

Comparative Performance Analysis

ADO.NET, Entity Framework, and MongoDB

This study evaluates the performance of three distinct database frameworks — ADO.NET, Entity Framework, and MongoDB — through CRUD (Create, Read, Update, Delete) operations across various dataset sizes.

Summary of Findings

MongoDB is the most efficient framework, showcasing consistent performance across all CRUD operations, particularly with smaller datasets. However, deletion times for larger datasets require optimization to maintain flexibility.

ADO.NET demonstrates superior performance with larger datasets. It is well-suited for applications handling large volumes of data.

Entity Framework exhibits longer operation times compared to the other frameworks, regardless of dataset size. This highlights the need for careful performance evaluation when selecting a database framework for projects.

Testing Approach

This performance analysis involved multiple testing rounds to ensure a comprehensive evaluation of each framework's capabilities and limitations. This approach provided a deep understanding of the frameworks' performance characteristics across various scenarios and dataset sizes. **Importantly, all databases contained existing data during testing**, ensuring that the queries were tested in realistic conditions rather than against empty databases.

Detailed Analysis

ADO.NET Performance

The enchantedears database, containing 8,407,375 records, was used for testing CRUD operations with an artist named Joe Jonas. A for loop added numbers to the artist's name to ensure unique entries. Results showed efficient handling of up to 1 million records, particularly in data creation.

	Create	Read	Update	Delete
1	0.1 seconds	0.9 seconds	0.9 seconds	0.9 seconds
1 000	0.3 seconds	10 seconds	10 seconds	10 seconds
10 000	2.2 seconds	10 seconds	10 seconds	10 seconds
1 000 000	218.8 seconds	21 seconds	18 seconds	17 seconds

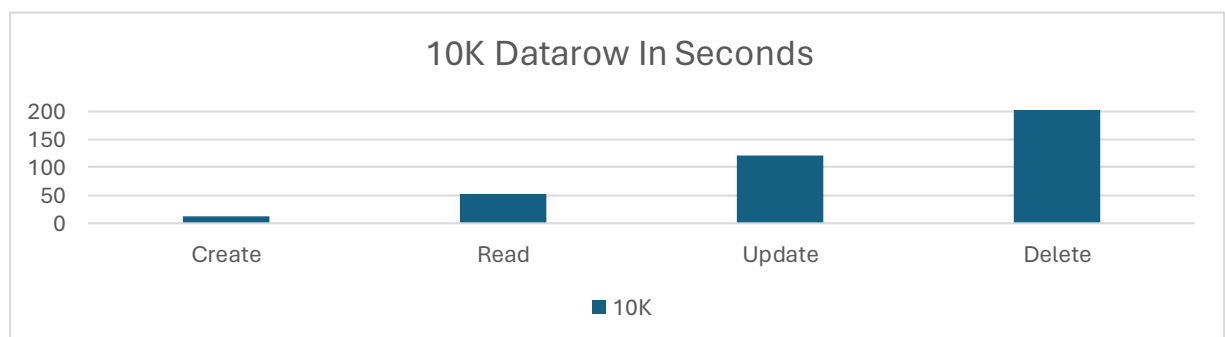
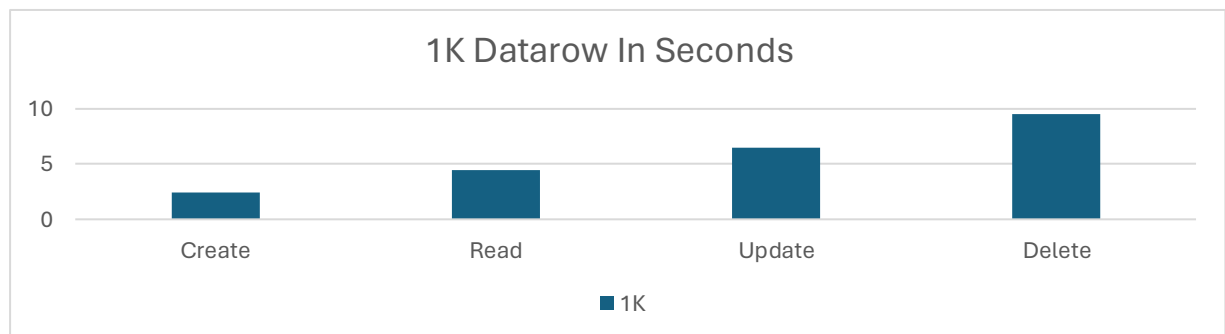
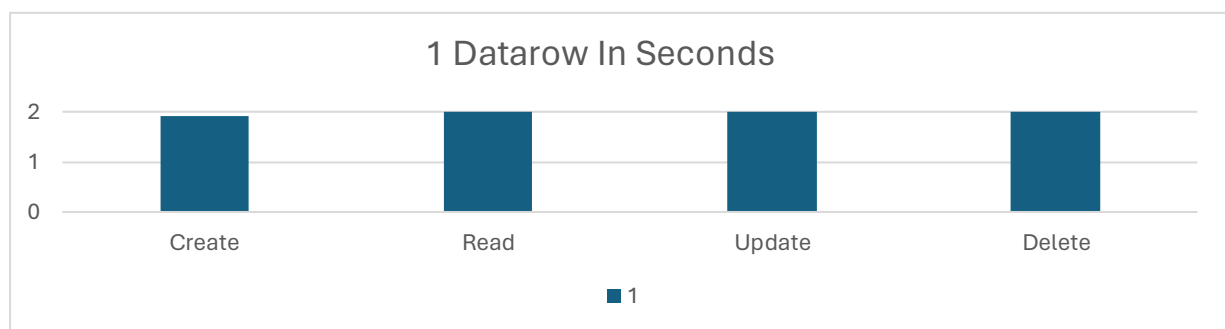


