

MySQL Information Schema

Abstract

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Document generated on: 2019-11-08 (revision: 64137)

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Chapter 1 INFORMATION_SCHEMA Tables

[INFORMATION_SCHEMA](#) provides access to database *metadata*, information about the MySQL server such as the name of a database or table, the data type of a column, or access privileges. Other terms that are sometimes used for this information are *data dictionary* and *system catalog*.

Chapter 2 The INFORMATION_SCHEMA SCHEMATA Table

A schema is a database, so the [SCHEMATA](#) table provides information about databases.

The [SCHEMATA](#) table has these columns:

- [CATALOG_NAME](#)

The name of the catalog to which the schema belongs. This value is always `def`.

- [SCHEMA_NAME](#)

The name of the schema.

- [DEFAULT_CHARACTER_SET_NAME](#)

The schema default character set.

- [DEFAULT_COLLATION_NAME](#)

The schema default collation.

- [SQL_PATH](#)

This value is always `NULL`.

- [DEFAULT_ENCRYPTION](#)

The schema default encryption. This column was added in MySQL 8.0.16.

Schema names are also available from the [SHOW DATABASES](#) statement. See [SHOW DATABASES Syntax](#). The following statements are equivalent:

```
SELECT SCHEMA_NAME AS `Database`  
FROM INFORMATION_SCHEMA.SCHEMATA  
[WHERE SCHEMA_NAME LIKE 'wild']  
SHOW DATABASES  
[LIKE 'wild']
```

You see only those databases for which you have some kind of privilege, unless you have the global [SHOW DATABASES](#) privilege.

Caution

Because any static global privilege is considered a privilege for all databases, any static global privilege enables a user to see all database names with [SHOW DATABASES](#) or by examining the [SCHEMATA](#) table of [INFORMATION_SCHEMA](#), except databases that have been restricted at the database level by partial revokes.

Chapter 3 The INFORMATION_SCHEMA TABLES Table

The `TABLES` table provides information about tables in databases.

Columns in `TABLES` that represent table statistics hold cached values. The `information_schema_stats_expiry` system variable defines the period of time before cached table statistics expire. The default is 86400 seconds (24 hours). If there are no cached statistics or statistics have expired, statistics are retrieved from storage engines when querying table statistics columns. To update cached values at any time for a given table, use `ANALYZE TABLE`. To always retrieve the latest statistics directly from storage engines, set `information_schema_stats_expiry` to 0. For more information, see [Optimizing INFORMATION_SCHEMA Queries](#).

Note

If the `innodb_read_only` system variable is enabled, `ANALYZE TABLE` may fail because it cannot update statistics tables in the data dictionary, which use InnoDB. For `ANALYZE TABLE` operations that update the key distribution, failure may occur even if the operation updates the table itself (for example, if it is a MyISAM table). To obtain the updated distribution statistics, set `information_schema_stats_expiry=0`.

The `TABLES` table has these columns:

- `TABLE_CATALOG`
The name of the catalog to which the table belongs. This value is always `def`.
- `TABLE_SCHEMA`
The name of the schema (database) to which the table belongs.
- `TABLE_NAME`
The name of the table.
- `TABLE_TYPE`
`BASE TABLE` for a table, `VIEW` for a view, or `SYSTEM VIEW` for an `INFORMATION_SCHEMA` table.
The `TABLES` table does not list `TEMPORARY` tables.
- `ENGINE`
The storage engine for the table. See [The InnoDB Storage Engine](#), and [Alternative Storage Engines](#).
For partitioned tables, `ENGINE` shows the name of the storage engine used by all partitions.
- `VERSION`
This column is unused. With the removal of `.frm` files in MySQL 8.0, this column now reports a hardcoded value of 10, which is the last `.frm` file version used in MySQL 5.7.
- `ROW_FORMAT`
The row-storage format (`Fixed`, `Dynamic`, `Compressed`, `Redundant`, `Compact`). For MyISAM tables, `Dynamic` corresponds to what `myisamchk -dvv` reports as `Packed`.
- `TABLE_ROWS`
The number of rows. Some storage engines, such as MyISAM, store the exact count. For other storage engines, such as InnoDB, this value is an approximation, and may vary from the actual value by as much as 40% to 50%. In such cases, use `SELECT COUNT(*)` to obtain an accurate count.

`TABLE_ROWS` is `NULL` for `INFORMATION_SCHEMA` tables.

For `InnoDB` tables, the row count is only a rough estimate used in SQL optimization. (This is also true if the `InnoDB` table is partitioned.)

- `AVG_ROW_LENGTH`

The average row length.

- `DATA_LENGTH`

For `MyISAM`, `DATA_LENGTH` is the length of the data file, in bytes.

For `InnoDB`, `DATA_LENGTH` is the approximate amount of memory allocated for the clustered index, in bytes. Specifically, it is the clustered index size, in pages, multiplied by the `InnoDB` page size.

Refer to the notes at the end of this section for information regarding other storage engines.

- `MAX_DATA_LENGTH`

For `MyISAM`, `MAX_DATA_LENGTH` is maximum length of the data file. This is the total number of bytes of data that can be stored in the table, given the data pointer size used.

Unused for `InnoDB`.

Refer to the notes at the end of this section for information regarding other storage engines.

- `INDEX_LENGTH`

For `MyISAM`, `INDEX_LENGTH` is the length of the index file, in bytes.

For `InnoDB`, `INDEX_LENGTH` is the approximate amount of memory allocated for non-clustered indexes, in bytes. Specifically, it is the sum of non-clustered index sizes, in pages, multiplied by the `InnoDB` page size.

Refer to the notes at the end of this section for information regarding other storage engines.

- `DATA_FREE`

The number of allocated but unused bytes.

`InnoDB` tables report the free space of the tablespace to which the table belongs. For a table located in the shared tablespace, this is the free space of the shared tablespace. If you are using multiple tablespaces and the table has its own tablespace, the free space is for only that table. Free space means the number of bytes in completely free extents minus a safety margin. Even if free space displays as 0, it may be possible to insert rows as long as new extents need not be allocated.

For `NDB Cluster`, `DATA_FREE` shows the space allocated on disk for, but not used by, a Disk Data table or fragment on disk. (In-memory data resource usage is reported by the `DATA_LENGTH` column.)

For partitioned tables, this value is only an estimate and may not be absolutely correct. A more accurate method of obtaining this information in such cases is to query the `INFORMATION_SCHEMA PARTITIONS` table, as shown in this example:

```
SELECT SUM(DATA_FREE)
FROM INFORMATION_SCHEMA.PARTITIONS
WHERE TABLE_SCHEMA = 'mydb'
AND TABLE_NAME = 'mytable';
```

For more information, see [Chapter 20, The `INFORMATION_SCHEMA PARTITIONS` Table](#).

- `AUTO_INCREMENT`

The next `AUTO_INCREMENT` value.

- `CREATE_TIME`

When the table was created.

- `UPDATE_TIME`

When the data file was last updated. For some storage engines, this value is `NULL`. For example, `InnoDB` stores multiple tables in its `system tablespace` and the data file timestamp does not apply. Even with `file-per-table` mode with each `InnoDB` table in a separate `.ibd` file, `change buffering` can delay the write to the data file, so the file modification time is different from the time of the last insert, update, or delete. For `MyISAM`, the data file timestamp is used; however, on Windows the timestamp is not updated by updates, so the value is inaccurate.

`UPDATE_TIME` displays a timestamp value for the last `UPDATE`, `INSERT`, or `DELETE` performed on `InnoDB` tables that are not partitioned. For MVCC, the timestamp value reflects the `COMMIT` time, which is considered the last update time. Timestamps are not persisted when the server is restarted or when the table is evicted from the `InnoDB` data dictionary cache.

- `CHECK_TIME`

When the table was last checked. Not all storage engines update this time, in which case, the value is always `NULL`.

For partitioned `InnoDB` tables, `CHECK_TIME` is always `NULL`.

- `TABLE_COLLATION`

The table default collation. The output does not explicitly list the table default character set, but the collation name begins with the character set name.

- `CHECKSUM`

The live checksum value, if any.

- `CREATE_OPTIONS`

Extra options used with `CREATE TABLE`. The original options specified when `CREATE TABLE` was executed are retained. The information reported may differ from current table settings and options.

For `InnoDB` tables, the actual `ROW_FORMAT` and `KEY_BLOCK_SIZE` options are shown. Prior to MySQL 8.0, `CREATE_OPTIONS` shows the originally supplied `ROW_FORMAT` and `KEY_BLOCK_SIZE`. For more information, see [CREATE TABLE Syntax](#).

`CREATE_OPTIONS` shows `partitioned` for a partitioned table. Prior to MySQL 8.0.16, it also shows the `ENCRYPTION` clause specified for tables created in file-per-table tablespaces. As of MySQL 8.0.16, it only shows the encryption clause for file-per-table tablespaces if the table is encrypted or if the specified encryption differs from the schema encryption. The encryption clause is not shown for tables created in general tablespaces. To identify encrypted file-per-table and general tablespaces, query the `INNODB_TABLESPACES_ENCRYPTION` column.

- `TABLE_COMMENT`

The comment used when creating the table (or information as to why MySQL could not access the table information).

Notes

- For **NDB** tables, the output of this statement shows appropriate values for the `AVG_ROW_LENGTH` and `DATA_LENGTH` columns, with the exception that `BLOB` columns are not taken into account.
- For **NDB** tables, `DATA_LENGTH` includes data stored in main memory only; the `MAX_DATA_LENGTH` and `DATA_FREE` columns apply to Disk Data.
- For **NDB Cluster Disk Data** tables, `MAX_DATA_LENGTH` shows the space allocated for the disk part of a Disk Data table or fragment. (In-memory data resource usage is reported by the `DATA_LENGTH` column.)
- For **MEMORY** tables, the `DATA_LENGTH`, `MAX_DATA_LENGTH`, and `INDEX_LENGTH` values approximate the actual amount of allocated memory. The allocation algorithm reserves memory in large amounts to reduce the number of allocation operations.
- For views, most `TABLES` columns are 0 or `NULL` except that `TABLE_NAME` indicates the view name, `CREATE_TIME` indicates the creation time, and `TABLE_COMMENT` says `VIEW`.

Table information is also available from the `SHOW TABLE STATUS` and `SHOW TABLES` statements. See [SHOW TABLE STATUS Syntax](#), and [SHOW TABLES Syntax](#). The following statements are equivalent:

```
SELECT
  TABLE_NAME, ENGINE, VERSION, ROW_FORMAT, TABLE_ROWS, AVG_ROW_LENGTH,
  DATA_LENGTH, MAX_DATA_LENGTH, INDEX_LENGTH, DATA_FREE, AUTO_INCREMENT,
  CREATE_TIME, UPDATE_TIME, CHECK_TIME, TABLE_COLLATION, CHECKSUM,
  CREATE_OPTIONS, TABLE_COMMENT
FROM INFORMATION_SCHEMA.TABLES
WHERE table_schema = 'db_name'
[AND table_name LIKE 'wild']
SHOW TABLE STATUS
FROM db_name
[LIKE 'wild']
```

The following statements are equivalent:

```
SELECT
  TABLE_NAME, TABLE_TYPE
FROM INFORMATION_SCHEMA.TABLES
WHERE table_schema = 'db_name'
[AND table_name LIKE 'wild']
SHOW FULL TABLES
FROM db_name
[LIKE 'wild']
```

Chapter 4 The INFORMATION_SCHEMA COLUMNS Table

The `COLUMNS` table provides information about columns in tables. The related `ST_GEOMETRY_COLUMNS` table provides information about table columns that store spatial data. See [The INFORMATION_SCHEMA ST_GEOMETRY_COLUMNS Table](#).

