Comparative Performance Analysis

ADO.NET, Entity Framework, and MongoDB

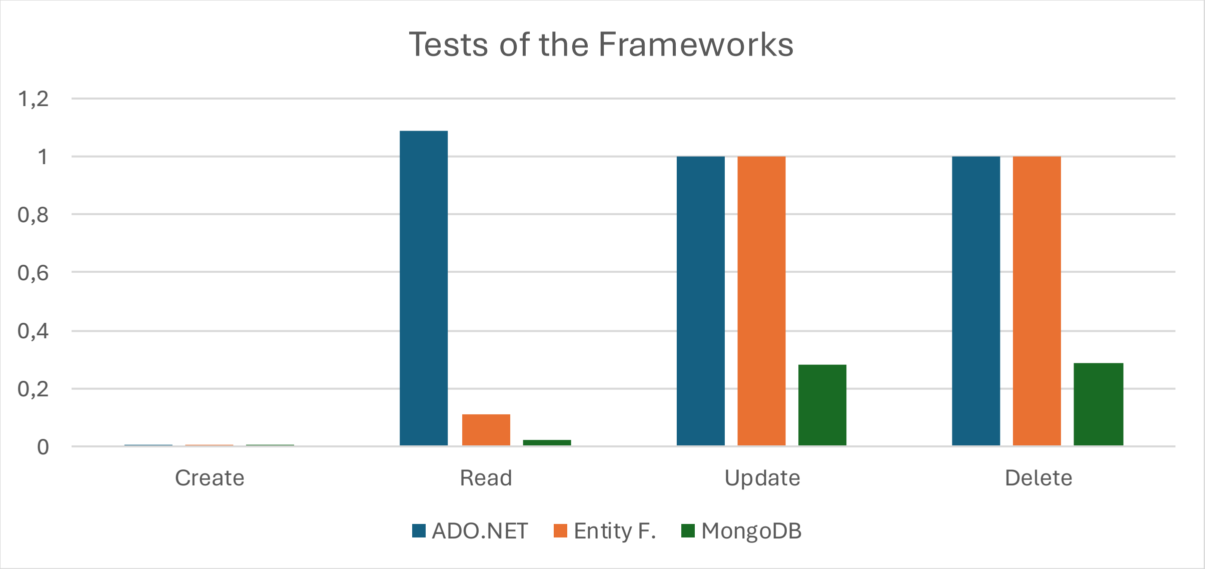
Based on the provided data, significant performance differences emerge among three distinct database frameworks: ADO.NET, Entity Framework, and MongoDB, as they execute CRUD (Create, Read, Update, Delete) operations across varying quantities of records. I added only an artist to Entity Framework and ADO.NET, for MongoDB I tried a bit more like a song and an artist.

In my opinion, MongoDB emerges as the most versatile and efficient framework among the three options. Its consistent performance across all CRUD operations, even with larger datasets, showcases its robust capabilities for handling diverse workload requirements. While there is room for optimization, particularly in deletion times for larger datasets, MongoDB's scalability and flexibility make it a compelling choice for applications with dynamic data needs.

Entity Framework demonstrates commendable performance, especially with smaller datasets. However, its noticeable increase in insertion time as dataset size grows highlights potential scalability challenges. While suitable for applications with moderate data volumes, careful consideration is needed when scaling to handle larger datasets.

ADO.NET, while reliable, exhibits slower performance compared to MongoDB and Entity Framework, particularly with larger datasets. The significant increase in insertion time for 1000 rows underscores the importance of optimization efforts. While still viable for applications with smaller datasets or specific performance requirements, ADO.NET may require additional resources and optimization efforts for handling larger workloads effectively.

In conclusion, the choice of the appropriate framework depends on various factors, including performance requirements, scalability needs, and the specific characteristics of the application. While MongoDB offers efficient performance across a wide range of scenarios, Entity Framework and ADO.NET remain viable options for applications with smaller datasets or specialized requirements. Ultimately, careful consideration of these factors will ensure the selection of the most suitable framework to meet the application's needs.



