MySQL CHECK Constraint

Summary: in this tutorial, you will learn how to use MySQL `CHECK` constraint to ensure that values stored in a column or group of columns satisfy a Boolean expression.

> MySQL 8.0.16 implemented the SQL check constraint. If you use MySQL with the earlier versions, you can emulate a `CHECK` constraint using a view `WITH CHECK OPTION` or a trigger.

Introduction to the MySQL CHECK constraint

Before MySQL 8.0.16, the `CREATE TABLE` allows you to include a table `CHECK` constraint. However, MySQL ignores all the `CHECK` constraints:

```
CHECK(expression)
```

As of MySQL 8.0.16, the `CREATE TABLE` supported essential features of table and column `CHECK` constraints for all storage engines.

Here is the basic syntax:

```
CONSTRAINT constraint_name
CHECK (expression)
[ENFORCED | NOT ENFORCED]
```

In this syntax:

First, specify the name for the check constraint that you want to create after the `CONSTRAINT` keyword. If you omit the constraint name, MySQL automatically generates a name with the following convention:

```
table_name_chk_n
```

In this convention, `n` is an ordinal number such as 1,2, and 3. For example, the automatically generated names of `CHECK` constraints of the `parts` table will be `parts_chk_1`, `parts_chk_2`, and so on.

Second, specify a Boolean `expression` which must be evaluated to `TRUE` or `UNKNOWN` for each row of the table inside the parentheses after the `CHECK` keyword.

If the expression evaluates to `FALSE`, the values violate the constraint or a constraint violation occurs.

> Note that MySQL treats 1 as true and 0 as false.

Third, optionally specify the enforcement clause to indicate whether the check constraint is enforced:

- Use `ENFORCED` or omit the `ENFORCED` clause to create and enforce the constraint.
- Use `NOT ENFORCED` to create the constraint but not enforce it.

As mentioned earlier, you can define a `CHECK` constraint as a table constraint or column constraint.

A table `CHECK` constraint can reference multiple columns whereas the column `CHECK` constraint can refer to the only column where it is defined.

MySQL CHECK constraint examples

Let's take some examples of using the `CHECK` constraints.

1) Creating CHECK constraints as column constraints

The following CREATE TABLE statement creates a new table called `parts`:

```
CREATE TABLE parts (
    part_no VARCHAR(18) PRIMARY KEY,
    description VARCHAR(40),
    cost DECIMAL(10,2 ) NOT NULL CHECK (cost >= 0),
    price DECIMAL(10,2) NOT NULL CHECK (price >= 0)
);
```

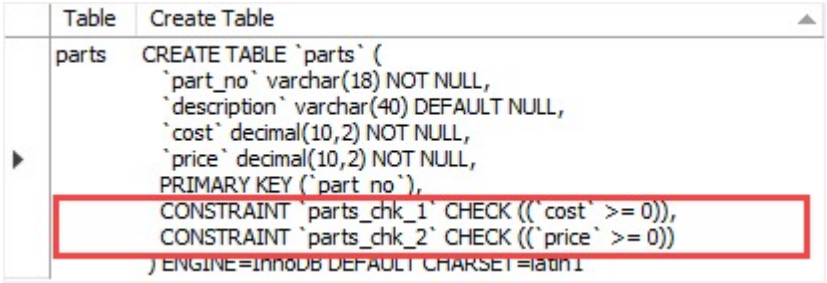
The parts table has two column `CHECK` constraints: one for the `cost` column and the other for the `price` column.

Because we did not explicitly specify the names of the `CHECK` constraints, MySQL automatically generated names for them.

To view the table definition with the `CHECK` constraint name, you use the `SHOW CREATE TABLE` statement:

```
SHOW CREATE TABLE parts;
```

Output:



The output indicates that MySQL generated the names (`parts_chk_1` and `parts_chk_2`) for the check constraints.

After creating `CHECK` constraints, if you insert or update a value that causes the Boolean expression to be false, MySQL rejects the change and issues an error.

This statement inserts a new row into the `parts` table:

```
INSERT INTO parts(part_no, description,cost,price)
VALUES('A-001','Cooler',0,-100);
```

MySQL issued an error:

```
Error Code: 3819. Check constraint 'parts_chk_2' is violated.
```

Because the value of the `price` column is negative which causes the expression `price > 0` evaluates to `FALSE` that results in a constraint violation.

2) Creating CHECK constraints as a table constraints

First, drop the `parts` table:

```
DROP TABLE IF EXISTS parts;
```

Then, create a new `parts` table with one more table `CHECK` constraint:

```
CREATE TABLE parts (
    part_no VARCHAR(18) PRIMARY KEY,
    description VARCHAR(40),
    cost DECIMAL(10,2 ) NOT NULL CHECK (cost >= 0),
    price DECIMAL(10,2) NOT NULL CHECK (price >= 0),
    CONSTRAINT parts_chk_price_gt_cost
        CHECK(price >= cost)
);
```

The following new clause defines a table `CHECK` constraint that ensures the price is always greater than or equal to the cost:

```
CONSTRAINT parts_chk_price_gt_cost CHECK(price >= cost)
```

Because we explicitly specify the name of the `CHECK` constraint, MySQL creates the new constraint with the specified name.

Here is the definition of the `parts` table:

```
SHOW CREATE TABLE parts;
```

The table `CHECK` constraint appears at the end of the table definition after the column list.

This statement attempts to insert a new part whose price is less than the cost:

```
INSERT INTO parts(part_no, description,cost,price)
VALUES('A-001','Cooler',200,100);
```

Here is the error due to the constraint violation:

```
Error Code: 3819. Check constraint 'parts_chk_price_gt_cost' is violated.
```

Adding a check constraint to a table

To add a check constraint to an existing table, you use the `ALTER TABLE ... ADD CHECK` statement:

```
ALTER TABLE table_name
ADD CHECK (expression);
```

If you want to explicitly specify the name of the `CHECK` constraint, you can use the `ALTER TABLE ... ADD CONSTRAINT ... CHECK` statement:

```
ALTER TABLE table_name
ADD CONSTRAINT contraint_name
CHECK (expression);
```

For example, the following statement adds a `CHECK` constraint to the `parts` table:

```
ALTER TABLE parts
ADD CHECK (part_no <> description);
```

This `CHECK` constraint prevents you from having the `part_no` identical to the `description`.

For example, the following `INSERT` statement will be rejected:

```
INSERT INTO parts
VALUES('A','A',100,120);
```

Output:

```
ERROR 3819 (HY000): Check constraint 'parts_chk_3' is violated.
```

Removing a check constraint from a table

To remove a `CHECK` constraint from a table, you use the `ALTER TABLE ... DROP CHECK` statement:

```
ALTER TABLE table_name
DROP CHECK constraint_name;
```

For example, the following statement removes the `CHECK` constraint `parts_chk_3` from the parts table:

```
ALTER TABLE parts
DROP CHECK parts_chk_3;
```

Summary

- Use `CHECK` constraints to ensure values stored in a column satisfy a Boolean condition.
- Use the `CHECK(expression)` to define a `CHECK` constraint.
- Use the `ALTER TABLE ... ADD CHECK` to add a `CHECK` constraint to a table.

- Use the `ALTER TABLE ... DROP CHECK` to remove a `CHECK` constraint from a table.

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