

MySQL[®] Compatibility

Robert Schulze (Core Team)
Serge Klochkov (Integrations Team)



31 October 2023

||||· ClickHouse

Agenda

01

Motivation and Context

02

MySQL Wire Protocol Compatibility

03

MySQL SQL Dialect Compatibility

Motivation



amazon
QuickSight



larskarbo ✓ 🤖
@larskarbo

The best database: @ClickHouseDB

The best BI tool: @Tableau

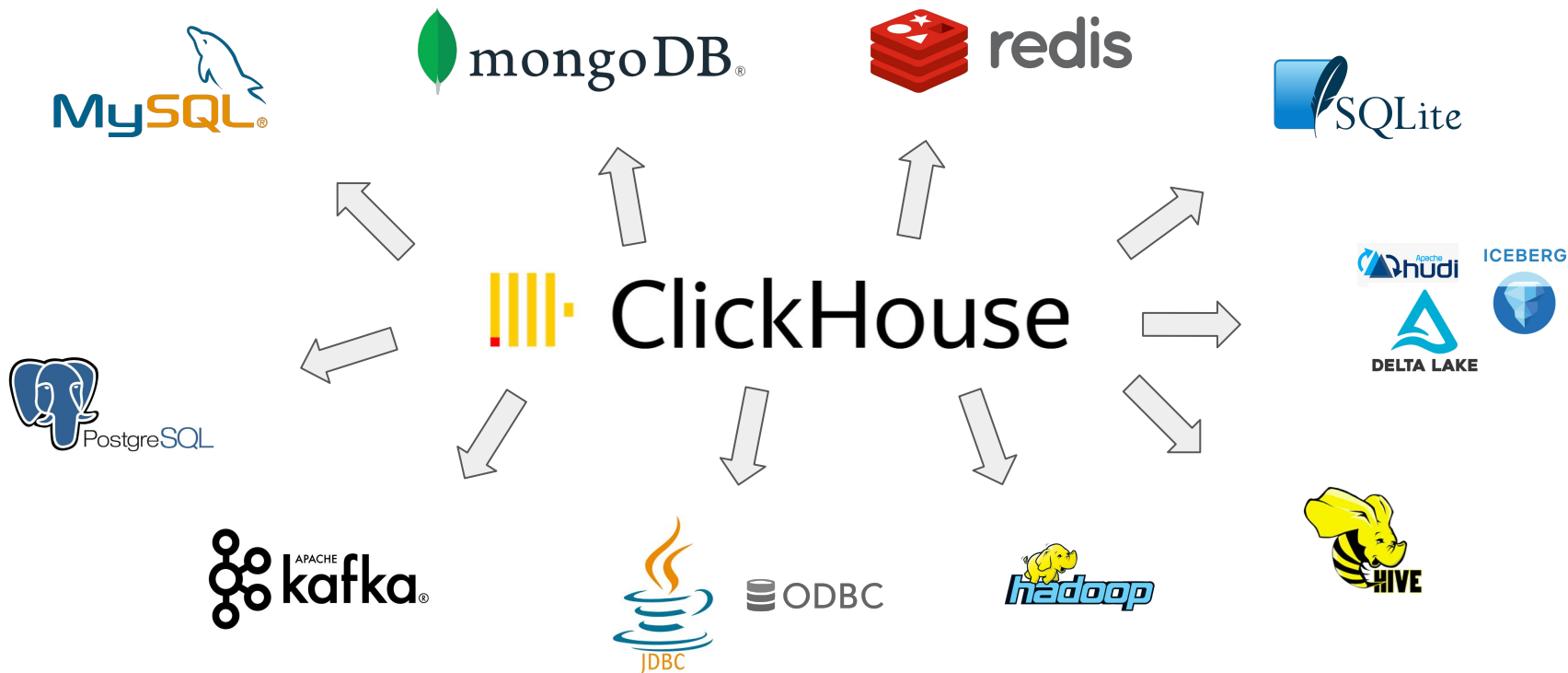
Why is there no way to use these together (in tableau online)?