The `COLUMNS` table has these columns:

- `TABLE_CATALOG`

The name of the catalog to which the table containing the column belongs. This value is always `def`.

- `TABLE_SCHEMA`

The name of the schema (database) to which the table containing the column belongs.

- `TABLE_NAME`

The name of the table containing the column.

- `COLUMN_NAME`

The name of the column.

- `ORDINAL_POSITION`

The position of the column within the table. `ORDINAL_POSITION` is necessary because you might want to say `ORDER BY ORDINAL_POSITION`. Unlike `SHOW COLUMNS`, `SELECT` from the `COLUMNS` table does not have automatic ordering.

- `COLUMN_DEFAULT`

The default value for the column. This is `NULL` if the column has an explicit default of `NULL`, or if the column definition includes no `DEFAULT` clause.

- `IS_NULLABLE`

The column nullability. The value is `YES` if `NULL` values can be stored in the column, `NO` if not.

- `DATA_TYPE`

The column data type.

The `DATA_TYPE` value is the type name only with no other information. The `COLUMN_TYPE` value contains the type name and possibly other information such as the precision or length.

- `CHARACTER_MAXIMUM_LENGTH`

For string columns, the maximum length in characters.

- `CHARACTER_OCTET_LENGTH`

For string columns, the maximum length in bytes.

- `NUMERIC_PRECISION`

For numeric columns, the numeric precision.

- `NUMERIC_SCALE`

For numeric columns, the numeric scale.

- `DATETIME_PRECISION`

For temporal columns, the fractional seconds precision.

- `CHARACTER_SET_NAME`

For character string columns, the character set name.

- `COLLATION_NAME`

For character string columns, the collation name.

- `COLUMN_TYPE`

The column data type.

The `DATA_TYPE` value is the type name only with no other information. The `COLUMN_TYPE` value contains the type name and possibly other information such as the precision or length.

- `COLUMN_KEY`

Whether the column is indexed:

- If `COLUMN_KEY` is empty, the column either is not indexed or is indexed only as a secondary column in a multiple-column, nonunique index.
- If `COLUMN_KEY` is `PRI`, the column is a `PRIMARY KEY` or is one of the columns in a multiple-column `PRIMARY KEY`.
- If `COLUMN_KEY` is `UNI`, the column is the first column of a `UNIQUE` index. (A `UNIQUE` index permits multiple `NULL` values, but you can tell whether the column permits `NULL` by checking the `Null` column.)
- If `COLUMN_KEY` is `MUL`, the column is the first column of a nonunique index in which multiple occurrences of a given value are permitted within the column.

If more than one of the `COLUMN_KEY` values applies to a given column of a table, `COLUMN_KEY` displays the one with the highest priority, in the order `PRI`, `UNI`, `MUL`.

A `UNIQUE` index may be displayed as `PRI` if it cannot contain `NULL` values and there is no `PRIMARY KEY` in the table. A `UNIQUE` index may display as `MUL` if several columns form a composite `UNIQUE` index; although the combination of the columns is unique, each column can still hold multiple occurrences of a given value.

- `EXTRA`

Any additional information that is available about a given column. The value is nonempty in these cases:

- `auto_increment` for columns that have the `AUTO_INCREMENT` attribute.
- `on update CURRENT_TIMESTAMP` for `TIMESTAMP` or `DATETIME` columns that have the `ON UPDATE CURRENT_TIMESTAMP` attribute.
- `VIRTUAL GENERATED` or `VIRTUAL STORED` for generated columns.
- `DEFAULT_GENERATED` for columns that have an expression default value.
- `PRIVILEGES`

The privileges you have for the column.

- `COLUMN_COMMENT`

Any comment included in the column definition.

- `GENERATION_EXPRESSION`

For generated columns, displays the expression used to compute column values. Empty for nongenerated columns. For information about generated columns, see [CREATE TABLE and Generated Columns](#).

- `SRS_ID`

This value applies to spatial columns. It contains the column `SRID` value that indicates the spatial reference system for values stored in the column. See [Spatial Data Types](#), and [Spatial Reference System Support](#). The value is `NULL` for nonspatial columns and spatial columns with no `SRID` attribute.

Notes

- In `SHOW COLUMNS`, the `Type` display includes values from several different `COLUMNS` columns.
- `CHARACTER_OCTET_LENGTH` should be the same as `CHARACTER_MAXIMUM_LENGTH`, except for multibyte character sets.
- `CHARACTER_SET_NAME` can be derived from `COLLATION_NAME`. For example, if you say `SHOW FULL COLUMNS FROM t`, and you see in the `COLLATION_NAME` column a value of `utf8_swedish_ci`, the character set is what is before the first underscore: `utf8`.

Column information is also available from the `SHOW COLUMNS` statement. See [SHOW COLUMNS Syntax](#). The following statements are nearly equivalent:

```
SELECT COLUMN_NAME, DATA_TYPE, IS_NULLABLE, COLUMN_DEFAULT
  FROM INFORMATION_SCHEMA.COLUMNS
 WHERE table_name = 'tbl_name'
    [AND table_schema = 'db_name']
    [AND column_name LIKE 'wild']
SHOW COLUMNS
  FROM tbl_name
    [FROM db_name]
    [LIKE 'wild']
```

Chapter 5 The INFORMATION_SCHEMA STATISTICS Table

The `STATISTICS` table provides information about table indexes.

Columns in `STATISTICS` that represent table statistics hold cached values. The `information_schema_stats_expiry` system variable defines the period of time before cached table statistics expire. The default is 86400 seconds (24 hours). If there are no cached statistics or statistics have expired, statistics are retrieved from storage engines when querying table statistics columns. To update cached values at any time for a given table, use `ANALYZE TABLE`. To always retrieve the latest statistics directly from storage engines, set `information_schema_stats_expiry=0`. For more information, see [Optimizing INFORMATION_SCHEMA Queries](#).

Note

If the `innodb_read_only` system variable is enabled, `ANALYZE TABLE` may fail because it cannot update statistics tables in the data dictionary, which use `InnoDB`. For `ANALYZE TABLE` operations that update the key distribution, failure may occur even if the operation updates the table itself (for example, if it is a `MyISAM` table). To obtain the updated distribution statistics, set `information_schema_stats_expiry=0`.

The `STATISTICS` table has these columns:

- `TABLE_CATALOG`

The name of the catalog to which the table containing the index belongs. This value is always `def`.

- `TABLE_SCHEMA`

The name of the schema (database) to which the table containing the index belongs.

- `TABLE_NAME`

The name of the table containing the index.

- `NON_UNIQUE`

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

- `INDEX_SCHEMA`

The name of the schema (database) to which the index belongs.

- `INDEX_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.

- `COLUMN_NAME`

The column name. See also the description for the `EXPRESSION` column.

- `COLLATION`

How the column is sorted in the index. This can have values `A` (ascending), `D` (descending), or `NULL` (not sorted).

- `CARDINALITY`

An estimate of the number of unique values in the index. To update this number, run [ANALYZE TABLE](#) or (for [MyISAM](#) tables) `myisamchk -a`.

[CARDINALITY](#) is counted based on statistics stored as integers, so the value is not necessarily exact even for small tables. The higher the cardinality, the greater the chance that MySQL uses the index when doing joins.

- [SUB_PART](#)

The index prefix. That is, the number of indexed characters if the column is only partly indexed, [NULL](#) if the entire column is indexed.

Note

Prefix *limits* are measured in bytes. However, prefix *lengths* for index specifications in [CREATE TABLE](#), [ALTER TABLE](#), and [CREATE INDEX](#) statements are interpreted as number of characters for nonbinary string types ([CHAR](#), [VARCHAR](#), [TEXT](#)) and number of bytes for binary string types ([BINARY](#), [VARBINARY](#), [BLOB](#)). Take this into account when specifying a prefix length for a nonbinary string column that uses a multibyte character set.

For additional information about index prefixes, see [Column Indexes](#), and [CREATE INDEX Syntax](#).

- [PACKED](#)

Indicates how the key is packed. [NULL](#) if it is not.

- [NULLABLE](#)

Contains [YES](#) if the column may contain [NULL](#) values and `' '` if not.

- [INDEX_TYPE](#)

The index method used ([BTREE](#), [FULLTEXT](#), [HASH](#), [RTREE](#)).

- [COMMENT](#)

Information about the index not described in its own column, such as [disabled](#) if the index is disabled.

- [INDEX_COMMENT](#)

Any comment provided for the index with a [COMMENT](#) attribute when the index was created.

- [IS_VISIBLE](#)

Whether the index is visible to the optimizer. See [Invisible Indexes](#).

- [EXPRESSION](#)

MySQL 8.0.13 and higher supports functional key parts (see [Functional Key Parts](#)), which affects both the [COLUMN_NAME](#) and [EXPRESSION](#) columns:

- For a nonfunctional key part, [COLUMN_NAME](#) indicates the column indexed by the key part and [EXPRESSION](#) is [NULL](#).
- For a functional key part, [COLUMN_NAME](#) column is [NULL](#) and [EXPRESSION](#) indicates the expression for the key part.

Notes

- There is no standard `INFORMATION_SCHEMA` table for indexes. The MySQL column list is similar to what SQL Server 2000 returns for `sp_statistics`, except that `QUALIFIER` and `OWNER` are replaced with `CATALOG` and `SCHEMA`, respectively.

Information about table indexes is also available from the `SHOW INDEX` statement. See [SHOW INDEX Syntax](#). The following statements are equivalent:

```
SELECT * FROM INFORMATION_SCHEMA.STATISTICS
  WHERE table_name = 'tbl_name'
  AND table_schema = 'db_name'
SHOW INDEX
  FROM tbl_name
  FROM db_name
```

Chapter 6 The INFORMATION_SCHEMA USER_PRIVILEGES Table

The `USER_PRIVILEGES` table provides information about global privileges. It takes its values from the `mysql.user` system table.

The `USER_PRIVILEGES` table has these columns:

- `GRANTEE`

The name of the account to which the privilege is granted, in '`user_name`'@'`host_name`' format.

- `TABLE_CATALOG`

The name of the catalog. This value is always `def`.

- `PRIVILEGE_TYPE`

The privilege granted. The value can be any privilege that can be granted at the global level; see [GRANT Syntax](#). Each row lists a single privilege, so there is one row per global privilege held by the grantee.

- `IS_GRANTABLE`

`YES` if the user has the `GRANT OPTION` privilege, `NO` otherwise. The output does not list `GRANT OPTION` as a separate row with `PRIVILEGE_TYPE='GRANT OPTION'`.

Notes

- The `USER_PRIVILEGES` table is a nonstandard `INFORMATION_SCHEMA` table.

The following statements are *not* equivalent:

```
SELECT ... FROM INFORMATION_SCHEMA.USER_PRIVILEGES
SHOW GRANTS ...
```

Chapter 7 The INFORMATION_SCHEMA SCHEMA_PRIVILEGES Table

The `SCHEMA_PRIVILEGES` table provides information about schema (database) privileges. It takes its values from the `mysql.db` system table.

The `SCHEMA_PRIVILEGES` table has these columns:

- `GRANTEE`

The name of the account to which the privilege is granted, in '`user_name`'@'`host_name`' format.

- `TABLE_CATALOG`

The name of the catalog to which the schema belongs. This value is always `def`.

- `TABLE_SCHEMA`

The name of the schema.

- `PRIVILEGE_TYPE`

The privilege granted. The value can be any privilege that can be granted at the schema level; see [GRANT Syntax](#). Each row lists a single privilege, so there is one row per schema privilege held by the grantee.