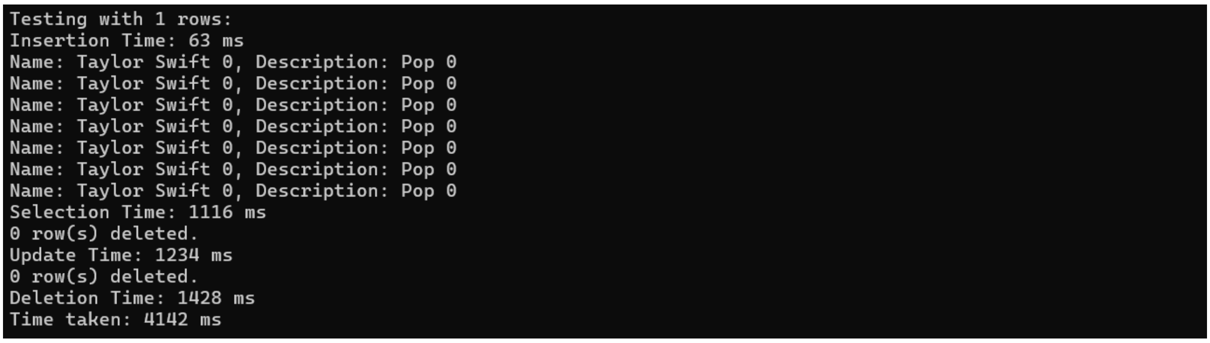
ADO.NET

I added *Taylor Swift* as a pop artist.

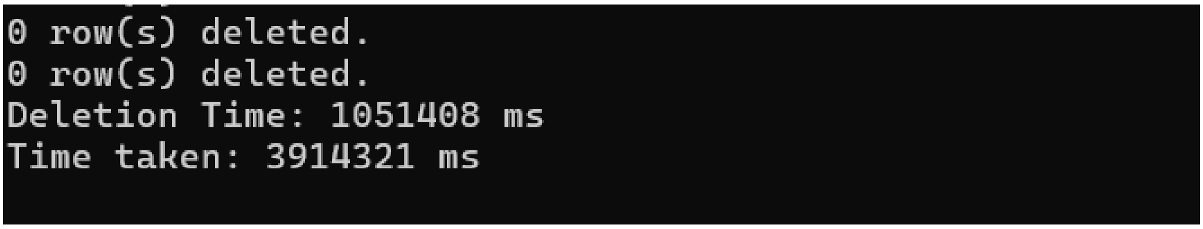
These CRUD operations using ADO.NET seem to take a significant amount of time. It might be a better choice for smaller databases as evidence by not able to run the operators without taking too much time.

	Create	Read	Update	Delete
1	4142 milliseconds = 0.07 minutes = 0.0012 hours			
1 000	3 914 321 milliseconds = 65.24 minutes = 1.09 hours			
10 000	Not available.			
1 000 000	Not available.			

**It would be more time to run 10 000 and 1 000 000 data.*



```
Testing with 1 rows:
Insertion Time: 63 ms
Name: Taylor Swift 0, Description: Pop 0
Name: Taylor Swift 0, Description: Pop 0
Name: Taylor Swift 0, Description: Pop 0
Name: Taylor Swift 0, Description: Pop 0
Name: Taylor Swift 0, Description: Pop 0
Name: Taylor Swift 0, Description: Pop 0
Name: Taylor Swift 0, Description: Pop 0
Selection Time: 1116 ms
0 row(s) deleted.
Update Time: 1234 ms
0 row(s) deleted.
Deletion Time: 1428 ms
Time taken: 4142 ms
```



```
0 row(s) deleted.
0 row(s) deleted.
Deletion Time: 1051408 ms
Time taken: 3914321 ms
```

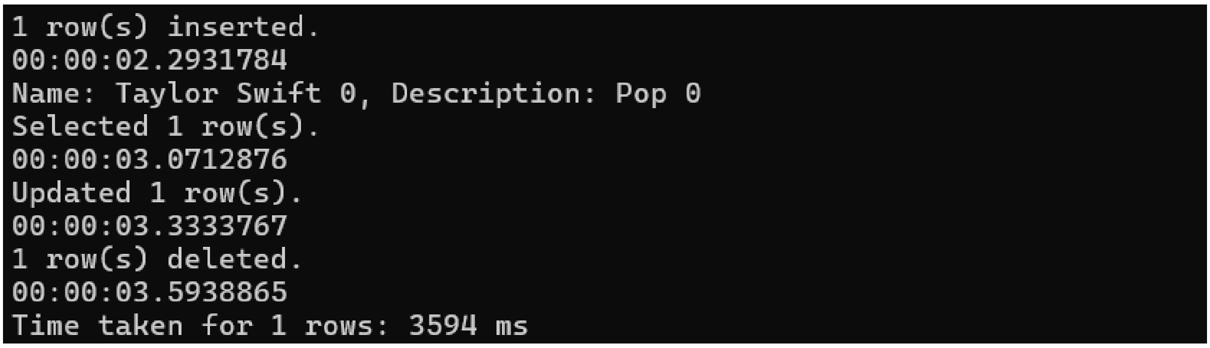
Entity Framework

I added *Taylor Swift* as a pop artist.

