Index Fragmentation

What is Fragmentation?

Hello! I’m...

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578 1K 5K

What is Fragmentation?

Logical vs. Physical Order

Fragmentation occurs when the logical order of the index (the order defined by the index key) does not match the physical order of the data on disk. This can happen over time as rows are inserted, updated, or deleted.

Internal Fragmentation

Gaps within the data pages caused by deleted or updated rows that leave empty space. This leads to inefficient use of space.

External Fragmentation

Occurs when the data pages are no longer stored contiguously on disk. This means the database engine might need to read from multiple locations on disk to retrieve logically consecutive data, which can slow down query performance.

Impact on Performance

Slower Reads

Fragmentation can cause the database to work harder to retrieve data, leading to slower read performance, especially for range queries or sequential scans.

Increased I/O Operations

Non-contiguous data pages mean the database engine must perform more I/O operations to access the data, which is slower than accessing contiguous data.

Maintenance and Defragmentation

Rebuilding Indexes

Rebuilding an index creates a new, defragmented version of the index, which reorders the data pages and compacts the data. This is a more comprehensive operation that requires more resources but is effective at reducing fragmentation.

Reorganizing Indexes

Reorganizing an index defragments the index by physically reordering the data pages and compacting the data. This operation is less resource-intensive than a full rebuild but may be less effective in heavily fragmented indexes.

Regular Maintenance

Regularly scheduled maintenance tasks such as index rebuilding or reorganizing can help mitigate the impact of fragmentation, ensuring that queries remain performant over time.