- `IS_GRANTABLE`

`YES` if the user has the `GRANT OPTION` privilege, `NO` otherwise. The output does not list `GRANT OPTION` as a separate row with `PRIVILEGE_TYPE='GRANT OPTION'`.

Notes

- The `SCHEMA_PRIVILEGES` table is a nonstandard `INFORMATION_SCHEMA` table.

The following statements are *not* equivalent:

```
SELECT ... FROM INFORMATION_SCHEMA.SCHEMA_PRIVILEGES
SHOW GRANTS ...
```

Chapter 8 The INFORMATION_SCHEMA TABLE_PRIVILEGES Table

The `TABLE_PRIVILEGES` table provides information about table privileges. It takes its values from the `mysql.tables_priv` system table.

The `TABLE_PRIVILEGES` table has these columns:

- `GRANTEE`

The name of the account to which the privilege is granted, in `'user_name'@'host_name'` format.

- `TABLE_CATALOG`

The name of the catalog to which the table belongs. This value is always `def`.

- `TABLE_SCHEMA`

The name of the schema (database) to which the table belongs.

- `TABLE_NAME`

The name of the table.

- `PRIVILEGE_TYPE`

The privilege granted. The value can be any privilege that can be granted at the table level; see [GRANT Syntax](#). Each row lists a single privilege, so there is one row per table privilege held by the grantee.

- `IS_GRANTABLE`

`YES` if the user has the `GRANT OPTION` privilege, `NO` otherwise. The output does not list `GRANT OPTION` as a separate row with `PRIVILEGE_TYPE='GRANT OPTION'`.

Notes

- The `TABLE_PRIVILEGES` table is a nonstandard `INFORMATION_SCHEMA` table.

The following statements are *not* equivalent:

```
SELECT ... FROM INFORMATION_SCHEMA.TABLE_PRIVILEGES
SHOW GRANTS ...
```

Chapter 9 The INFORMATION_SCHEMA COLUMN_PRIVILEGES Table

The `COLUMN_PRIVILEGES` table provides information about column privileges. It takes its values from the `mysql.columns_priv` system table.

The `COLUMN_PRIVILEGES` table has these columns:

- `GRANTEE`

The name of the account to which the privilege is granted, in `'user_name'@'host_name'` format.

- `TABLE_CATALOG`

The name of the catalog to which the table containing the column belongs. This value is always `def`.

- `TABLE_SCHEMA`

The name of the schema (database) to which the table containing the column belongs.

- `TABLE_NAME`

The name of the table containing the column.

- `COLUMN_NAME`

The name of the column.

- `PRIVILEGE_TYPE`

The privilege granted. The value can be any privilege that can be granted at the column level; see [GRANT Syntax](#). Each row lists a single privilege, so there is one row per column privilege held by the grantee.

In the output from `SHOW FULL COLUMNS`, the privileges are all in one column and in lowercase, for example, `select,insert,update,references`. In `COLUMN_PRIVILEGES`, there is one privilege per row, in uppercase.

- `IS_GRANTABLE`

`YES` if the user has the `GRANT OPTION` privilege, `NO` otherwise. The output does not list `GRANT OPTION` as a separate row with `PRIVILEGE_TYPE='GRANT OPTION'`.

Notes

- The `COLUMN_PRIVILEGES` table is a nonstandard `INFORMATION_SCHEMA` table.

The following statements are *not* equivalent:

```
SELECT ... FROM INFORMATION_SCHEMA.COLUMN_PRIVILEGES
SHOW GRANTS ...
```

Chapter 10 The INFORMATION_SCHEMA CHARACTER_SETS Table

The [CHARACTER_SETS](#) table provides information about available character sets.

The [CHARACTER_SETS](#) table has these columns:

- [CHARACTER_SET_NAME](#)

The character set name.

- [DEFAULT_COLLATE_NAME](#)

The default collation for the character set.

- [DESCRIPTION](#)

A description of the character set.

- [MAXLEN](#)

The maximum number of bytes required to store one character.

Notes

Character set information is also available from the [SHOW CHARACTER SET](#) statement. See [SHOW CHARACTER SET Syntax](#). The following statements are equivalent:

```
SELECT * FROM INFORMATION_SCHEMA.CHARACTER_SETS
  [WHERE CHARACTER_SET_NAME LIKE 'wild']
SHOW CHARACTER SET
  [LIKE 'wild']
```

Chapter 11 The INFORMATION_SCHEMA COLLATIONS Table

The `COLLATIONS` table provides information about collations for each character set.

The `COLLATIONS` table has these columns:

- `COLLATION_NAME`

The collation name.

- `CHARACTER_SET_NAME`

The name of the character set with which the collation is associated.

- `ID`

The collation ID.

- `IS_DEFAULT`

Whether the collation is the default for its character set.

- `IS_COMPILED`

Whether the character set is compiled into the server.

- `SORTLEN`

This is related to the amount of memory required to sort strings expressed in the character set.

- `PAD_ATTRIBUTE`

The collation pad attribute.

Notes

Collation information is also available from the `SHOW COLLATION` statement. See [SHOW COLLATION Syntax](#). The following statements are equivalent:

```
SELECT COLLATION_NAME FROM INFORMATION_SCHEMA.COLLATIONS
  [WHERE COLLATION_NAME LIKE 'wild']
SHOW COLLATION
  [LIKE 'wild']
```

Chapter 12 The INFORMATION_SCHEMA COLLATION_CHARACTER_SET_APPLICABILITY Table

The `COLLATION_CHARACTER_SET_APPLICABILITY` table indicates what character set is applicable for what collation.

The `COLLATION_CHARACTER_SET_APPLICABILITY` table has these columns:

- `COLLATION_NAME`

The collation name.

- `CHARACTER_SET_NAME`

The name of the character set with which the collation is associated.

Notes

The `COLLATION_CHARACTER_SET_APPLICABILITY` columns are equivalent to the first two columns displayed by the `SHOW COLLATION` statement.

Chapter 13 The INFORMATION_SCHEMA TABLE_CONSTRAINTS Table

The `TABLE_CONSTRAINTS` table describes which tables have constraints.

The `TABLE_CONSTRAINTS` table has these columns:

- `CONSTRAINT_CATALOG`

The name of the catalog to which the constraint belongs. This value is always `def`.

- `CONSTRAINT_SCHEMA`

The name of the schema (database) to which the constraint belongs.

- `TABLE_SCHEMA`

The name of the schema (database) to which the table belongs.

- `TABLE_NAME`

The name of the table.

- The `CONSTRAINT_TYPE`

The type of constraint. The value can be `UNIQUE`, `PRIMARY KEY`, `FOREIGN KEY`, or (as of MySQL 8.0.16) `CHECK`. This is a `CHAR` (not `ENUM`) column.

The `UNIQUE` and `PRIMARY KEY` information is about the same as what you get from the `Key_name` column in the output from `SHOW INDEX` when the `Non_unique` column is 0.

- `ENFORCED`

For `CHECK` constraints, the value is `YES` or `NO` to indicate whether the constraint is enforced. For other constraints, the value is always `YES`.

This column was added in MySQL 8.0.16.

Chapter 14 The INFORMATION_SCHEMA KEY_COLUMN_USAGE Table

The `KEY_COLUMN_USAGE` table describes which key columns have constraints. This table provides no information about functional key parts because they are expressions and the table provides information only about columns.

The `KEY_COLUMN_USAGE` table has these columns:

- `CONSTRAINT_CATALOG`

The name of the catalog to which the constraint belongs. This value is always `def`.

- `CONSTRAINT_SCHEMA`

The name of the schema (database) to which the constraint belongs.

- `CONSTRAINT_NAME`

The name of the constraint.

- `TABLE_CATALOG`

The name of the catalog to which the table belongs. This value is always `def`.

- `TABLE_SCHEMA`

The name of the schema (database) to which the table belongs.

- `TABLE_NAME`

The name of the table that has the constraint.

- `COLUMN_NAME`

The name of the column that has the constraint.

If the constraint is a foreign key, then this is the column of the foreign key, not the column that the foreign key references.

- `ORDINAL_POSITION`

The column's position within the constraint, not the column's position within the table. Column positions are numbered beginning with 1.

- `POSITION_IN_UNIQUE_CONSTRAINT`

`NULL` for unique and primary-key constraints. For foreign-key constraints, this column is the ordinal position in key of the table that is being referenced.

- `REFERENCED_TABLE_SCHEMA`

The name of the schema referenced by the constraint.

- `REFERENCED_TABLE_NAME`

The name of the table referenced by the constraint.

- `REFERENCED_COLUMN_NAME`

The name of the column referenced by the constraint.

Suppose that there are two tables name `t1` and `t3` that have the following definitions:

```
CREATE TABLE t1
(
  s1 INT,
  s2 INT,
  s3 INT,
  PRIMARY KEY(s3)
) ENGINE=InnoDB;
CREATE TABLE t3
(
  s1 INT,
  s2 INT,
  s3 INT,
  KEY(s1),
  CONSTRAINT CO FOREIGN KEY (s2) REFERENCES t1(s3)
) ENGINE=InnoDB;
```

For those two tables, the `KEY_COLUMN_USAGE` table has two rows:

- One row with `CONSTRAINT_NAME = 'PRIMARY'`, `TABLE_NAME = 't1'`, `COLUMN_NAME = 's3'`, `ORDINAL_POSITION = 1`, `POSITION_IN_UNIQUE_CONSTRAINT = NULL`.

For `NDB`: This value is always `NULL`.

- One row with `CONSTRAINT_NAME = 'CO'`, `TABLE_NAME = 't3'`, `COLUMN_NAME = 's2'`, `ORDINAL_POSITION = 1`, `POSITION_IN_UNIQUE_CONSTRAINT = 1`.

Chapter 15 The INFORMATION_SCHEMA ROUTINES Table

The `ROUTINES` table provides information about stored routines (stored procedures and stored functions). The `ROUTINES` table does not include built-in SQL functions or user-defined functions (UDFs).

The `ROUTINES` table has these columns:

- `SPECIFIC_NAME`

The name of the routine.

- `ROUTINE_CATALOG`

The name of the catalog to which the routine belongs. This value is always `def`.

- `ROUTINE_SCHEMA`

The name of the schema (database) to which the routine belongs.

- `ROUTINE_NAME`

The name of the routine.

- `ROUTINE_TYPE`

`PROCEDURE` for stored procedures, `FUNCTION` for stored functions.

- `DATA_TYPE`

If the routine is a stored function, the return value data type. If the routine is a stored procedure, this value is empty.

The `DATA_TYPE` value is the type name only with no other information. The `DTD_IDENTIFIER` value contains the type name and possibly other information such as the precision or length.

- `CHARACTER_MAXIMUM_LENGTH`

For stored function string return values, the maximum length in characters. If the routine is a stored procedure, this value is `NULL`.

- `CHARACTER_OCTET_LENGTH`

For stored function string return values, the maximum length in bytes. If the routine is a stored procedure, this value is `NULL`.

- `NUMERIC_PRECISION`

For stored function numeric return values, the numeric precision. If the routine is a stored procedure, this value is `NULL`.

- `NUMERIC_SCALE`

For stored function numeric return values, the numeric scale. If the routine is a stored procedure, this value is `NULL`.

- `DATETIME_PRECISION`

For stored function temporal return values, the fractional seconds precision. If the routine is a stored procedure, this value is `NULL`.

- `CHARACTER_SET_NAME`

For stored function character string return values, the character set name. If the routine is a stored procedure, this value is `NULL`.

- `COLLATION_NAME`

For stored function character string return values, the collation name. If the routine is a stored procedure, this value is `NULL`.

- `DTD_IDENTIFIER`

If the routine is a stored function, the return value data type. If the routine is a stored procedure, this value is empty.