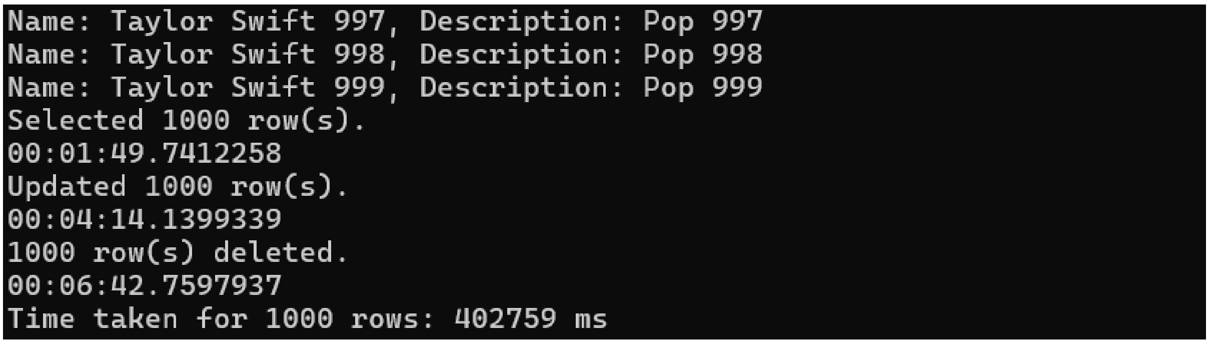
From 1 row to 1000 rows, their initial results suggest that the Entity Framework's performance in terms of insertion deteriorates significantly with larger datasets, as evidenced by the substantial increase in time for the operation.

	Create	Read	Update	Delete
1	3594 milliseconds = 0.06 minutes = 0.001 hours			
1 000	402 759 milliseconds = 6.71 minutes = 0.112 hours			
10 000	Not available.			
1 000 000	Not available.			

**It would be more time to run 10 000 and 1 000 000 data.*



```
1 row(s) inserted.
00:00:02.2931784
Name: Taylor Swift 0, Description: Pop 0
Selected 1 row(s).
00:00:03.0712876
Updated 1 row(s).
00:00:03.3333767
1 row(s) deleted.
00:00:03.5938865
Time taken for 1 rows: 3594 ms
```



```
Name: Taylor Swift 997, Description: Pop 997
Name: Taylor Swift 998, Description: Pop 998
Name: Taylor Swift 999, Description: Pop 999
Selected 1000 row(s).
00:01:49.7412258
Updated 1000 row(s).
00:04:14.1399339
1000 row(s) deleted.
00:06:42.7597937
Time taken for 1000 rows: 402759 ms
```

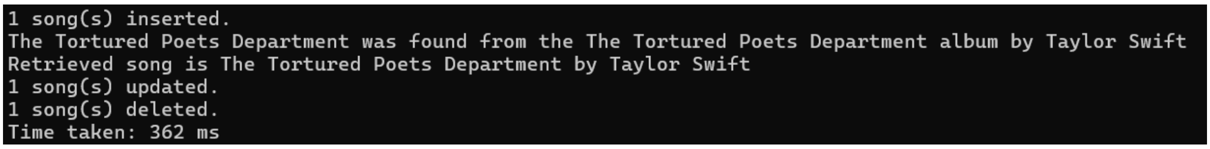
MongoDB

I added *The Tortured Poets Department* from the album called the same way by Taylor Swift.

