented lock free
- New reserved keywords:
  - **RECURSIVE, ROWS, WINDOW** (table alias only), **JSON**

# Oracle compatibility

- Oracle-style **EXECUTE IMMEDIATE**
  - **SET @debug = 1;**  
**EXECUTE IMMEDIATE CONCAT(IF(@debug,**  
**'EXPLAIN ', '' ), 'SELECT \* FROM dual');**
- Number of supported decimals in **DECIMAL** from 30 to 38 (Oracle style)
  - **DECIMAL(65, 38)**
- Adding **NOPAD** collations ('a' != 'a')
- See also MariaDB 10.3
  - **sql\_mode = ORACLE**

# MariaDB Connectors

- **C and C++ Connector**
  - Old libmysqlclient was GPL
  - Connector/C 3.0.3 (LGPL)
- **Java Connector**
  - Connector/J 2.2.2 (LGPL), supports Java 8 and higher
  - Type 4 JDBC driver, JDBC 1.4.2 compliant
- **ODBC Connector**
  - Connector/ODBC 3.0.3 (LGPL)
  - Supports ODBC Standard 3.5
- **Perl DBI**
  - DBD::MariaDB
- **Other Connectors**
  - User MySQL Connectors

# Binary Logging

- `server_id` default changed from 0 to 1
- `binlog_format` default changed to `MIXED` (before `STATEMENT`) why not `ROW`??? :-)
- `binlog_annotate_row_events` (Master) default changed to `ON`
  - → Original Statement in Binary Log (increases size)
  - Example next page
- `binlog_checksum = CRC32`
  - before was `NONE` (0)



# binlog\_annotate\_row\_events

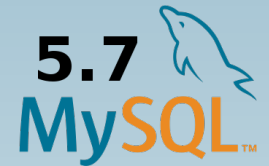
www.fromdual.com

```
# at 830
#180306 12:32:07 server id 1 end_log_pos 872 CRC32 0xb900f6c2
# GTID 0-1-22 trans
/*!100001 SET @@session.gtid_seq_no=22*//*!*/;
BEGIN /*!*/;
# at 872
# at 944
#180306 12:32:07 server id 1 end_log_pos 944 CRC32 0xe03cbb03
# Annotate_rows:
#Q> insert into test values (NULL, 'Some data', NULL)
#180306 12:32:07 server id 1 end_log_pos 996 CRC32 0xa93c6f0b
# Table_map: `test`.`test` mapped to number 24
# at 996
#180306 12:32:07 server id 1 end_log_pos 1048 CRC32 0x3e58a57d
# Write_rows: table id 24 flags: STMT_END_F
BINLOG '
N3yeWhMBAAAANAAAAOQDAAAAABgAAAAAAAAEABHRlc3QABHRlc3QAAwMPEQOAAAACC288qQ==
N3yeWhcBAAAANAAAABgEAAAABgAAAAAAAAEAA//4AQAAAA1Tb21lIGRhdGFannw3faVYPg==
'/*!*/;
### INSERT INTO `test`.`test`
### SET
### @1=1
### @2='Some data'
### @3=1520335927
# at 1048
#180306 12:32:07 server id 1 end_log_pos 1079 CRC32 0xbf8ef8cd Xid = 28
COMMIT/*!*/;
```



# Replication I

- `slave_parallel_workers` alias for `slave_parallel_threads`
- Default of `slave_net_timeout` reduced to 60 seconds from 3600
- `read_binlog_speed_limit` restricts speed the Slave reads the binary log from master
- `replicate_annotate_row_events` (Slave) default changed to ON
  - `log_slave_updates = 1`
- Compression of events in the binary log is supported
  - `log_bin_compress` and `log_bin_compress_min_len` 10 ... 1024 (256)
- Replicate MariaDB GTIDs to other nodes in the Galera Cluster



# Replication II

- **Delayed replication**

- **CHANGE MASTER TO master\_delay = 3600;**

- Slave must be stopped

- **START SLAVE UNTIL master\_gtid\_pos = ...;**

- **SHOW PROCESSLIST for Slave Threads**

- Time is now counted from start of wait

- **New Slave thread Commands:**

- **Slave\_IO** for Slave thread reading relay log

- **Slave\_SQL** for slave executing SQL commands or distribution queries to Slave workers

- **Slave\_worker** for slave threads executing SQL commands in parallel replication



# I\_S, P\_S and Status

- **INFORMATION\_SCHEMA / I\_S**
  - Generated Columns information added to `I_S.columns`
  - `I_S.user_variables` added
- **PERFORMANCE\_SCHEMA / P\_S**
  - Updated to 5.6.31, but still off :-)
- **DISKS plug-in**
- **Status**
  - `Com_show_create_user`, `Com_alter_user`, `Com_multi`, `Com_reset_connection`, `Executed_triggers`
  - `Innodb_have_punch_hole`, `Innodb_pages0_read`, `Innodb_scrub_log`, `Innodb_encryption_num_key_requests`