The `DATA_TYPE` value is the type name only with no other information. The `DTD_IDENTIFIER` value contains the type name and possibly other information such as the precision or length.

- `ROUTINE_BODY`

The language used for the routine definition. This value is always `SQL`.

- `ROUTINE_DEFINITION`

The text of the SQL statement executed by the routine.

- `EXTERNAL_NAME`

This value is always `NULL`.

- `EXTERNAL_LANGUAGE`

The language of the stored routine. The value is read from the `external_language` column of the `mysql.routines` data dictionary table.

- `PARAMETER_STYLE`

This value is always `SQL`.

- `IS_DETERMINISTIC`

`YES` or `NO`, depending on whether the routine is defined with the `DETERMINISTIC` characteristic.

- `SQL_DATA_ACCESS`

The data access characteristic for the routine. The value is one of `CONTAINS SQL`, `NO SQL`, `READS SQL DATA`, or `MODIFIES SQL DATA`.

- `SQL_PATH`

This value is always `NULL`.

- `SECURITY_TYPE`

The routine `SQL SECURITY` characteristic. The value is one of `DEFINER` or `INVOKER`.

- `CREATED`

The date and time when the routine was created. This is a `TIMESTAMP` value.

- `LAST_ALTERED`

The date and time when the routine was last modified. This is a `TIMESTAMP` value. If the routine has not been modified since its creation, this value is the same as the `CREATED` value.

- [SQL_MODE](#)

The SQL mode in effect when the routine was created or altered, and under which the routine executes. For the permitted values, see [Server SQL Modes](#).

- [ROUTINE_COMMENT](#)

The text of the comment, if the routine has one. If not, this value is empty.

- [DEFINER](#)

The account of the user who created the routine, in '*user_name*'@'*host_name*' format.

- [CHARACTER_SET_CLIENT](#)

The session value of the [character_set_client](#) system variable when the routine was created.

- [COLLATION_CONNECTION](#)

The session value of the [collation_connection](#) system variable when the routine was created.

- [DATABASE_COLLATION](#)

The collation of the database with which the routine is associated.

Notes

- Information about stored function return values is also available in the [PARAMETERS](#) table. The return value row for a stored function can be identified as the row that has an [ORDINAL_POSITION](#) value of 0.

Chapter 16 The INFORMATION_SCHEMA VIEWS Table

The `VIEWS` table provides information about views in databases. You must have the `SHOW VIEW` privilege to access this table.

The `VIEWS` table has these columns:

- `TABLE_CATALOG`

The name of the catalog to which the view belongs. This value is always `def`.

- `TABLE_SCHEMA`

The name of the schema (database) to which the view belongs.

- `TABLE_NAME`

The name of the view.

- `VIEW_DEFINITION`

The `SELECT` statement that provides the definition of the view. This column has most of what you see in the `Create Table` column that `SHOW CREATE VIEW` produces. Skip the words before `SELECT` and skip the words `WITH CHECK OPTION`. Suppose that the original statement was:

```
CREATE VIEW v AS
  SELECT s2,s1 FROM t
  WHERE s1 > 5
  ORDER BY s1
  WITH CHECK OPTION;
```

Then the view definition looks like this:

```
SELECT s2,s1 FROM t WHERE s1 > 5 ORDER BY s1
```

- `CHECK_OPTION`

The value of the `CHECK_OPTION` attribute. The value is one of `NONE`, `CASCADE`, or `LOCAL`.

- `IS_UPDATABLE`

MySQL sets a flag, called the view updatability flag, at `CREATE VIEW` time. The flag is set to `YES` (true) if `UPDATE` and `DELETE` (and similar operations) are legal for the view. Otherwise, the flag is set to `NO` (false). The `IS_UPDATABLE` column in the `VIEWS` table displays the status of this flag. It means that the server always knows whether a view is updatable.

If a view is not updatable, statements such `UPDATE`, `DELETE`, and `INSERT` are illegal and are rejected. (Even if a view is updatable, it might not be possible to insert into it; for details, refer to [Updatable and Insertable Views](#).)

- `DEFINER`

The account of the user who created the view, in `'user_name'@'host_name'` format.

- `SECURITY_TYPE`

The view `SQL SECURITY` characteristic. The value is one of `DEFINER` or `INVOKER`.

- `CHARACTER_SET_CLIENT`

The session value of the `character_set_client` system variable when the view was created.

- `COLLATION_CONNECTION`

The session value of the `collation_connection` system variable when the view was created.

Notes

MySQL permits different `sql_mode` settings to tell the server the type of SQL syntax to support. For example, you might use the `ANSI` SQL mode to ensure MySQL correctly interprets the standard SQL concatenation operator, the double bar (`||`), in your queries. If you then create a view that concatenates items, you might worry that changing the `sql_mode` setting to a value different from `ANSI` could cause the view to become invalid. But this is not the case. No matter how you write out a view definition, MySQL always stores it the same way, in a canonical form. Here is an example that shows how the server changes a double bar concatenation operator to a `CONCAT()` function:

```
mysql> SET sql_mode = 'ANSI';
Query OK, 0 rows affected (0.00 sec)
mysql> CREATE VIEW test.v AS SELECT 'a' || 'b' as coll;
Query OK, 0 rows affected (0.00 sec)
mysql> SELECT VIEW_DEFINITION FROM INFORMATION_SCHEMA.VIEWS
        WHERE TABLE_SCHEMA = 'test' AND TABLE_NAME = 'v';
+-----+
| VIEW_DEFINITION |
+-----+
| select concat('a','b') AS `coll` |
+-----+
1 row in set (0.00 sec)
```

The advantage of storing a view definition in canonical form is that changes made later to the value of `sql_mode` do not affect the results from the view. However, an additional consequence is that comments prior to `SELECT` are stripped from the definition by the server.

Chapter 17 The INFORMATION_SCHEMA TRIGGERS Table

The `TRIGGERS` table provides information about triggers. To see information about a table's triggers, you must have the `TRIGGER` privilege for the table.

The `TRIGGERS` table has these columns:

- `TRIGGER_CATALOG`

The name of the catalog to which the trigger belongs. This value is always `def`.

- `TRIGGER_SCHEMA`

The name of the schema (database) to which the trigger belongs.

- `TRIGGER_NAME`

The name of the trigger.

- `EVENT_MANIPULATION`

The trigger event. This is the type of operation on the associated table for which the trigger activates. The value is `INSERT` (a row was inserted), `DELETE` (a row was deleted), or `UPDATE` (a row was modified).

- `EVENT_OBJECT_CATALOG`, `EVENT_OBJECT_SCHEMA`, and `EVENT_OBJECT_TABLE`

As noted in [Using Triggers](#), every trigger is associated with exactly one table. These columns indicate the catalog and schema (database) in which this table occurs, and the table name, respectively. The `EVENT_OBJECT_CATALOG` value is always `def`.

- `ACTION_ORDER`

The ordinal position of the trigger's action within the list of triggers on the same table with the same `EVENT_MANIPULATION` and `ACTION_TIMING` values.

- `ACTION_CONDITION`

This value is always `NULL`.

- `ACTION_STATEMENT`

The trigger body; that is, the statement executed when the trigger activates. This text uses UTF-8 encoding.

- `ACTION_ORIENTATION`

This value is always `ROW`.

- `ACTION_TIMING`

Whether the trigger activates before or after the triggering event. The value is `BEFORE` or `AFTER`.

- `ACTION_REFERENCE_OLD_TABLE`

This value is always `NULL`.

- `ACTION_REFERENCE_NEW_TABLE`

This value is always `NULL`.

- `ACTION_REFERENCE_OLD_ROW` and `ACTION_REFERENCE_NEW_ROW`

The old and new column identifiers, respectively. The `ACTION_REFERENCE_OLD_ROW` value is always `OLD` and the `ACTION_REFERENCE_NEW_ROW` value is always `NEW`.

- `CREATED`

The date and time when the trigger was created. This is a `TIMESTAMP(2)` value (with a fractional part in hundredths of seconds) for triggers.

- `SQL_MODE`

The SQL mode in effect when the trigger was created, and under which the trigger executes. For the permitted values, see [Server SQL Modes](#).

- `DEFINER`

The account of the user who created the trigger, in `'user_name'@'host_name'` format.

- `CHARACTER_SET_CLIENT`

The session value of the `character_set_client` system variable when the trigger was created.

- `COLLATION_CONNECTION`

The session value of the `collation_connection` system variable when the trigger was created.

- `DATABASE_COLLATION`

The collation of the database with which the trigger is associated.

Example

The following example uses the `ins_sum` trigger defined in [Using Triggers](#):

```
mysql> SELECT * FROM INFORMATION_SCHEMA.TRIGGERS
      WHERE TRIGGER_SCHEMA='test' AND TRIGGER_NAME='ins_sum'\G
***** 1. row *****
      TRIGGER_CATALOG: def
      TRIGGER_SCHEMA: test
      TRIGGER_NAME: ins_sum
      EVENT_MANIPULATION: INSERT
      EVENT_OBJECT_CATALOG: def
      EVENT_OBJECT_SCHEMA: test
      EVENT_OBJECT_TABLE: account
      ACTION_ORDER: 1
      ACTION_CONDITION: NULL
      ACTION_STATEMENT: SET @sum = @sum + NEW.amount
      ACTION_ORIENTATION: ROW
      ACTION_TIMING: BEFORE
      ACTION_REFERENCE_OLD_TABLE: NULL
      ACTION_REFERENCE_NEW_TABLE: NULL
      ACTION_REFERENCE_OLD_ROW: OLD
      ACTION_REFERENCE_NEW_ROW: NEW
      CREATED: 2018-08-08 10:10:12.61
      SQL_MODE: ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES,
                NO_ZERO_IN_DATE,NO_ZERO_DATE,
                ERROR_FOR_DIVISION_BY_ZERO,
                NO_ENGINE_SUBSTITUTION
      DEFINER: me@localhost
      CHARACTER_SET_CLIENT: utf8mb4
      COLLATION_CONNECTION: utf8mb4_0900_ai_ci
      DATABASE_COLLATION: utf8mb4_0900_ai_ci
```

Trigger information is also available from the `SHOW TRIGGERS` statement. See [SHOW TRIGGERS Syntax](#).

Chapter 18 The INFORMATION_SCHEMA PLUGINS Table

The `PLUGINS` table provides information about server plugins.

The `PLUGINS` table has these columns:

- `PLUGIN_NAME`

The name used to refer to the plugin in statements such as `INSTALL PLUGIN` and `UNINSTALL PLUGIN`.

- `PLUGIN_VERSION`

The version from the plugin's general type descriptor.

- `PLUGIN_STATUS`

The plugin status, one of `ACTIVE`, `INACTIVE`, `DISABLED`, `DELETING`, or `DELETED`.

- `PLUGIN_TYPE`

The type of plugin, such as `STORAGE ENGINE`, `INFORMATION_SCHEMA`, or `AUTHENTICATION`.

- `PLUGIN_TYPE_VERSION`

The version from the plugin's type-specific descriptor.

- `PLUGIN_LIBRARY`

The name of the plugin shared library file. This is the name used to refer to the plugin file in statements such as `INSTALL PLUGIN` and `UNINSTALL PLUGIN`. This file is located in the directory named by the `plugin_dir` system variable. If the library name is `NULL`, the plugin is compiled in and cannot be uninstalled with `UNINSTALL PLUGIN`.

- `PLUGIN_LIBRARY_VERSION`

The plugin API interface version.

- `PLUGIN_AUTHOR`

The plugin author.

- `PLUGIN_DESCRIPTION`

A short description of the plugin.