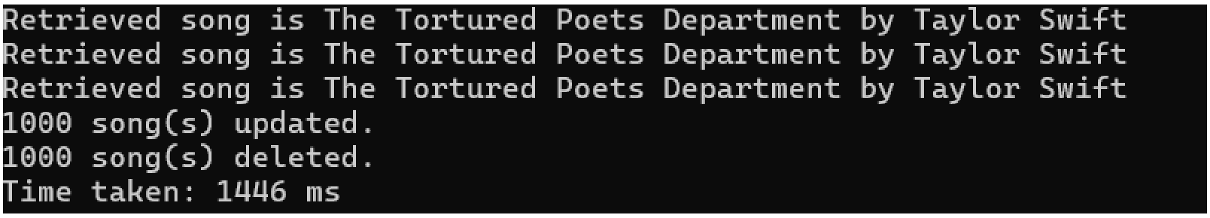
This table includes the times it took to perform all CRUD operations for each amount of data. From these results, it can be clearly seen that the time taken to perform CRUD operations increases as the number of data increases, which is expected. The observation further reinforces that the time taken to perform CRUD operations increases as the amount of data increases.

While MongoDB demonstrates efficiency for smaller datasets, the time taken significantly increases for larger datasets, such as 1 million records. This underscores the importance of optimizing database operations and considering scalability requirements when working with large datasets in MongoDB.

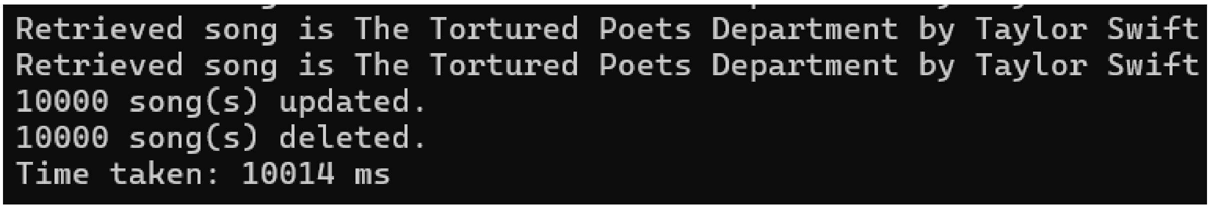
	Create	Read	Update	Delete
1	362 milliseconds = 0.01 minutes = 0.006 hours			
1 000	1 446 milliseconds = 0.02 minutes = 0.024 hours			
10 000	10 014 milliseconds = 0.17 minutes = 0.283 hours			
1M	1 032 111 milliseconds = 17.20 minutes = 0.287 hours			



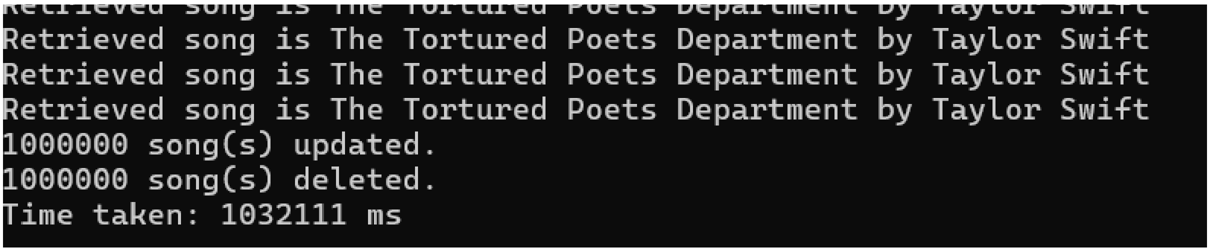
```
1 song(s) inserted.
The Tortured Poets Department was found from the The Tortured Poets Department album by Taylor Swift
Retrieved song is The Tortured Poets Department by Taylor Swift
1 song(s) updated.
1 song(s) deleted.
Time taken: 362 ms
```



```
Retrieved song is The Tortured Poets Department by Taylor Swift
Retrieved song is The Tortured Poets Department by Taylor Swift
Retrieved song is The Tortured Poets Department by Taylor Swift
1000 song(s) updated.
1000 song(s) deleted.
Time taken: 1446 ms
```



```
Retrieved song is The Tortured Poets Department by Taylor Swift
Retrieved song is The Tortured Poets Department by Taylor Swift
10000 song(s) updated.
10000 song(s) deleted.
Time taken: 10014 ms
```



```
Retrieved song is The Tortured Poets Department by Taylor Swift
Retrieved song is The Tortured Poets Department by Taylor Swift
Retrieved song is The Tortured Poets Department by Taylor Swift
Retrieved song is The Tortured Poets Department by Taylor Swift
1000000 song(s) updated.
1000000 song(s) deleted.
Time taken: 1032111 ms
```