<https://docs.couchbase.com/cloud/n1ql/n1ql-language-reference/cost-based-optimizer.html>

Understand the Cost-Based Optimizer for Queries

he cost-based optimizer takes into account the cost of memory, CPU, network transport, and disk usage when choosing the optimal plan to execute a query.

**Overview**

The *cost-based optimizer* (CBO) enables the Query service to create the most efficient plan to execute a query.

The execution of a query involves [many possible operations](https://docs.couchbase.com/server/current/learn/services-and-indexes/services/query-service.html#query-execution): scan, fetch, join, filter, and so on. When the query processor is planning the query execution, there may be several possible choices for each operation: for example, there may be different possible indexes, or a choice of join types. With each of these operations, some of these choices are quicker and more efficient than others.

The cost-based optimizer uses metadata and statistics to estimate the amount of processing (memory, CPU, network traffic, and I/O) required for each operation. It compares the cost of alternative routes, and then selects the query-execution plan with the least cost.

A diagram of a diagram

AI-generated content may be incorrect.

*Figure 1. Query execution flow, showing the cost-based optimizer using statistics and metadata*

The cost-based optimizer can generate a query plan for [SELECT](https://docs.couchbase.com/cloud/n1ql/n1ql-language-reference/selectintro.html), [UPDATE](https://docs.couchbase.com/cloud/n1ql/n1ql-language-reference/update.html), [DELETE](https://docs.couchbase.com/cloud/n1ql/n1ql-language-reference/delete.html), [MERGE](https://docs.couchbase.com/cloud/n1ql/n1ql-language-reference/merge.html), and [INSERT INTO with SELECT](https://docs.couchbase.com/cloud/n1ql/n1ql-language-reference/insert.html) queries.