- `PLUGIN_LICENSE`

How the plugin is licensed (for example, `GPL`).

- `LOAD_OPTION`

How the plugin was loaded. The value is `OFF`, `ON`, `FORCE`, or `FORCE_PLUS_PERMANENT`. See [Installing and Uninstalling Plugins](#).

Notes

- The `PLUGINS` table is a nonstandard `INFORMATION_SCHEMA` table.
- For plugins installed with `INSTALL PLUGIN`, the `PLUGIN_NAME` and `PLUGIN_LIBRARY` values are also registered in the `mysql.plugin` table.
- For information about plugin data structures that form the basis of the information in the `PLUGINS` table, see [The MySQL Plugin API](#).

Plugin information is also available from the `SHOW PLUGINS` statement. See [SHOW PLUGINS Syntax](#). These statements are equivalent:

```
SELECT
  PLUGIN_NAME, PLUGIN_STATUS, PLUGIN_TYPE,
  PLUGIN_LIBRARY, PLUGIN_LICENSE
FROM INFORMATION_SCHEMA.PLUGINS;
SHOW PLUGINS;
```

Chapter 19 The INFORMATION_SCHEMA ENGINES Table

The `ENGINES` table provides information about storage engines. This is particularly useful for checking whether a storage engine is supported, or to see what the default engine is.

The `ENGINES` table has these columns:

- `ENGINE`

The name of the storage engine.

- `SUPPORT`

The server's level of support for the storage engine, as shown in the following table.

Value	Meaning
<code>YES</code>	The engine is supported and is active
<code>DEFAULT</code>	Like <code>YES</code> , plus this is the default engine
<code>NO</code>	The engine is not supported
<code>DISABLED</code>	The engine is supported but has been disabled

A value of `NO` means that the server was compiled without support for the engine, so it cannot be enabled at runtime.

A value of `DISABLED` occurs either because the server was started with an option that disables the engine, or because not all options required to enable it were given. In the latter case, the error log should contain a reason indicating why the option is disabled. See [The Error Log](#).

You might also see `DISABLED` for a storage engine if the server was compiled to support it, but was started with a `--skip-engine_name` option. For the `NDB` storage engine, `DISABLED` means the server was compiled with support for NDB Cluster, but was not started with the `--ndbcluster` option.

All MySQL servers support `MyISAM` tables. It is not possible to disable `MyISAM`.

- `COMMENT`

A brief description of the storage engine.

- `TRANSACTIONS`

Whether the storage engine supports transactions.

- `XA`

Whether the storage engine supports XA transactions.

- `SAVEPOINTS`

Whether the storage engine supports savepoints.

Notes

- The `ENGINES` table is a nonstandard `INFORMATION_SCHEMA` table.

Storage engine information is also available from the `SHOW ENGINES` statement. See [SHOW ENGINES Syntax](#). The following statements are equivalent:

```
SELECT * FROM INFORMATION_SCHEMA.ENGINES  
SHOW ENGINES
```

Chapter 20 The INFORMATION_SCHEMA PARTITIONS Table

The `PARTITIONS` table provides information about table partitions. Each row in this table corresponds to an individual partition or subpartition of a partitioned table. For more information about partitioning tables, see [Partitioning](#).

The `PARTITIONS` table has these columns:

- `TABLE_CATALOG`

The name of the catalog to which the table belongs. This value is always `def`.

- `TABLE_SCHEMA`

The name of the schema (database) to which the table belongs.

- `TABLE_NAME`

The name of the table containing the partition.

- `PARTITION_NAME`

The name of the partition.

- `SUBPARTITION_NAME`

If the `PARTITIONS` table row represents a subpartition, the name of subpartition; otherwise `NULL`.

For `NDB`: This value is always `NULL`.

- `PARTITION_ORDINAL_POSITION`

All partitions are indexed in the same order as they are defined, with `1` being the number assigned to the first partition. The indexing can change as partitions are added, dropped, and reorganized; the number shown in this column reflects the current order, taking into account any indexing changes.

- `SUBPARTITION_ORDINAL_POSITION`

Subpartitions within a given partition are also indexed and reindexed in the same manner as partitions are indexed within a table.

- `PARTITION_METHOD`

One of the values `RANGE`, `LIST`, `HASH`, `LINEAR HASH`, `KEY`, or `LINEAR KEY`; that is, one of the available partitioning types as discussed in [Partitioning Types](#).

- `SUBPARTITION_METHOD`

One of the values `HASH`, `LINEAR HASH`, `KEY`, or `LINEAR KEY`; that is, one of the available subpartitioning types as discussed in [Subpartitioning](#).

- `PARTITION_EXPRESSION`

The expression for the partitioning function used in the `CREATE TABLE` or `ALTER TABLE` statement that created the table's current partitioning scheme.

For example, consider a partitioned table created in the `test` database using this statement:

```
CREATE TABLE tp (
```

```

    c1 INT,
    c2 INT,
    c3 VARCHAR(25)
)
PARTITION BY HASH(c1 + c2)
PARTITIONS 4;

```

The `PARTITION_EXPRESSION` column in a `PARTITIONS` table row for a partition from this table displays `c1 + c2`, as shown here:

```

mysql> SELECT DISTINCT PARTITION_EXPRESSION
      FROM INFORMATION_SCHEMA.PARTITIONS
      WHERE TABLE_NAME='tp' AND TABLE_SCHEMA='test';
+-----+
| PARTITION_EXPRESSION |
+-----+
| c1 + c2              |
+-----+

```

- `SUBPARTITION_EXPRESSION`

This works in the same fashion for the subpartitioning expression that defines the subpartitioning for a table as `PARTITION_EXPRESSION` does for the partitioning expression used to define a table's partitioning.

If the table has no subpartitions, this column is `NULL`.

- `PARTITION_DESCRIPTION`

This column is used for `RANGE` and `LIST` partitions. For a `RANGE` partition, it contains the value set in the partition's `VALUES LESS THAN` clause, which can be either an integer or `MAXVALUE`. For a `LIST` partition, this column contains the values defined in the partition's `VALUES IN` clause, which is a list of comma-separated integer values.

For partitions whose `PARTITION_METHOD` is other than `RANGE` or `LIST`, this column is always `NULL`.

- `TABLE_ROWS`

The number of table rows in the partition.

For partitioned `InnoDB` tables, the row count given in the `TABLE_ROWS` column is only an estimated value used in SQL optimization, and may not always be exact.

For `NDB` tables, you can also obtain this information using the `ndb_desc` utility.

- `AVG_ROW_LENGTH`

The average length of the rows stored in this partition or subpartition, in bytes. This is the same as `DATA_LENGTH` divided by `TABLE_ROWS`.

For `NDB` tables, you can also obtain this information using the `ndb_desc` utility.

- `DATA_LENGTH`

The total length of all rows stored in this partition or subpartition, in bytes; that is, the total number of bytes stored in the partition or subpartition.

For `NDB` tables, you can also obtain this information using the `ndb_desc` utility.

- `MAX_DATA_LENGTH`

The maximum number of bytes that can be stored in this partition or subpartition.

For `NDB` tables, you can also obtain this information using the `ndb_desc` utility.

- [INDEX_LENGTH](#)

The length of the index file for this partition or subpartition, in bytes.

For partitions of [NDB](#) tables, whether the tables use implicit or explicit partitioning, the [INDEX_LENGTH](#) column value is always 0. However, you can obtain equivalent information using the [ndb_desc](#) utility.

- [DATA_FREE](#)

The number of bytes allocated to the partition or subpartition but not used.

For [NDB](#) tables, you can also obtain this information using the [ndb_desc](#) utility.

- [CREATE_TIME](#)

The time that the partition or subpartition was created.

- [UPDATE_TIME](#)

The time that the partition or subpartition was last modified.

- [CHECK_TIME](#)

The last time that the table to which this partition or subpartition belongs was checked.

For partitioned [InnoDB](#) tables, the value is always [NULL](#).

- [CHECKSUM](#)

The checksum value, if any; otherwise [NULL](#).

- [PARTITION_COMMENT](#)

The text of the comment, if the partition has one. If not, this value is empty.

The maximum length for a partition comment is defined as 1024 characters, and the display width of the [PARTITION_COMMENT](#) column is also 1024, characters to match this limit.

- [NODEGROUP](#)

This is the nodegroup to which the partition belongs. This is relevant only to [NDB Cluster](#) tables; otherwise, the value is always 0.

- [TABLESPACE_NAME](#)

The name of the tablespace to which the partition belongs. The value is always [DEFAULT](#), unless the table uses the [NDB](#) storage engine (see the *Notes* at the end of this section).

Notes

- The [PARTITIONS](#) table is a nonstandard [INFORMATION_SCHEMA](#) table.
- A table using any storage engine other than [NDB](#) and which is not partitioned has one row in the [PARTITIONS](#) table. However, the values of the [PARTITION_NAME](#), [SUBPARTITION_NAME](#), [PARTITION_ORDINAL_POSITION](#), [SUBPARTITION_ORDINAL_POSITION](#), [PARTITION_METHOD](#), [SUBPARTITION_METHOD](#), [PARTITION_EXPRESSION](#), [SUBPARTITION_EXPRESSION](#), and [PARTITION_DESCRIPTION](#) columns are all [NULL](#). Also, the [PARTITION_COMMENT](#) column in this case is blank.
- An [NDB](#) table which is not explicitly partitioned has one row in the [PARTITIONS](#) table for each data node in the [NDB cluster](#). For each such row:

- The `SUBPARTITION_NAME`, `SUBPARTITION_ORDINAL_POSITION`, `SUBPARTITION_METHOD`, `PARTITION_EXPRESSION`, `SUBPARTITION_EXPRESSION`, `CREATE_TIME`, `UPDATE_TIME`, `CHECK_TIME`, `CHECKSUM`, and `TABLESPACE_NAME` columns are all `NULL`.
- The `PARTITION_METHOD` is always `AUTO`.
- The `NODEGROUP` column is `default`.
- The `PARTITION_EXPRESSION` and `PARTITION_COMMENT` columns are empty.

Chapter 21 The INFORMATION_SCHEMA EVENTS Table

The `EVENTS` table provides information about Event Manager events, which are discussed in [Using the Event Scheduler](#).

The `EVENTS` table has these columns:

- `EVENT_CATALOG`

The name of the catalog to which the event belongs. This value is always `def`.

- `EVENT_SCHEMA`

The name of the schema (database) to which the event belongs.

- `EVENT_NAME`

The name of the event.

- `DEFINER`

The account of the user who created the event, in `'user_name'@'host_name'` format.

- `TIME_ZONE`

The event time zone, which is the time zone used for scheduling the event and that is in effect within the event as it executes. The default value is `SYSTEM`.

- `EVENT_BODY`

The language used for the statements in the event's `DO` clause. The value is always `SQL`.

- `EVENT_DEFINITION`

The text of the SQL statement making up the event's `DO` clause; in other words, the statement executed by this event.

- `EVENT_TYPE`

The event repetition type, either `ONE TIME` (transient) or `RECURRING` (repeating).

- `EXECUTE_AT`

For a one-time event, this is the `DATETIME` value specified in the `AT` clause of the `CREATE EVENT` statement used to create the event, or of the last `ALTER EVENT` statement that modified the event. The value shown in this column reflects the addition or subtraction of any `INTERVAL` value included in the event's `AT` clause. For example, if an event is created using `ON SCHEDULE AT CURRENT_TIMESTAMP + '1:6' DAY_HOUR`, and the event was created at 2018-02-09 14:05:30, the value shown in this column would be `'2018-02-10 20:05:30'`. If the event's timing is determined by an `EVERY` clause instead of an `AT` clause (that is, if the event is recurring), the value of this column is `NULL`.