# Variables

- **Changed defaults**
  - binlog\_checksum, server\_id, binlog\_format, replicate\_annotate\_row\_events, binlog\_annotate\_row\_events, slave\_net\_timeout
  - innodb\_strict\_mode, innodb\_compression\_algorithm, innodb\_log\_compressed\_pages, innodb\_use\_atomic\_writes, innodb\_use\_trim
  - group\_concat\_max\_len, aria\_recover, myisam\_recover\_options
- **New**
  - max\_recursive\_iterations, standards\_compliant\_cte
  - thread\_pool\_prio\_kickup\_timer, thread\_pool\_priority,
  - read\_binlog\_speed\_limit, slave\_parallel\_workers, log\_bin\_compress, log\_bin\_compress\_min\_len
  - innodb\_deadlock\_detect, innodb\_stats\_include\_delete\_marked, innodb\_tmpdir
  - tmp\_disk\_table\_size, tmp\_memory\_table\_size, aria\_recover\_options, compression\_default
- **Deprecated**
  - innodb\_mtflush\_threads, innodb\_use\_mtflush
  - **XtraDB specific variables are ignored**
- **Removed**
  - innodb\_api\_\*, innodb\_purge\_stop\_now, innodb\_purge\_run\_now

# MariaDB Server version

```
SQL> SELECT @@version_comment, @@version;
+-----+-----+
| @@version_comment | @@version |
+-----+-----+
| MariaDB Server | 8.0.4-rc-blog |
+-----+-----+
```

```
SQL> status;
-----
mysql Ver 15.1 Distrib 10.2.13-MariaDB,
for Linux (x86_64) using readline 5.1
```

- Possibly you get MySQL Workbench working again with it...? ;-)
- Caution:  
 ERROR: Could not find server version: Master reported unrecognized MySQL version '8.0.4-rc-blog'.

# Security / Encryption

- Amazon AWS Key Management plug-in for Windows/Linux
  - AWS Key Management Service (KMS) for encryption at rest (on disk)
  - Customer Master Key (CMK) kept in AWS KMS
- Added support for OpenSSL 1.1 and LibreSSL
- Support CRC32 SSE2 implementation (hardware) under Windows
- Temporary InnoDB files are always encrypted if `innodb_encrypt_log` is set to 1
- 40 Security Vulnerability fixes:
  - CVE-2017-3257, CVE-2017-3302, CVE-2017-3308, CVE-2017-3309, CVE-2017-3313, CVE-2017-3453, CVE-2017-3456, CVE-2017-3464, CVE-2017-3636, CVE-2017-3641, CVE-2017-3653, CVE-2017-10268, CVE-2017-10286, CVE-2017-10320, CVE-2017-10365, CVE-2017-10378, CVE-2017-10379, CVE-2017-10384, CVE-2017-15365, CVE-2018-2562, CVE-2018-2612, CVE-2018-2622, CVE-2018-2640, CVE-2018-2665, CVE-2018-2668, CVE-2018-2755, CVE-2018-2759, CVE-2018-2761, CVE-2018-2766, CVE-2018-2771, CVE-2018-2777, CVE-2018-2781, CVE-2018-2782, CVE-2018-2784, CVE-2018-2786, CVE-2018-2787, CVE-2018-2810, CVE-2018-2813, CVE-2018-2817, CVE-2018-2819

# User and Connection

- **New SHOW CREATE USER**
  - Similar to SHOW GRANTS but without Privileges
- **New ALTER USER / extended CREATE USER**
  - ALTER USER 'fromdual'@'%' IDENTIFIED BY 'secret' REQUIRE SSL;
  - MAX\_{QUERIES|UPDATE|CONNECTIONS}\_PER\_HOUR, MAX\_USER\_CONNECTIONS, TLS/SSL options
- **Thread pool**
  - Higher priority to connections that have an active transaction
  - Controlled with thread\_pool\_prio\_kickup\_timer and thread\_pool\_priority
- **COM\_RESET\_CONNECTION** command added for pooled connections
- **More "secure" ed25519 Authentication Plug-in**
  - Replacement of old sha1, probably NOT compatible with MySQL sha256



# Optimizations / Performance

- **Optimizations for faster connection creation time.**
  - Connection set-up faster by moving creation of THD to new thread.
- **Allow online table rebuild when encryption or compression parameters change (InnoDB)**
- **Table open cache can automatically partition itself**
  - Better throughput in some cases?
- **Debugging:**
  - Core dumps can now be enabled dynamically
- **Not so much Marketing BS on Performance for 10.2!**



