

so that performance stays high as the data volume increases. Starting with an efficient database design makes it easier for team members to write high-performing application code, and makes the database likely to endure as applications evolve and are rewritten.

8.4.1 Optimizing Data Size

Design your tables to minimize their space on the disk. This can result in huge improvements by reducing the amount of data written to and read from disk. Smaller tables normally require less main memory while their contents are being actively processed during query execution. Any space reduction for table data also results in smaller indexes that can be processed faster.

MySQL supports many different storage engines (table types) and row formats. For each table, you can decide which storage and indexing method to use. Choosing the proper table format for your application can give you a big performance gain. See [Chapter 15, The InnoDB Storage Engine](#), and [Chapter 16, Alternative Storage Engines](#).

You can get better performance for a table and minimize storage space by using the techniques listed here:

- [Table Columns](#)
- [Row Format](#)
- [Indexes](#)
- [Joins](#)
- [Normalization](#)

Table Columns

- Use the most efficient (smallest) data types possible. MySQL has many specialized types that save disk space and memory. For example, use the smaller integer types if possible to get smaller tables. `MEDIUMINT` is often a better choice than `INT` because a `MEDIUMINT` column uses 25% less space.
- Declare columns to be `NOT NULL` if possible. It makes SQL operations faster, by enabling better use of indexes and eliminating overhead for testing whether each value is `NULL`. You also save some storage space, one bit per column. If you really need `NULL` values in your tables, use them. Just avoid the default setting that allows `NULL` values in every column.

Row Format

- `InnoDB` tables are created using the `DYNAMIC` row format by default. To use a row format other than `DYNAMIC`, configure `innodb_default_row_format`, or specify the `ROW_FORMAT` option explicitly in a `CREATE TABLE` or `ALTER TABLE` statement.

The compact family of row formats, which includes `COMPACT`, `DYNAMIC`, and `COMPRESSED`, decreases row storage space at the cost of increasing CPU use for some operations. If your workload is a typical one that is limited by cache hit rates and disk speed it is likely to be faster. If it is a rare case that is limited by CPU speed, it might be slower.

The compact family of row formats also optimizes `CHAR` column storage when using a variable-length character set such as `utf8mb3` or `utf8mb4`. With `ROW_FORMAT=REDUNDANT`, `CHAR(N)` occupies $N \times$ the maximum byte length of the character set. Many languages can be written primarily using single-byte `utf8` characters, so a fixed storage length often wastes space. With the compact family of rows formats, `InnoDB` allocates a variable amount of storage in the range of N to $N \times$ the maximum byte length of the