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Native Support for New Data Types in MySQL

BOOLEAN, UUID, and ARRAY

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Proposals for new data types

BOOLEAN

UUID

ARRAY

BOOLEAN

BOOLEAN

Currently a synonym for TINYINT

```
mysql> CREATE TABLE t1(b BOOLEAN);
Query OK, 0 rows affected (0.051 sec)

mysql> SHOW CREATE TABLE t1;
+-------+--------------------------------------------------------------------------------------+
| Table | Create Table                                                                         |
+-------+--------------------------------------------------------------------------------------+
| t1    | CREATE TABLE `t1` (
  `b` tinyint(1) DEFAULT NULL
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci                           |
+-------+--------------------------------------------------------------------------------------+
1 row in set (0.017 sec)
```

Make BOOLEAN a native type

WL#3554 Boolean data type

First step

- Introduce a new type BOOLX

Functional requirements

- F1 - Create column with BOOLX data type, e.g. CREATE TABLE t(b BOOLX);
- F3 - Let BOOLX be an integer value with only two possible values: 0 (FALSE) and 1 (TRUE).
- F4 - SHOW CREATE TABLE must show BOOLX data types.
- F5 - DESCRIBE must show BOOLX data types.
- F6 - DUMP command must show BOOLX data types for backup purposes.
- F7 - Implicit CAST between integer types and BOOLX (non-standard)
- F8 - ALTER TABLE allows to convert between data types, according to the rules for CAST.

Existing contribution

- Bug#103845 — Contribution: WL#3554 Boolean data type in MySQL

Make BOOLEAN a native type

WL#15215 Switch behaviour of BOOL/BOOLEAN from TINYINT(1) to new boolean data type

Final step

- Support BOOLEAN according to the SQL standard
- Allow BOOL as synonym for BOOLEAN
- Introduce new system variable **`boolean_is_tinyint`** to switch between old and new behavior

Question

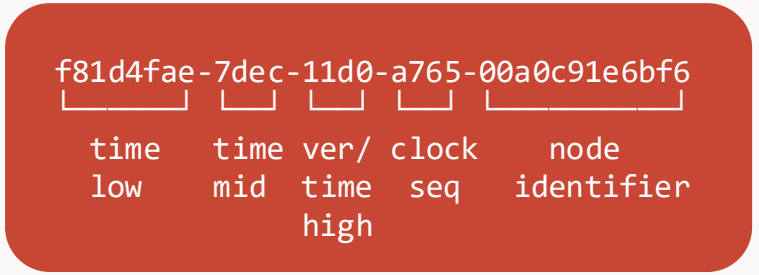
Is the two-step approach strictly necessary?

UUID

UUID

Universally Unique Identifier

- 128-bit number used as a unique identifier
- Current representation
  - CHAR(36)
    - `UUID()` function generates a new UUID version 1
    - `IS_UUID()` checks whether the supplied string is a valid UUID.
    - Disadvantage: Size
  - BINARY(16)
    - Functions to convert between character string and binary
      - `UUID_TO_BIN()`
      - `BIN_TO_UUID()`
      - Optional parameter to swap *time-low* and *time-high* parts to ensure chronological sorting



UUID

New data type?

```
CREATE TABLE t1 (id UUID)
```

- Stored as BINARY(16)
- Internal format ensures chronological sorting
- Automatic conversion from CHAR to UUID

```
INSERT INTO TABLE t1 VALUES ('f81d4fae-7dec-11d0-a765-00a0c91e6bf6');
```

- Built-in CAST

```
SELECT CAST('f81d4fae-7dec-11d0-a765-00a0c91e6bf6' AS UUID);
```

- Error if CHAR/BINARY value is not a valid UUID
- Easy Migration

```
CREATE TABLE t1 (id BINARY(16));
ALTER TABLE t1 MODIFY COLUMN id UUID;
```

New function?

- `UUID_v7()`

UUID data type

Main benefits:

- Avoids explicit use of conversion functions
- Efficient storage
- Automatic validation of UUID values

ARRAY

ARRAY

SQL Standard Data Type

```
CREATE TABLE t1 (id INTEGER, vals DOUBLE ARRAY[10])
```

- Maximum cardinality is optional
- Nested arrays are supported

```
CREATE TABLE t2 (vals2d VARCHAR(10) ARRAY ARRAY)
```

- Array constructor

```
INSERT INTO t1 VALUES (ARRAY[1.0, 1.4142, 2.7182, 3.14])
INSERT INTO t1 VALUES (ARRAY(SELECT …))
```

- Cardinality function

```
SELECT CARDINALITY(vals) FROM t1
```

- Array element reference

```
SELECT vals[1], vals[CARDINALITY(vals)] FROM t1
```

- Aggregate function

```
SELECT x, ARRAY_AGG(y) FROM t GROUP BY x
```

- Collection derived table

```
SELECT … FROM UNNEST(ARRAY(SELECT vals FROM t1)) WITH ORDINALITY AS dt(val, idx)
SELECT t1.id, dt.val FROM t1, LATERAL(UNNEST(t1.vals)) AS dt(val)
```

Alternative

Use JSON arrays

Summary

Bug#120450 Proposed new native data types

- BOOLEAN
  - Contribution exists
- UUID
  - Avoids explicit use of conversion functions
  - Efficient storage
  - Automatic validation of UUID values
- ARRAY
  - SQL standard type
  - Benefits compared to JSON arrays:
    - Strict typing
    - More compact syntax

Contributions are encouraged!

Thank you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