ClickHouse



ClickHouse and Other Databases



Setting up ClickHouse for Connection from MySQL

- Adding a few lines to config.xml:

```
<clickhouse>
  <mysql_port>9004</mysql_port>
  <custom_settings_prefixes>SQL_,custom_</custom_settings_prefixes>
</clickhouse>
```

Don't fail on commands such as
SET SQL_AUTO_IS_NULL = 0

- And (quite) a few more to users.xml:

```
<clickhouse>
  <profiles>
    <default>
      <use_mysql_types_in_show_columns>1</use_mysql_types_in_show_columns>
      <mysql_map_string_to_text_in_show_columns>1</mysql_map_string_to_text_in_show_columns>
      <mysql_map_fixed_string_to_text_in_show_columns>1</mysql_map_fixed_string_to_text_in_show_columns>
    </default>
  </profiles>
  <users>
    <mysql_user>
      <password_double_sha1_hex>...</password_double_sha1_hex>
    </mysql_user>
  </users>
</clickhouse>
```

Enabling ClickHouse -> MySQL types translation in
SHOW [FULL] COLUMNS queries

By default, String/FixedString types are reported as
BLOB MySQL type. QuickSight does not like that.

MySQL user's password has to be encrypted with Double SHA1



What does “MySQL Wire Protocol” mean?

- TCP Connection
- MySQL authentication support
- Incoming command packets handler *
- Result set protocols - text and binary



How it started ...

QuickSight

New MySQL data source

Data source name

ClickHouse

Connection type

Public network

Database server

Port

Database name

default

Username

default

Password

.....

We weren't able to create this data source.

Tableau Online

MySQL

General

Initial SQL

Server

Port

Database

default

Username

default

Password

.....

Can't connect to MySQL

Detailed Error Message

[MySQL][ODBC 8.0(w) Driver][mysqld-23.8.4.69-ClickHouse]Code: 48.
DB::Exception: Command \x16; is not implemented. (NOT_IMPLEMENTED)

What is "command \x16"? 🤔

How it started ...

QuickSight

Unsupported data type

Field name	Data type
area	OTHER
averageSignal	OTHER
cell	OTHER
changeable	OTHER
lat	OTHER
lon	OTHER
mcc	OTHER
net	OTHER
radio	OTHER

Close

12 fields were skipped because they use unsupported data types. [Show details](#)

Missing ClickHouse → MySQL types translation

Tableau Online

New Data Source

cell_towers (default)

cell_towers

Need more data?
Drag tables here to relate them. [Learn more](#)

