

# Benefits of Oracle Advanced Row Compression

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## **Purpose statement**

This document provides an overview of features and enhancements included in release 23ai. It is intended solely to help you assess the business benefits of upgrading to 23ai and planning for the implementation and upgrade of the product features described.

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# Oracle Advanced Compression

## Optimizes Database Storage and Query Performance

This document discusses the potential benefits of Advanced Row Compression, a feature of Advanced Compression.

### Advanced Row Compression

Advanced Row Compression uses a unique compression algorithm specifically designed to work with OLTP/DW applications. The algorithm works by eliminating duplicate values within a database block, even across multiple columns.

Compressed blocks contain a structure, called a symbol table, which maintains compression metadata. When a block is compressed, duplicate values are eliminated by first adding a single copy of the duplicate value to the symbol table. Each duplicate value is then replaced by a short reference to the appropriate entry in the symbol table. Through this innovative design, compressed data is self-contained within the database block, as the metadata used to translate compressed data into its original state is stored in the block header.

When compared with competing compression algorithms that maintain a global database symbol table, Oracle's approach offers significant performance benefits by not introducing additional I/O (needed with a global symbol table) when accessing compressed data.

### Key Benefits

#### Defer Future Database Storage Purchases

Enterprises are experiencing an explosion in the volume of data required to effectively run their businesses. This ongoing growth in data volume presents a daunting management challenge for IT administrators.

First and foremost are the spiraling storage costs even though the cost per MB of storage has been declining dramatically in the last few years, the enormous growth in the volume of data that needs to be retained online makes storage one of the biggest cost elements of most IT budgets.

Advanced Row Compression is a non-obtrusive, data compression solution that typically results in a 50%, or more, reduction in overall storage requirement for database tables with little or no disruption for implementation.

The compression ratio achieved in each environment depends on the data being compressed, specifically the cardinality of the data. In general, organizations can expect to reduce their storage space consumption by a factor of 2x to 4x by using Advanced Row Compression. That is, the amount of space consumed by uncompressed data will be two to four times larger than that of the compressed data.

This will allow you to better utilize existing database storage, and possibly defer additional purchases of new storage, for growing applications. Because Advanced Compression substantially reduces the total data size in the application database, storage requirements grow much slower than non-compressed databases.

#### Improve Database Query Performance

Many Oracle Database users have growing databases behind their applications, and as the business expands, so does the amount of data under management. As this happens, application and database administrators are confronted with the realization that their application query performance is being impacted by ongoing data growth.

Fortunately, the benefits of Advanced Row Compression go beyond just on-disk storage savings. Another significant advantage is Oracle Database's ability, when using Advanced Row Compression, to read/process compressed data (and indexes) directly, in memory, without uncompressing the data.

This can help improve query performance due to the reduction in I/O, and the reduction in system calls related to the I/O operations. Further, the database's buffer cache becomes more efficient by storing more data (using fewer blocks) without having to add memory.

Once data is compressed with Advanced Row Compression, it remains in this state for all types of operations (queries, backups etc...) which means fewer blocks must be manipulated per transaction. It is typical for Advanced Compression users to report a 2x to 3x improvement in query performance after data compression.

### Optimize Compression Based Upon Data Usage

Oracle Database provides several types of compression, allowing organizations to choose the type of compression best suited to the current usage of the data, as data moves through its lifecycle - from hot/active to warm/less active to cold/historical – while still meeting the performance and availability requirements for the application.

Heat Map, a feature of Oracle Database Enterprise Edition, is the key to providing the heuristics to manage data (tables/partitions) based on access and usage type. Heat Map automatically tracks usage information at the row and segment levels.<sup>1</sup> Data modification times are tracked at the row level and aggregated to the block level, and modification times, full table scan times, and index lookup times are tracked at the segment level.

Heat Map enables a detailed view of how data is accessed, and how access patterns change over time. This information enables organizations to choose the best level of Oracle compression that is the most optimal based upon the current data usage.

### Summary of Benefits

As discussed above, Oracle Advanced Compression provides a comprehensive set of compression features designed to reduce costs and improve query performance by enabling compression for structured data, unstructured data, indexes, database backups and network traffic.

These benefits include:

- **REDUCES DATABASE STORAGE REQUIREMENTS**
  - **50% OR GREATER STORAGE REDUCTION IS TYPICAL**
  - **COMBINE WITH HYBRID COLUMNAR COMPRESSION TO OPTIMIZE COMPRESSION BASED UPON DATA USAGE**
- **SCALABILITY OF STORAGE BANDWIDTH AND CAPACITY**
- **REDUCES CPU UTILIZATION**
  - **ENABLES MORE ROWS PER BLOCK AND REDUCES NUMBER OF BLOCK ACCESSES PER ROW ACCESS**
  - **IMPROVES BUFFER CACHE HIT RATE**
- **IMPROVES IO EFFICIENCY**
  - **FREES UP IO BANDWIDTH, REDUCES IO LATENCY**

<sup>1</sup> Database rows are stored in database blocks, which are grouped in extents. A segment is a set of extents that contains all the data for a logical storage structure within a tablespace (i.e., a table or partition).

## Conclusion

Oracle Advanced Compression, and Oracle Database, together provide a robust set of compression, performance and data storage optimization capabilities that enable IT managers to succeed in complex environments.

Whether it is a cloud, or an on-premise Oracle Database deployment, Advanced Row Compression can deliver robust data compression, across different environments, with no changes in applications.

## Free Compression Advisor

An easy way to get started, with Advanced Row Compression, is by using compression advisor. The “DBMS\_COMPRESSION” PL/SQL package (commonly called compression advisor) gathers compression-related information within a database environment.

This includes estimating the compressibility of both uncompressed partitioned, and non-partitioned tables, and gathering row-level compression information on previously compressed tables/partitions. Compression advisor provides organizations with the storage reduction information needed to make compression-related usage decisions.

The output of running compression advisor is an estimation of the compression ratio for the specific table or partition that was the target of compression advisor. The output indicates the “COMPRESSION RATIO” presented as a number such as 2.1. This number indicates that, for this specific table or partition, the estimated compression ratio is 2.1x, which represents about a 50% reduction in the footprint of the table or partition should compression be enabled.

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