Entity Framework Performance

Entity Framework testing involved adding Taylor Swift as a pop artist to a database containing 379,966 records. Performance issues were noted as dataset size increased, especially during insertion operations.

	Create	Read	Update	Delete
1	1.9 seconds	2.0 seconds	2.0 seconds	2.0 seconds
1 000	2.4 seconds	4.5 seconds	6.5 seconds	9.5 seconds
10 000	13.4 seconds	53.0 seconds	122.4 seconds	224.6 seconds
1 000 000	1 029.4 s	2 135.6 s	? seconds	? seconds

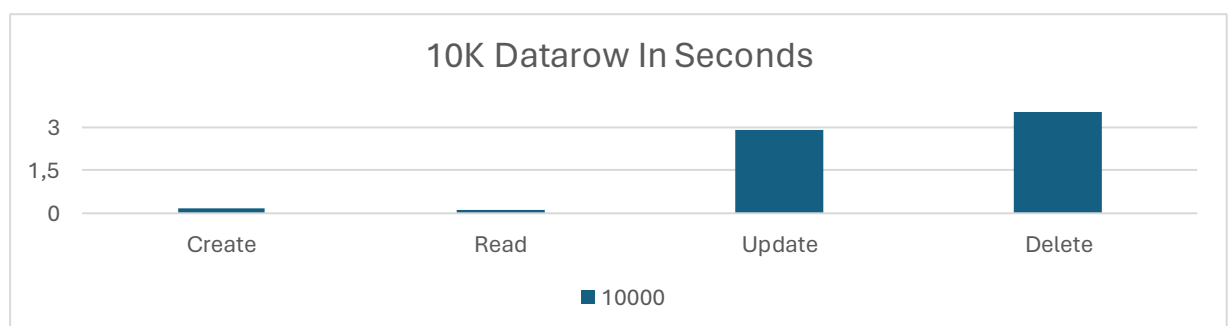
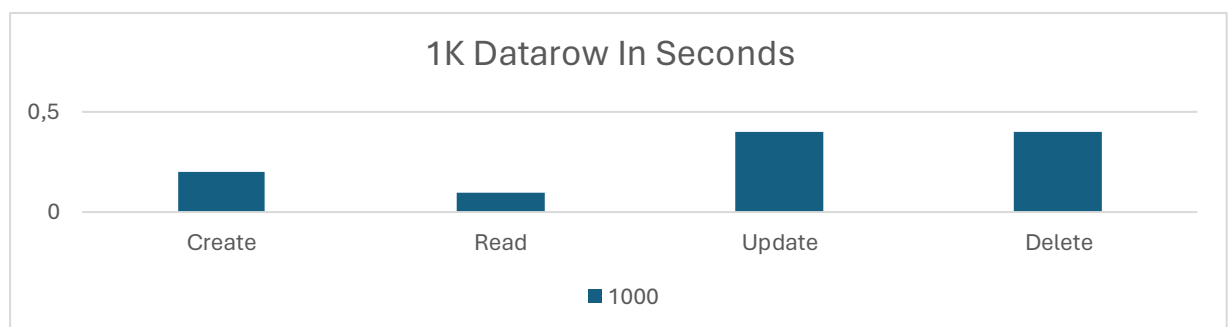
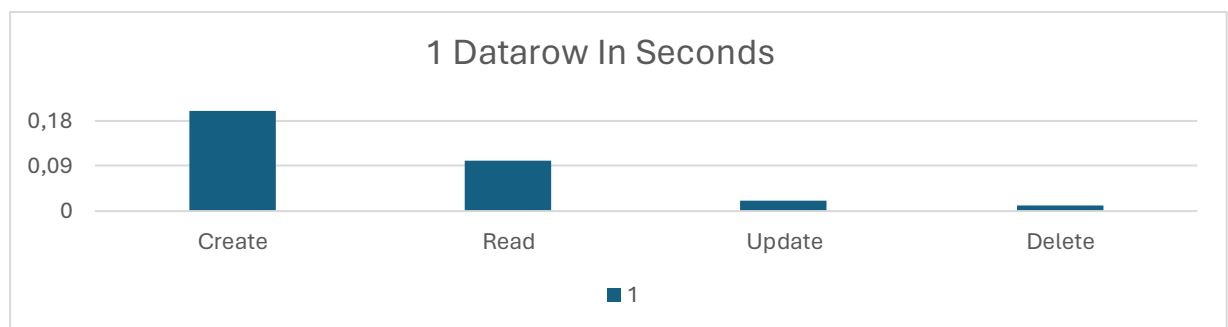
It took a while but after 8 hours it did not finish, and even in the morning it did not get updated or removed after 7 hours. It can be seen it runs but it takes a lot of times.



MongoDB Performance

Testing MongoDB involved adding "The Tortured Poets Department" album by Taylor Swift. MongoDB demonstrated fast update and delete operations, though insertion and retrieval times increased with larger datasets. The database contained 2,090,121 records during testing.

	Create	Read	Update	Delete
1	0.2 seconds	0.1 seconds	0.02 seconds	0.01 seconds
1 000	0.2 seconds	0.1 seconds	0.4 seconds	0.4 seconds
10 000	0.2 seconds	0.1 seconds	2.9 seconds	3.7 seconds
1M	0.1 seconds	0.1 seconds	308.2 seconds	389.8 seconds



Conclusion

This comprehensive analysis underscores the importance of selecting the right database framework based on specific application requirements and dataset sizes.

MongoDB is highly efficient for a broad range of CRUD operations, especially with smaller datasets, but requires optimization for large-scale deletions.

ADO.NET offers robust performance for large datasets, making it a suitable choice for applications with high data volume requirements.

Entity Framework shows slower performance, emphasizing the need for careful consideration of its use in projects where performance is critical.