# Backup / Binlog / Flashback

- `mysqldump --add-drop-trigger`
- `mysqlbinlog`
  - Add continuous binary log backup to `mysqlbinlog`
  - `mysqlbinlog --user=replication --host=127.0.0.1 --raw \ --read-from-remote-server --stop-never --to-last-log binlog.000001`
- Flashback with `mysqlbinlog`
  - DML only (no DDL yet!) → `mysqldump --no-data` from time to time
  - `binlog_format = ROW`
  - `binlog_row_image = FULL`
  - `mysqlbinlog --flashback --start-position=1206 \ --stop-position=2008 binlog.000013`



# Flashback Example

```
#Q> insert into test values (null, 'Data where ups happens', null)
#Q> update test set data = 'Ups happens' where id = 5635999
#Q> delete from test where id = 5635999
```

```
#180308 19:23:51 server id 3336 end_log_pos 2008 CRC32 0xcb7ae7d2      Xid = 83
### INSERT INTO `test`.`test`
### SET
###   @1=5635999
###   @2='Ups happens'
###   @3=1520533412
```

```
#180308 19:23:32 server id 3336 end_log_pos 1771 CRC32 0x6e9eded3      Xid = 81
### UPDATE `test`.`test`
### WHERE
###   @1=5635999
###   @2='Ups happens'
###   @3=1520533412
### SET
###   @1=5635999
###   @2='Data where ups happens'
###   @3=1520533340
```

```
#180308 19:22:20 server id 3336 end_log_pos 1481 CRC32 0x8ae5fd7a      Xid = 79
### DELETE FROM `test`.`test`
### WHERE
###   @1=5635999
###   @2='Data where ups happens'
###   @3=1520533340
```

# MariaBackup

- **Alternative to XtraBackup and MySQL Enterprise Backup!**
- **Bases on XtraBackup 2.3.8**
- **Stable in 10.2.10 also for MariaDB 10.1, supported platforms: Linux and also on Windows!**
- **For InnoDB, Aria, MyISAM**
- **Hot online physical backup**
  - **full backup (all databases)**
  - **incremental backup (delta: complicated!)**
  - **partial backup (schema or table: complicated!)**
- **Supports Compressed and Encrypted Files**
- **Galera `sst_method = mariabackup`**

# MariaBackup Example

```
mariabackup --user=root --backup --target-dir=/backup/tape
```

```
mariabackup --user=root --prepare --target-dir=/backup/tape
```

```
mariabackup --user=root --copy-back --target-dir=/backup/tape \  
  --datadir=/var/lib/mysql  
chown -R mysql:mysql /var/lib/mysql/
```

# Other MariaDB tools

- **MariaDB Column Store**
  - Nov 2017: v1.1.2 GA, bases on MariaDB 10.2
  - Columnar Storage, designed for **analytic queries** on big data
  - Windows Functions!
- **MaxScale**
  - Used for: "in front of a database" (Proxy, Firewall, Router, ...)
  - Features: SQL Firewall, DoS protection, Read/write-splitting, Data masking, Query Caching, Schema-based sharding
  - 1.x is GPL (last release 2017-02, not supported any more)
  - 2.x is BSL, 2.2 is GA
  - Opponents: MySQL Router, ProxySQL (NOT a proxy!)
  - MySQL Router and MaxScale are not easy any more (but clever! and not so fast?), HAproxy is easy (but fast! and not so clever)

# MariaDB Outlook 10.3

- 10.3.5 Release Candidate (RC) 2018-02, 10.3.7 Sources available
- System-Versioned Tables (SQL:2011)
- Storage Engine independent Column Compression
- Window functions improvements
- Invisible Columns
- Instant **ADD COLUMN**
- Optimizer and Performance improvements
- Spider SE and OQGRAPH SE upgrades
- Partition engine improvements

## **AND:**

- `sql_mode = ORACLE` supports PL/SQL language subset
- **PL/SQL CREATE PACKAGE** support
- **INTERSECT** and **EXCEPT (vs. UNION)**
- Oracle style Sequences

# MariaDB vs. Oracle

Home > Features > Data Features

## MariaDB ups the stakes in database war with Oracle

More than two years into the job, MariaDB CEO Michael Howard has ambitious plans for the open source database company, many of which hinge on convincing Oracle customers to switch sides



Scott Carey  
March 5, 2018

The open source database company MariaDB is aggressively courting Oracle customers, offering more portability and ease of migration to help enterprises make the switch.

MariaDB was developed by some of the original developers of the MySQL relational database, including Michael "Monty" Widenius, who jumped ship after MySQL was acquired by Oracle. It has always been developed as an open source 'drop in' replacement for MySQL.



MariaDB CEO Michael Howard

Michael Howard, who worked at Oracle for four years between 1996-2000, has been CEO of MariaDB since December 2015.

# Q & A



Questions ?

Discussion?

**We have time for some face-to-face talks...**

- **FromDual provides neutral and independent:**
  - Consulting
  - Remote-DBA
  - Support for MySQL, Galera, Percona Server and MariaDB
  - Training