- `INTERVAL_VALUE`

For a recurring event, the number of intervals to wait between event executions. For a transient event, the value is always `NULL`.

- `INTERVAL_FIELD`

The time units used for the interval which a recurring event waits before repeating. For a transient event, the value is always `NULL`.

- `SQL_MODE`

The SQL mode in effect when the event was created or altered, and under which the event executes. For the permitted values, see [Server SQL Modes](#).

- [STARTS](#)

The start date and time for a recurring event. This is displayed as a [DATETIME](#) value, and is [NULL](#) if no start date and time are defined for the event. For a transient event, this column is always [NULL](#). For a recurring event whose definition includes a [STARTS](#) clause, this column contains the corresponding [DATETIME](#) value. As with the [EXECUTE_AT](#) column, this value resolves any expressions used. If there is no [STARTS](#) clause affecting the timing of the event, this column is [NULL](#).

- [ENDS](#)

For a recurring event whose definition includes a [ENDS](#) clause, this column contains the corresponding [DATETIME](#) value. As with the [EXECUTE_AT](#) column, this value resolves any expressions used. If there is no [ENDS](#) clause affecting the timing of the event, this column is [NULL](#).

- [STATUS](#)

The event status. One of [ENABLED](#), [DISABLED](#), or [SLAVESIDE_DISABLED](#). [SLAVESIDE_DISABLED](#) indicates that the creation of the event occurred on another MySQL server acting as a replication master and replicated to the current MySQL server which is acting as a slave, but the event is not presently being executed on the slave. For more information, see [Replication of Invoked Features](#) information.

- [ON_COMPLETION](#)

One of the two values [PRESERVE](#) or [NOT PRESERVE](#).

- [CREATED](#)

The date and time when the event was created. This is a [TIMESTAMP](#) value.

- [LAST_ALTERED](#)

The date and time when the event was last modified. This is a [TIMESTAMP](#) value. If the event has not been modified since its creation, this value is the same as the [CREATED](#) value.

- [LAST_EXECUTED](#)

The date and time when the event last executed. This is a [DATETIME](#) value. If the event has never executed, this column is [NULL](#).

[LAST_EXECUTED](#) indicates when the event started. As a result, the [ENDS](#) column is never less than [LAST_EXECUTED](#).

- [EVENT_COMMENT](#)

The text of the comment, if the event has one. If not, this value is empty.

- [ORIGINATOR](#)

The server ID of the MySQL server on which the event was created; used in replication. This value may be updated by [ALTER EVENT](#) to the server ID of the server on which that statement occurs, if executed on a master server. The default value is 0.

- [CHARACTER_SET_CLIENT](#)

The session value of the [character_set_client](#) system variable when the event was created.

- [COLLATION_CONNECTION](#)

The session value of the `collation_connection` system variable when the event was created.

- `DATABASE_COLLATION`

The collation of the database with which the event is associated.

Notes

- The `EVENTS` table is a nonstandard `INFORMATION_SCHEMA` table.
- Times in the `EVENTS` table are displayed using the event time zone, the current session time zone, or UTC, as described in [Event Metadata](#).
- For more information about `SLAVESIDE_DISABLED` and the `ORIGINATOR` column, see [Replication of Invoked Features](#).

Example

Suppose that the user `'jon'@'ghidora'` creates an event named `e_daily`, and then modifies it a few minutes later using an `ALTER EVENT` statement, as shown here:

```
DELIMITER |
CREATE EVENT e_daily
ON SCHEDULE
  EVERY 1 DAY
COMMENT 'Saves total number of sessions then clears the table each day'
DO
BEGIN
  INSERT INTO site_activity.totals (time, total)
    SELECT CURRENT_TIMESTAMP, COUNT(*)
    FROM site_activity.sessions;
  DELETE FROM site_activity.sessions;
END |
DELIMITER ;
ALTER EVENT e_daily
ENABLE;
```

(Note that comments can span multiple lines.)

This user can then run the following `SELECT` statement, and obtain the output shown:

```
mysql> SELECT * FROM INFORMATION_SCHEMA.EVENTS
WHERE EVENT_NAME = 'e_daily'
AND EVENT_SCHEMA = 'myschema'\G
***** 1. row *****
EVENT_CATALOG: def
EVENT_SCHEMA: myschema
EVENT_NAME: e_daily
DEFINER: jon@ghidora
TIME_ZONE: SYSTEM
EVENT_BODY: SQL
EVENT_DEFINITION: BEGIN
  INSERT INTO site_activity.totals (time, total)
    SELECT CURRENT_TIMESTAMP, COUNT(*)
    FROM site_activity.sessions;
  DELETE FROM site_activity.sessions;
END
EVENT_TYPE: RECURRING
EXECUTE_AT: NULL
INTERVAL_VALUE: 1
INTERVAL_FIELD: DAY
SQL_MODE: ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES,
NO_ZERO_IN_DATE,NO_ZERO_DATE,
ERROR_FOR_DIVISION_BY_ZERO,
NO_ENGINE_SUBSTITUTION
```

Example

```
STARTS: 2018-08-08 11:06:34
ENDS: NULL
STATUS: ENABLED
ON_COMPLETION: NOT PRESERVE
CREATED: 2018-08-08 11:06:34
LAST_ALTERED: 2018-08-08 11:06:34
LAST_EXECUTED: 2018-08-08 16:06:34
EVENT_COMMENT: Saves total number of sessions then clears the
                table each day
ORIGINATOR: 1
CHARACTER_SET_CLIENT: utf8mb4
COLLATION_CONNECTION: utf8mb4_0900_ai_ci
DATABASE_COLLATION: utf8mb4_0900_ai_ci
```

Event information is also available from the `SHOW EVENTS` statement. See [SHOW EVENTS Syntax](#). The following statements are equivalent:

```
SELECT
    EVENT_SCHEMA, EVENT_NAME, DEFINER, TIME_ZONE, EVENT_TYPE, EXECUTE_AT,
    INTERVAL_VALUE, INTERVAL_FIELD, STARTS, ENDS, STATUS, ORIGINATOR,
    CHARACTER_SET_CLIENT, COLLATION_CONNECTION, DATABASE_COLLATION
FROM INFORMATION_SCHEMA.EVENTS
WHERE table_schema = 'db_name'
[AND column_name LIKE 'wild']
SHOW EVENTS
[FROM db_name]
[LIKE 'wild']
```

Chapter 22 The INFORMATION_SCHEMA FILES Table

The `FILES` table provides information about the files in which MySQL tablespace data is stored.

The `FILES` table provides information about `InnoDB` data files. In NDB Cluster, this table also provides information about the files in which NDB Cluster Disk Data tables are stored. For additional information specific to `InnoDB`, see [InnoDB Notes](#), later in this section; for additional information specific to NDB Cluster, see [NDB Notes](#).

The `FILES` table has these columns:

- `FILE_ID`

For `InnoDB`: The tablespace ID, also referred to as the `space_id` or `fil_space_t::id`.

For `NDB`: A file identifier. `FILE_ID` column values are auto-generated.

- `FILE_NAME`

For `InnoDB`: The name of the data file. File-per-table and general tablespaces have an `.ibd` file name extension. Undo tablespaces are prefixed by `undo`. The system tablespace is prefixed by `ibdata`. The global temporary tablespace is prefixed by `ibtmp`. The file name includes the file path, which may be relative to the MySQL data directory (the value of the `datadir` system variable).

For `NDB`: The name of an `UNDO` log file created by `CREATE LOGFILE GROUP` or `ALTER LOGFILE GROUP`, or of a data file created by `CREATE TABLESPACE` or `ALTER TABLESPACE`.

- `FILE_TYPE`

For `InnoDB`: The tablespace file type. There are three possible file types for `InnoDB` files. `TABLESPACE` is the file type for any system, general, or file-per-table tablespace file that holds tables, indexes, or other forms of user data. `TEMPORARY` is the file type for temporary tablespaces. `UNDO LOG` is the file type for undo tablespaces, which hold undo records.

For `NDB`: One of the values `UNDO LOG`, `DATAFILE`, or `TABLESPACE`.

- `TABLESPACE_NAME`

For `InnoDB`: The SQL name for the tablespace. A general tablespace name is the `SYS_TABLESPACES.NAME` value. For other tablespace files, names start with `innodb_`, such as `innodb_system`, `innodb_undo`, and `innodb_file_per_table`. The file-per-table tablespace name format is `innodb_file_per_table_##`, where `##` is the tablespace ID.

For `NDB`: The name of the tablespace with which the file is associated.

- `TABLE_CATALOG`

This value is always empty.

- `TABLE_SCHEMA`

This value is always `NULL`.

- `TABLE_NAME`

For `InnoDB`: This value is always `NULL`.

For `NDB`: The name of the Disk Data table with which the file is associated, if any.

- `LOGFILE_GROUP_NAME`

For `InnoDB`: This value is always `NULL`.

For **NDB**: The name of the log file group to which the log file or data file belongs.

- **LOGFILE_GROUP_NUMBER**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For an **UNDO** log file, the auto-generated ID number of the log file group to which the log file belongs.

- **ENGINE**

For **InnoDB**: This value is always **InnoDB**.

For **NDB**: For an NDB Cluster Disk Data log file or data file, this value is always **NDB** or **NDBCLUSTER**.

- **FULLTEXT_KEYS**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For an NDB Cluster Disk Data log file or data file, this value is always empty.

- **DELETED_ROWS**

For **InnoDB**: This value is always **NULL**.

- **UPDATE_COUNT**

For **InnoDB**: This value is always **NULL**.

- **FREE_EXTENTS**

For **InnoDB**: The number of fully free extents in the current data file.

For **NDB**: The number of extents which have not yet been used by the file.

- **TOTAL_EXTENTS**

For **InnoDB**: The number of full extents used in the current data file. Any partial extent at the end of the file is not counted.

For **NDB**: The total number of extents allocated to the file.

- **EXTENT_SIZE**

For **InnoDB**: Extent size is 1048576 (1MB) for files with a 4KB, 8KB, or 16KB page size. Extent size is 2097152 bytes (2MB) for files with a 32KB page size, and 4194304 (4MB) for files with a 64KB page size. **FILES** does not report **InnoDB** page size. Page size is defined by the **innodb_page_size** system variable. Extent size information can also be retrieved from the **INNODB_TABLESPACES** table where **FILES.FILE_ID = INNODB_TABLESPACES.SPACE**.

For **NDB**: The size of an extent for the file in bytes.

- **INITIAL_SIZE**

For **InnoDB**: The initial size of the file in bytes.

For **NDB**: The size of the file in bytes. This is the same value that was used in the **INITIAL_SIZE** clause of the **CREATE LOGFILE GROUP**, **ALTER LOGFILE GROUP**, **CREATE TABLESPACE**, or **ALTER TABLESPACE** statement used to create the file.

- **MAXIMUM_SIZE**

For **InnoDB**: The maximum number of bytes permitted in the file. The value is **NULL** for all data files except for predefined system tablespace data files. Maximum system tablespace file size is defined by `innodb_data_file_path`. Maximum global temporary tablespace file size is defined by `innodb_temp_data_file_path`. A **NULL** value for a predefined system tablespace data file indicates that a file size limit was not defined explicitly.

For **NDB**: For NDB Cluster Disk Data files, this value is always the same as the `INITIAL_SIZE` value.

- **AUTOEXTEND_SIZE**

For **InnoDB**: **AUTOEXTEND_SIZE** is the auto-extend size defined by `innodb_data_file_path` for the system tablespace, or by `innodb_temp_data_file_path` for the global temporary tablespace.

For **NDB**: For NDB Cluster Disk Data files, this value is always empty.

