Write a short essay (300+ words, plus screenshots) talking about a scenario: It is Monday morning and your boss just told you that “he got feedbacks from a random average user that the ‘website’ was very slow and even threw db related errors during the weekend”. What should you do?

Considering this scenario, I would assume that the performance of the database needs to be greatly improved to make the database operate faster than before.

Hence, I would like to implement performance monitoring firstly to explore the occurrence of error and find time-consuming events, and then apply performance tuning to optimize the database performance.

**Performance monitoring:**

Firstly, we can use Extended Events and Execution Plan to find any potential index placement and check if there is missing index and useless index. In the missing index, add an index to improve the efficiency of the search. At the same time delete 0 use index or low use index to improve the efficiency of insert and update.

Then we can also use Tuning Advisor to automatically locate missing indexes and Use DMV to find the content corresponding to each index and the missing index.

Thirdly, we can check the execution time and CPU to determine if we should upgrade the hardware.

**Performance tuning:**

1. Get rid of unnecessary “group by”.
2. Use Correlated subquery.
3. Adjust “where” in “join”.
4. Check temp table, table variable.
5. Be smart with Locks, Isolation Levels.
6. Check Statistics of SQL Server, force refreshing when necessary.
7. Recompile of SP and Functions.
8. Try to avoid using cursors and consider rewriting cursors as much as possible when processing large amounts of data.
9. Try to avoid using Merge and Correlated Subquery.
10. Replace time-consuming statement with Stored Procedure and optimize stored procedure, which can improve performance greatly.

Besides, we can look for table scans, heavy index scans, and heavy joints through execution plan. We should ensure no harsh joints, table scans, heavy joints, heavy scans.