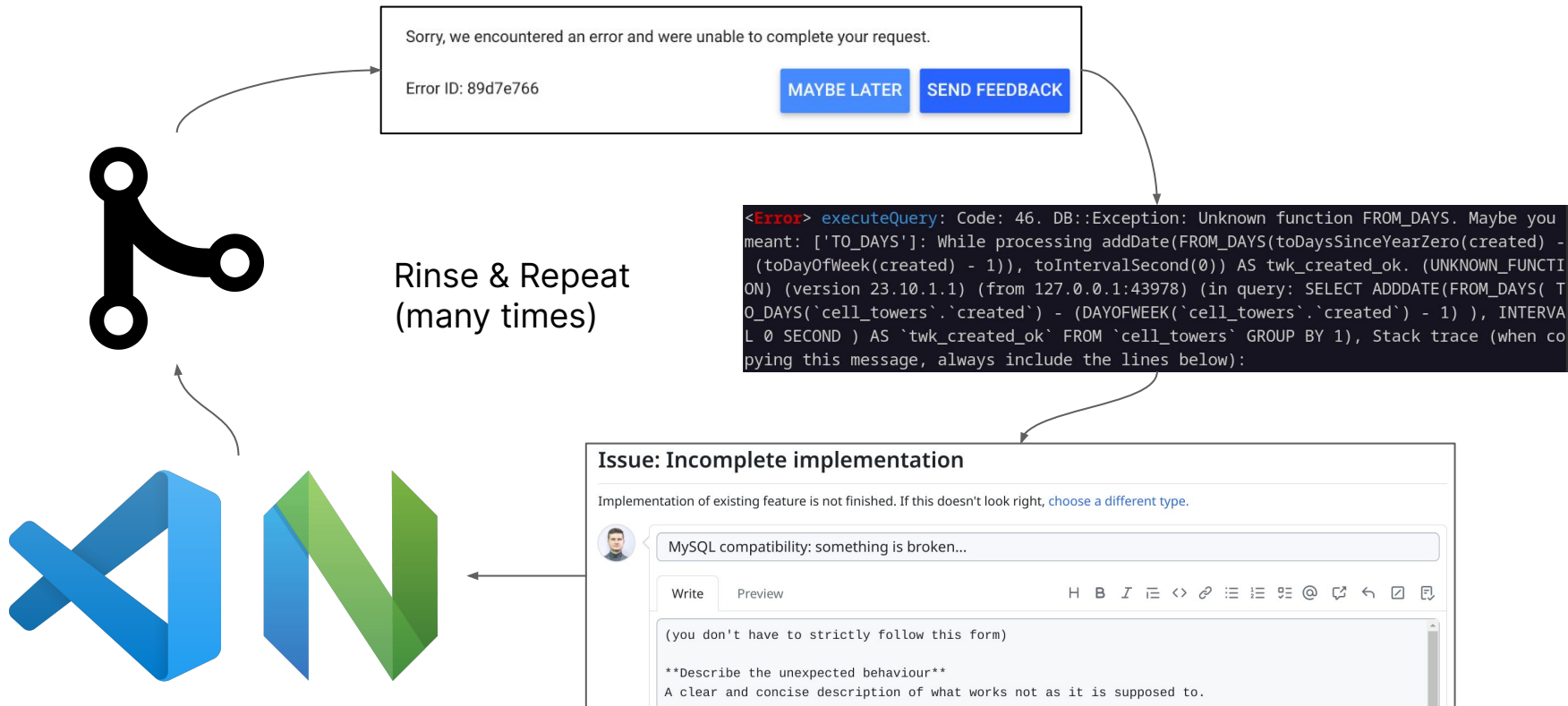
cell_towers 14 fields 0 rows

Name	Type	Field Name	Physical Table	Remote Field Name	cell_towers	cell_towers	cell_towers	cell_towers	cell_towers	cell_towers	cell_towers
cell_towers	Radio										
26 08:11:36 46.087091 -67...					12.592	null	304	null	12.337	null	
26 09:33:29 46.087093 ...					12.592	null	304	null	12.337	null	
26 14:00:09 46.087093 -67...					12.592	null	304	null	12.337	null	
26 15:07:17 46.087105 -67...					12.592	null	304	null	12.337	null	
21 15:07:43 47.214066 -68...					12.848	null	304	null	12.337	null	
15 02:09:44 48.978268 \xB:1...					null	14.640	304	null	12.548	null	
15 02:09:45 48.978268 \xB:1...					null	14.640	304	null	12.548	null	
15 02:09:46 48.978268 \xB:1...					null	14.640	304	null	12.548	null	
17-09-14 11:22:48 44.0095...					12.819	null	12.336	null	17.475	null	
17-09-14 11:57:04 \xB:43.7931...					12.819	null	12.336	null	19.780	null	

Too many nulls... And what's up with that "Radio" column?



Testing a Particular BI tool for Compatibility



MySQL Binary Protocol (#51103)

- Remember “command \x16” error in Tableau?
- Missing COM_STMT_PREPARE, COM_STMT_EXECUTE, COM_STMT_CLOSE handlers
- Unlike “standard” queries (COM_QUERY) which return just a plain text result set, COM_STMT_EXECUTE responds with binary protocol result set.
- Missing the entire binary protocol implementation.
- Added in 23.9, allowing to connect Tableau Online to ClickHouse.



Generated SQL Queries (#53066)

```
SELECT `87605426-78cf-432d-ad42-311766be5478.created_tg`, `count`
FROM (SELECT *
      FROM (SELECT `87605426-78cf-432d-ad42-311766be5478.created_tg`,
                  COUNT(*) AS `count`,
                  MAX(`$f16`) AS `$PERCENTILECONT_1`,
                  MAX(`$f17`) AS `$PERCENTILECONT_2`,
                  MAX(`$f18`) AS `$PERCENTILECONT_3`
            FROM (SELECT `87605426-78cf-432d-ad42-311766be5478.created_tg`,
                        (MAX(`$f18`) OVER (PARTITION BY `87605426-78cf-432d-ad42-311766be5478.created_tg`)) +
                        ((`$f16` - 1) * `$f15` -
                         (MAX(`$f17`) OVER (PARTITION BY `87605426-78cf-432d-ad42-311766be5478.created_tg`))) *
                         ((MAX(`$f20`) OVER (PARTITION BY `87605426-78cf-432d-ad42-311766be5478.created_tg`) -
                          (MAX(`$f18`)
                           OVER (PARTITION BY `87605426-78cf-432d-ad42-311766be5478.created_tg`)))) AS `$f16`,
                        (MAX(`$f23`) OVER (PARTITION BY `87605426-78cf-432d-ad42-311766be5478.created_tg`)) +
                        ((`$f21` - 1) * `$f15` -
                         (MAX(`$f22`) OVER (PARTITION BY `87605426-78cf-432d-ad42-311766be5478.created_tg`))) *
                         ((MAX(`$f25`) OVER (PARTITION BY `87605426-78cf-432d-ad42-311766be5478.created_tg`) -
                          (MAX(`$f23`)
                           OVER (PARTITION BY `87605426-78cf-432d-ad42-311766be5478.created_tg`)))) AS `$f17`,
                        (MAX(`$f28`) OVER (PARTITION BY `87605426-78cf-432d-ad42-311766be5478.created_tg`)) +
                        ((`$f26` - 1) * `$f15` -
                         (MAX(`$f27`) OVER (PARTITION BY `87605426-78cf-432d-ad42-311766be5478.created_tg`))) *
                         ((MAX(`$f30`) OVER (PARTITION BY `87605426-78cf-432d-ad42-311766be5478.created_tg`) -
                          (MAX(`$f28`) OVER (PARTITION BY `87605426-78cf-432d-ad42-311766be5478.created_tg`)))) AS `$f18`
            )
          )
    )
```