- **CREATION_TIME**

For **InnoDB**: This value is always **NULL**.

For **NDB**: The date and time when the file was created.

- **LAST_UPDATE_TIME**

For **InnoDB**: This value is always **NULL**.

For **NDB**: The date and time when the file was last modified.

- **LAST_ACCESS_TIME**

For **InnoDB**: This value is always **NULL**.

For **NDB**: The date and time when the file was last accessed by the server.

- **RECOVER_TIME**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For NDB Cluster Disk Data files, this value is always **0**.

- **TRANSACTION_COUNTER**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For NDB Cluster Disk Data files, this value is always **0**.

- **VERSION**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For NDB Cluster Disk Data files, this value is always **NULL**.

- **ROW_FORMAT**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For NDB Cluster Disk Data files, this value is always **NULL**.

- **TABLE_ROWS**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For NDB Cluster Disk Data files, this value is always **NULL**.

- **AVG_ROW_LENGTH**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For NDB Cluster Disk Data files, this value is always **NULL**.

- **DATA_LENGTH**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For NDB Cluster Disk Data files, this value is always **NULL**.

- **MAX_DATA_LENGTH**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For NDB Cluster Disk Data files, this value is always **NULL**.

- **INDEX_LENGTH**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For NDB Cluster Disk Data files, this value is always **NULL**.

- **DATA_FREE**

For **InnoDB**: The total amount of free space (in bytes) for the entire tablespace. Predefined system tablespaces, which include the system tablespace and temporary table tablespaces, may have one or more data files.

For **NDB**: For NDB Cluster Disk Data files, this value is always **NULL**.

- **CREATE_TIME**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For NDB Cluster Disk Data files, this value is always **NULL**.

- **UPDATE_TIME**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For NDB Cluster Disk Data files, this value is always **NULL**.

- **CHECK_TIME**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For NDB Cluster Disk Data files, this value is always **NULL**.

- **CHECKSUM**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For NDB Cluster Disk Data files, this value is always **NULL**.

- **STATUS**

For **InnoDB**: This value is **NORMAL** by default. **InnoDB** file-per-table tablespaces may report **IMPORTING**, which indicates that the tablespace is not yet available.

For **NDB**: For NDB Cluster Disk Data files, this value is always **NORMAL**.

- **EXTRA**

For **InnoDB**: This value is always **NULL**.

For **NDB**: For NDB Cluster Disk Data files, the **EXTRA** column shows which data node the file belongs to (each data node having its own copy), as well as the size of its undo buffer. Suppose that you use this statement on an NDB Cluster with four data nodes:

```
CREATE LOGFILE GROUP mygroup
  ADD UNDOFILE 'new_undo.dat'
  INITIAL_SIZE 2G
  ENGINE NDB;
```

After running the **CREATE LOGFILE GROUP** statement successfully, you should see a result similar to the one shown here for this query against the **FILES** table:

```
mysql> SELECT LOGFILE_GROUP_NAME, FILE_TYPE, EXTRA
        FROM INFORMATION_SCHEMA.FILES
        WHERE FILE_NAME = 'new_undo.dat';
```

LOGFILE_GROUP_NAME	FILE_TYPE	EXTRA
mygroup	UNDO LOG	CLUSTER_NODE=5;UNDO_BUFFER_SIZE=8388608
mygroup	UNDO LOG	CLUSTER_NODE=6;UNDO_BUFFER_SIZE=8388608
mygroup	UNDO LOG	CLUSTER_NODE=7;UNDO_BUFFER_SIZE=8388608
mygroup	UNDO LOG	CLUSTER_NODE=8;UNDO_BUFFER_SIZE=8388608

This information was not included in NDB Cluster 8.0 prior to NDB 8.0.15. (Bug #92796, Bug #28800252)

Notes

- The **FILES** table is a nonstandard **INFORMATION_SCHEMA** table.

InnoDB Notes

The following notes apply to **InnoDB** data files.

- Data reported by **FILES** is reported from the **InnoDB** in-memory cache for open files. By comparison, **INNODB_DATAFILES** reports data from the **InnoDB SYS_DATAFILES** internal data dictionary table.
- The data reported by **FILES** includes global temporary tablespace data. This data is not available in the **InnoDB SYS_DATAFILES** internal data dictionary table, and is therefore not reported by **INNODB_DATAFILES**.
- Undo tablespace data is reported by **FILES** when separate undo tablespaces are present, which they are by default in MySQL 8.0
- The following query returns all data pertinent to **InnoDB** tablespaces.

```
SELECT
  FILE_ID, FILE_NAME, FILE_TYPE, TABLESPACE_NAME, FREE_EXTENTS,
  TOTAL_EXTENTS, EXTENT_SIZE, INITIAL_SIZE, MAXIMUM_SIZE,
  AUTOEXTEND_SIZE, DATA_FREE, STATUS
FROM INFORMATION_SCHEMA.FILES WHERE ENGINE='InnoDB'\G
```

NDB Notes

- The `FILES` table provides information about Disk Data *files* only; you cannot use it for determining disk space allocation or availability for individual NDB tables. However, it is possible to see how much space is allocated for each NDB table having data stored on disk—as well as how much remains available for storage of data on disk for that table—using `ndb_desc`. For more information, see [ndb_desc — Describe NDB Tables](#).
- The `CREATION_TIME`, `LAST_UPDATE_TIME`, and `LAST_ACCESSED` values are as reported by the operating system, and are not supplied by the NDB storage engine. Where no value is provided by the operating system, these columns display `0000-00-00 00:00:00`.
- The difference between the `TOTAL_EXTENTS` and `FREE_EXTENTS` columns is the number of extents currently in use by the file:

```
SELECT TOTAL_EXTENTS - FREE_EXTENTS AS extents_used
FROM INFORMATION_SCHEMA.FILES
WHERE FILE_NAME = 'myfile.dat';
```

To approximate the amount of disk space in use by the file, multiply that difference by the value of the `EXTENT_SIZE` column, which gives the size of an extent for the file in bytes:

```
SELECT (TOTAL_EXTENTS - FREE_EXTENTS) * EXTENT_SIZE AS bytes_used
FROM INFORMATION_SCHEMA.FILES
WHERE FILE_NAME = 'myfile.dat';
```

Similarly, you can estimate the amount of space that remains available in a given file by multiplying `FREE_EXTENTS` by `EXTENT_SIZE`:

```
SELECT FREE_EXTENTS * EXTENT_SIZE AS bytes_free
FROM INFORMATION_SCHEMA.FILES
WHERE FILE_NAME = 'myfile.dat';
```

Important

The byte values produced by the preceding queries are approximations only, and their precision is inversely proportional to the value of `EXTENT_SIZE`. That is, the larger `EXTENT_SIZE` becomes, the less accurate the approximations are.

It is also important to remember that once an extent is used, it cannot be freed again without dropping the data file of which it is a part. This means that deletes from a Disk Data table do *not* release disk space.

The extent size can be set in a `CREATE TABLESPACE` statement. For more information, see [CREATE TABLESPACE Syntax](#).

- An additional row is present in the `FILES` table following the creation of a logfile group. This row has `NULL` for the value of the `FILE_NAME` column. For this row, the value of the `FILE_ID` column is always `0`, that of the `FILE_TYPE` column is always `UNDO FILE`, and that of the `STATUS` column is always `NORMAL`. The value of the `ENGINE` column is always `NDBCLUSTER`.

The `FREE_EXTENTS` column in this row shows the total number of free extents available to all undo files belonging to a given log file group whose name and number are shown in the `LOGFILE_GROUP_NAME` and `LOGFILE_GROUP_NUMBER` columns, respectively.

Suppose there are no existing log file groups on your NDB Cluster, and you create one using the following statement:

```
mysql> CREATE LOGFILE GROUP lg1
      ADD UNDOFILE 'undofile.dat'
      INITIAL_SIZE = 16M
      UNDO_BUFFER_SIZE = 1M
      ENGINE = NDB;
```

You can now see this `NULL` row when you query the `FILES` table:

```
mysql> SELECT DISTINCT
      FILE_NAME AS File,
      FREE_EXTENTS AS Free,
      TOTAL_EXTENTS AS Total,
      EXTENT_SIZE AS Size,
      INITIAL_SIZE AS Initial
      FROM INFORMATION_SCHEMA.FILES;
```

File	Free	Total	Size	Initial
undofile.dat	NULL	4194304	4	16777216
NULL	4184068	NULL	4	NULL

The total number of free extents available for undo logging is always somewhat less than the sum of the `TOTAL_EXTENTS` column values for all undo files in the log file group due to overhead required for maintaining the undo files. This can be seen by adding a second undo file to the log file group, then repeating the previous query against the `FILES` table:

```
mysql> ALTER LOGFILE GROUP lg1
      ADD UNDOFILE 'undofile02.dat'
      INITIAL_SIZE = 4M
      ENGINE = NDB;
mysql> SELECT DISTINCT
      FILE_NAME AS File,
      FREE_EXTENTS AS Free,
      TOTAL_EXTENTS AS Total,
      EXTENT_SIZE AS Size,
      INITIAL_SIZE AS Initial
      FROM INFORMATION_SCHEMA.FILES;
```

File	Free	Total	Size	Initial
undofile.dat	NULL	4194304	4	16777216
undofile02.dat	NULL	1048576	4	4194304
NULL	5223944	NULL	4	NULL

The amount of free space in bytes which is available for undo logging by Disk Data tables using this log file group can be approximated by multiplying the number of free extents by the initial size:

```
mysql> SELECT
      FREE_EXTENTS AS 'Free Extents',
      FREE_EXTENTS * EXTENT_SIZE AS 'Free Bytes'
      FROM INFORMATION_SCHEMA.FILES
      WHERE LOGFILE_GROUP_NAME = 'lg1'
      AND FILE_NAME IS NULL;
```

Free Extents	Free Bytes
5223944	20895776

If you create an NDB Cluster Disk Data table and then insert some rows into it, you can see approximately how much space remains for undo logging afterward, for example:

```
mysql> CREATE TABLESPACE ts1
      ADD DATAFILE 'data1.dat'
```

```

        USE LOGFILE GROUP lg1
        INITIAL_SIZE 512M
        ENGINE = NDB;
mysql> CREATE TABLE dd (
        c1 INT NOT NULL PRIMARY KEY,
        c2 INT,
        c3 DATE
        )
        TABLESPACE ts1 STORAGE DISK
        ENGINE = NDB;
mysql> INSERT INTO dd VALUES
        (NULL, 1234567890, '2007-02-02'),
        (NULL, 1126789005, '2007-02-03'),
        (NULL, 1357924680, '2007-02-04'),
        (NULL, 1642097531, '2007-02-05');
mysql> SELECT
        FREE_EXTENTS AS 'Free Extents',
        FREE_EXTENTS * EXTENT_SIZE AS 'Free Bytes'
        FROM INFORMATION_SCHEMA.FILES
        WHERE LOGFILE_GROUP_NAME = 'lg1'
        AND FILE_NAME IS NULL;
+-----+-----+
| Free Extents | Free Bytes |
+-----+-----+
|          5207565 |      20830260 |
+-----+-----+

```

- An additional row is present in the `FILES` table for any NDB Cluster tablespace, whether or not any data files are associated with the tablespace. This row has `NULL` for the value of the `FILE_NAME` column. For this row, the value of the `FILE_ID` column is always `0`, that of the `FILE_TYPE` column is always `TABLESPACE`, and that of the `STATUS` column is always `NORMAL`. The value of the `ENGINE` column is always `NDBCLUSTER`.
- For additional information, and examples of creating and dropping NDB Cluster Disk Data objects, see [NDB Cluster Disk Data Tables](#).

Chapter 23 The INFORMATION_SCHEMA PROCESSLIST Table

The `PROCESSLIST` table provides information about which threads are running.

The `PROCESSLIST` table has these columns:

- `ID`

The connection identifier. This is the same type of value displayed in the `Id` column of the `SHOW PROCESSLIST` statement, the `PROCESSLIST_ID` column of the Performance Schema `threads` table, and returned by the `CONNECTION_ID()` function.

- `USER`

The MySQL user who issued the statement. A value of `system user` refers to a nonclient thread spawned by the server to handle tasks internally. This could be the I/O or SQL thread used on replication slaves or a delayed-row handler. For `system user`, there is no host specified in the `Host` column. `unauthenticated user` refers to a thread that has become associated with a client connection but for which authentication of the client user has not yet been done. `event_scheduler` refers to the thread that monitors scheduled events (see [Using the Event Scheduler](#)).

Note

A `USER` value of `system user` is distinct from the `SYSTEM_USER` privilege. The former designates internal threads. The latter distinguishes the system user and regular user account categories (see [Account Categories](#)).

- `HOST`

The host name of the client issuing the statement (except for `system user`, for which there is no host). The host name for TCP/IP connections is reported in `host_name:client_port` format to make it easier to determine which client is doing what.

- `DB`

The default database, if one is selected; otherwise `NULL`.

- `COMMAND`

The type of command the thread is executing. For descriptions for thread commands, see [Examining Thread Information](#). The value of this column corresponds to the `COM_xxx` commands of the client/server protocol and `Com_xxx` status variables. See [Server Status Variables](#)

- `TIME`

The time in seconds that the thread has been in its current state. For a slave SQL thread, the value is the number of seconds between the timestamp of the last replicated event and the real time of the slave machine. See [Replication Implementation Details](#).

- `STATE`

An action, event, or state that indicates what the thread is doing. Descriptions for `STATE` values can be found at [Examining Thread Information](#).

Most states correspond to very quick operations. If a thread stays in a given state for many seconds, there might be a problem that needs to be investigated.

For the `SHOW PROCESSLIST` statement, the value of `STATE` is `NULL`.

- `INFO`

The statement the thread is executing, or `NULL` if it is not executing any statement. The statement might be the one sent to the server, or an innermost statement if the statement executes other statements. For example, if a `CALL` statement executes a stored procedure that is executing a `SELECT` statement, the `INFO` value shows the `SELECT` statement.

Notes

- The `PROCESSLIST` table is a nonstandard `INFORMATION_SCHEMA` table.
- Like the output from the `SHOW PROCESSLIST` statement, the `PROCESSLIST` table shows information only about your own threads, unless you have the `PROCESS` privilege, in which case you will see information about other threads, too. As an anonymous user, you cannot see any rows at all.
- If an SQL statement refers to the `PROCESSLIST` table, MySQL populates the entire table once, when statement execution begins, so there is read consistency during the statement. There is no read consistency for a multi-statement transaction.

Process information is also available from the `mysqladmin processlist` command, the `SHOW PROCESSLIST` statement, and the Performance Schema `threads` table (see [mysqladmin — Client for Administering a MySQL Server](#), [SHOW PROCESSLIST Syntax](#), and [The threads Table](#)). In contrast to the `INFORMATION_SCHEMA PROCESSLIST` table and `SHOW PROCESSLIST` statement, which have negative performance consequences because they require a mutex, access to `threads` does not require a mutex and has minimal impact on server performance. The `threads` table also shows information about background threads, which the `PROCESSLIST` table and `SHOW PROCESSLIST` do not. This means that `threads` can be used to monitor activity the other thread information sources cannot.

The following statements are equivalent:

```
SELECT * FROM INFORMATION_SCHEMA.PROCESSLIST
SHOW FULL PROCESSLIST
```

Chapter 24 The INFORMATION_SCHEMA REFERENTIAL_CONSTRAINTS Table

The `REFERENTIAL_CONSTRAINTS` table provides information about foreign keys.

The `REFERENTIAL_CONSTRAINTS` table has these columns:

- `CONSTRAINT_CATALOG`

The name of the catalog to which the constraint belongs. This value is always `def`.

- `CONSTRAINT_SCHEMA`

The name of the schema (database) to which the constraint belongs.

- `CONSTRAINT_NAME`

The name of the constraint.

- `UNIQUE_CONSTRAINT_CATALOG`

The name of the catalog containing the unique constraint that the constraint references. This value is always `def`.

- `UNIQUE_CONSTRAINT_SCHEMA`

The name of the schema containing the unique constraint that the constraint references.

- `UNIQUE_CONSTRAINT_NAME`

The name of the unique constraint that the constraint references.

- `MATCH_OPTION`

The value of the constraint `MATCH` attribute. The only valid value at this time is `NONE`.

- `UPDATE_RULE`

The value of the constraint `ON UPDATE` attribute. The possible values are `CASCADE`, `SET NULL`, `SET DEFAULT`, `RESTRICT`, `NO ACTION`.

- `DELETE_RULE`

The value of the constraint `ON DELETE` attribute. The possible values are `CASCADE`, `SET NULL`, `SET DEFAULT`, `RESTRICT`, `NO ACTION`.

- `TABLE_NAME`

The name of the table. This value is the same as in the `TABLE_CONSTRAINTS` table.

- `REFERENCED_TABLE_NAME`

The name of the table referenced by the constraint.

Chapter 25 Extensions to SHOW Statements

Some extensions to `SHOW` statements accompany the implementation of `INFORMATION_SCHEMA`:

- `SHOW` can be used to get information about the structure of `INFORMATION_SCHEMA` itself.
- Several `SHOW` statements accept a `WHERE` clause that provides more flexibility in specifying which rows to display.

`INFORMATION_SCHEMA` is an information database, so its name is included in the output from `SHOW DATABASES`. Similarly, `SHOW TABLES` can be used with `INFORMATION_SCHEMA` to obtain a list of its tables:

```
mysql> SHOW TABLES FROM INFORMATION_SCHEMA;
+-----+
| Tables_in_INFORMATION_SCHEMA |
+-----+
| CHARACTER_SETS              |
| COLLATIONS                  |
| COLLATION_CHARACTER_SET_APPLICABILITY |
| COLUMNS                    |
| COLUMN_PRIVILEGES          |
| ENGINES                    |
| EVENTS                     |
| FILES                      |
| KEY_COLUMN_USAGE           |
| PARTITIONS                 |
| PLUGINS                    |
| PROCESSLIST                |
| REFERENTIAL_CONSTRAINTS   |
| ROUTINES                   |
| SCHEMATA                   |
| SCHEMA_PRIVILEGES         |
| STATISTICS                 |
| TABLES                    |
| TABLE_CONSTRAINTS        |
| TABLE_PRIVILEGES         |
| TRIGGERS                   |
| USER_PRIVILEGES           |
| VIEWS                      |
+-----+
```

`SHOW COLUMNS` and `DESCRIBE` can display information about the columns in individual `INFORMATION_SCHEMA` tables.

`SHOW` statements that accept a `LIKE` clause to limit the rows displayed also permit a `WHERE` clause that specifies more general conditions that selected rows must satisfy:

```
SHOW CHARACTER SET
SHOW COLLATION
SHOW COLUMNS
SHOW DATABASES
SHOW FUNCTION STATUS
SHOW INDEX
SHOW OPEN TABLES
SHOW PROCEDURE STATUS
SHOW STATUS
SHOW TABLE STATUS
SHOW TABLES
SHOW TRIGGERS
SHOW VARIABLES
```

The `WHERE` clause, if present, is evaluated against the column names displayed by the `SHOW` statement. For example, the `SHOW CHARACTER SET` statement produces these output columns:

```
mysql> SHOW CHARACTER SET;
```

Charset	Description	Default collation	Maxlen
big5	Big5 Traditional Chinese	big5_chinese_ci	2
dec8	DEC West European	dec8_swedish_ci	1
cp850	DOS West European	cp850_general_ci	1
hp8	HP West European	hp8_english_ci	1
koi8r	KOI8-R Relcom Russian	koi8r_general_ci	1
latin1	cp1252 West European	latin1_swedish_ci	1
latin2	ISO 8859-2 Central European	latin2_general_ci	1
...			

To use a `WHERE` clause with `SHOW CHARACTER SET`, you would refer to those column names. As an example, the following statement displays information about character sets for which the default collation contains the string `'japanese'`:

```
mysql> SHOW CHARACTER SET WHERE `Default collation` LIKE '%japanese%';
```

Charset	Description	Default collation	Maxlen
ujis	EUC-JP Japanese	ujis_japanese_ci	3
sjis	Shift-JIS Japanese	sjis_japanese_ci	2
cp932	SJIS for Windows Japanese	cp932_japanese_ci	2
eucjpms	UJIS for Windows Japanese	eucjpms_japanese_ci	3

This statement displays the multibyte character sets:

```
mysql> SHOW CHARACTER SET WHERE Maxlen > 1;
```

Charset	Description	Default collation	Maxlen
big5	Big5 Traditional Chinese	big5_chinese_ci	2
ujis	EUC-JP Japanese	ujis_japanese_ci	3
sjis	Shift-JIS Japanese	sjis_japanese_ci	2
euckr	EUC-KR Korean	euckr_korean_ci	2
gb2312	GB2312 Simplified Chinese	gb2312_chinese_ci	2
gbk	GBK Simplified Chinese	gbk_chinese_ci	2
utf8	UTF-8 Unicode	utf8_general_ci	3
ucs2	UCS-2 Unicode	ucs2_general_ci	2
cp932	SJIS for Windows Japanese	cp932_japanese_ci	2
eucjpms	UJIS for Windows Japanese	eucjpms_japanese_ci	3

Chapter 26 MySQL 8.0 FAQ: INFORMATION_SCHEMA

Questions

- [26.1](#): Where can I find documentation for the MySQL `INFORMATION_SCHEMA` database?
- [26.2](#): Is there a discussion forum for `INFORMATION_SCHEMA`?
- [26.3](#): Where can I find the ANSI SQL 2003 specification for `INFORMATION_SCHEMA`?
- [26.4](#): What is the difference between the Oracle Data Dictionary and MySQL `INFORMATION_SCHEMA`?
- [26.5](#): Can I add to or otherwise modify the tables found in the `INFORMATION_SCHEMA` database?

Questions and Answers

26.1: Where can I find documentation for the MySQL `INFORMATION_SCHEMA` database?

See [Chapter 1, `INFORMATION_SCHEMA` Tables](#)

26.2: Is there a discussion forum for `INFORMATION_SCHEMA`?

See <https://forums.mysql.com/list.php?101>.

26.3: Where can I find the ANSI SQL 2003 specification for `INFORMATION_SCHEMA`?

Unfortunately, the official specifications are not freely available. (ANSI makes them available for purchase.) However, there are books available, such as *SQL-99 Complete, Really* by Peter Gultzan and Trudy Pelzer, that provide a comprehensive overview of the standard, including `INFORMATION_SCHEMA`.

26.4: What is the difference between the Oracle Data Dictionary and MySQL `INFORMATION_SCHEMA`?

Both Oracle and MySQL provide metadata in tables. However, Oracle and MySQL use different table names and column names. The MySQL implementation is more similar to those found in DB2 and SQL Server, which also support `INFORMATION_SCHEMA` as defined in the SQL standard.

26.5: Can I add to or otherwise modify the tables found in the `INFORMATION_SCHEMA` database?

No. Since applications may rely on a certain standard structure, this should not be modified. For this reason, *we cannot support bugs or other issues which result from modifying `INFORMATION_SCHEMA` tables or data.*