[... hundred more lines like that ...]



Tracking Progress ...

MySQL compatibility: missing function FROM_DAYS unfinished code	1		1
#55992 by slvrtrn was closed 2 days ago			
information_schema.columns lacks field EXTRA (MySQL compatibility) unfinished code	1		
#55183 by slvrtrn was closed 3 weeks ago			
information_schema.tables lacks field TABLE_ROWS (MySQL compatibility) unfinished code	1		
#55182 by slvrtrn was closed 3 weeks ago			
MySQL compatibility: missing information_schema.tables.data_length field unfinished code	1		1
#55031 by slvrtrn was closed last month			
MySQL compatibility: Function with name 'TIMESTAMP' does not exist feature			1
#54797 by slvrtrn was closed on Sep 19			
MySQL compatibility: Illegal type of argument #1 'date' of function toDaysSinceYearZero feature	1		
#54796 by slvrtrn was closed on Sep 22			
MySQL compatibility: Illegal type String of argument of function toDayOfWeek feature	2		
#54794 by slvrtrn was closed last week			
MySQL compatibility: TO_DAYS function feature	1		
#54277 by slvrtrn was closed on Sep 11			
MySQL compatibility: ADDDATE, TIMESTAMP functions feature	1		
#54275 by slvrtrn was closed last month			
MySQL compatibility: STD function feature	1		
#54274 by slvrtrn was closed on Sep 9			
MySQL compatibility: BLOB vs TEXT for String types usability	1		1
#53482 by slvrtrn was closed last week			
MySQL compatibility: <=> support and JOIN ON conditions feature			6
#53061 by slvrtrn was closed on Sep 5			
MySQL compatibility: SHOW KEYS output unexpected behaviour	1		1
#51782 by slvrtrn was closed on Jul 22			
MySQL compatibility: command \x16 is not implemented unfinished code	1		3
#51103 by slvrtrn was closed on Sep 14			

Fall into categories:

- Functions and function aliases
- SHOW statements
- information_schema

All findings:

<https://github.com/ClickHouse/ClickHouse/issues?q=is%3Aissue+author%3Aslvrtrn>

Functions and Function Aliases (#54795)

```
SELECT
    ADDDATE(
        DATE_FORMAT(
            cell_towers.updated,
            '%Y-01-01 00:00:00'
        ),
        INTERVAL 0 SECOND)
FROM cell_towers;
```

- **Missing string arguments:** TO_DAYS(), ADDDATE(), TODAYOFWEEK(), ...
- **Missing functions:** FROM_DAYS(), TIMESTAMP(), MAKEDATE(), REGEXP operator, ...
- **Missing aliases:** INSTR() for positionCaseInsensitive(), STR_TO_DATE() for parseDateTimeOrNull(), STD() for stddevPop(), ...

Different convenience vs. type-safety philosophies in ClickHouse / MySQL.

- String-formatted dates: '2023-10-31'
- Relaxed mode (e.g. '23:10:31'), invalid dates (e.g. '2023-11-31')

Carefully consider what ClickHouse can support and what not.



13.7.7 SHOW Statements

13.7.7.1 SHOW BINARY LOGS Statement
13.7.7.2 SHOW BINARY LOG STATUS Statement
13.7.7.3 SHOW BINLOG EVENTS Statement
13.7.7.4 SHOW CHARACTER SET Statement
13.7.7.5 SHOW COLLATION Statement
13.7.7.6 SHOW COLUMNS Statement
13.7.7.7 SHOW CREATE DATABASE Statement
13.7.7.8 SHOW CREATE EVENT Statement
13.7.7.9 SHOW CREATE FUNCTION Statement
13.7.7.10 SHOW CREATE PROCEDURE Statement
13.7.7.11 SHOW CREATE TABLE Statement
13.7.7.12 SHOW CREATE TRIGGER Statement
13.7.7.13 SHOW CREATE USER Statement
13.7.7.14 SHOW CREATE VIEW Statement
13.7.7.15 SHOW DATABASES Statement
13.7.7.16 SHOW ENGINE Statement
13.7.7.17 SHOW ENGINES Statement
13.7.7.18 SHOW ERRORS Statement
13.7.7.19 SHOW EVENTS Statement
13.7.7.20 SHOW FUNCTION CODE Statement
13.7.7.21 SHOW FUNCTION STATUS Statement
13.7.7.22 SHOW GRANTS Statement
13.7.7.23 SHOW INDEX Statement
13.7.7.24 SHOW MASTER STATUS Statement
13.7.7.25 SHOW OPEN TABLES Statement
13.7.7.26 SHOW PARSE_TREE Statement
13.7.7.27 SHOW PLUGINS Statement
13.7.7.28 SHOW PRIVILEGES Statement
13.7.7.29 SHOW PROCEDURE CODE Statement
13.7.7.30 SHOW PROCEDURE STATUS Statement
13.7.7.31 SHOW PROCESSLIST Statement
13.7.7.32 SHOW PROFILE Statement
13.7.7.33 SHOW PROFILES Statement
13.7.7.34 SHOW RELAYLOG EVENTS Statement
13.7.7.35 SHOW REPLICAS Statement
13.7.7.36 SHOW SLAVE HOSTS Statement
13.7.7.37 SHOW REPLICA STATUS Statement
13.7.7.38 SHOW SLAVE STATUS Statement
13.7.7.39 SHOW STATUS Statement
13.7.7.40 SHOW TABLE STATUS Statement
13.7.7.41 SHOW TABLES Statement
13.7.7.42 SHOW TRIGGERS Statement
13.7.7.43 SHOW VARIABLES Statement
13.7.7.44 SHOW WARNINGS Statement

Some have many forms that provide information about the

13.7.7.23 SHOW INDEX Statement

```
SHOW [EXTENDED] {INDEX | INDEXES | KEYS}
    {FROM | IN} tbl_name
    [{FROM | IN} db_name]
    [WHERE expr]
```

SHOW Statements (#49140)

SHOW INDEX returns the following fields:

- Table

The name of the table.

- Non_unique

0 if the index cannot contain duplicates, 1 if it can.

- Key_name

The name of the index. If the index is the primary key, the name is always PRIMARY.

- Seq_in_index

The column sequence number in the index, starting with 1.

INFORMATION_SCHEMA (#55183)

MySQL 8.2 Reference Manual / INFORMATION_SCHEMA Tables / INFORMATION_SCHEMA Table Reference

version 8.2 ▼

26.2 INFORMATION_SCHEMA Table Reference

The following table summarizes all available INFORMATION_SCHEMA tables. For greater detail, see the individual table descriptions.

Table 26.1 INFORMATION_SCHEMA Tables

Table Name	Description	Deprecated
<u>ADMINISTRABLE_ROLE_AUTHORIZATIONS</u>	Grantable users or roles for current user or role	
<u>APPLICABLE_ROLES</u>	Applicable roles for current user	
<u>CHARACTER_SETS</u>	Available character sets	
<u>CHECK_CONSTRAINTS</u>	Table and column CHECK constraints	
<u>COLLATION_CHARACTER_SET_APPLICABILITY</u>	Character set applicable to each collation	
<u>COLLATIONS</u>	Collations for each character set	
<u>COLUMN_PRIVILEGES</u>	Privileges defined on columns	
<u>COLUMN_STATISTICS</u>	Histogram statistics for column values	
<u>COLUMNS</u>	Columns in each table	
<u>COLUMNS_EXTENSIONS</u>	Column attributes for primary and secondary storage engines	
<u>CONNECTION_CONTROL_FAILED_LOGIN_ATTEMPTS</u>	Current number of consecutive failed connection attempts per account	



Conclusions

- v23.10: most fixes included, 90% of functionality in Looker Studio, Tableau Online and QuickSight work
- v23.11: Remaining fixes included
- In ClickHouse Cloud, enable the MySQL interface and be done.
- In parallel, we are working with BI tools vendors to develop official ClickHouse support (long-term effort).

