Balancing the pressures of a healthcare SQL Server DBA
More than security, compliance and auditing?

Working with SQL Server in the healthcare industry presents many unique challenges. The majority of these relate to the data held within the SQL Server database; they are not just rows in a table, they are people and their extremely personal information.

Much has been written about protecting and restricting access to this information. The HIPAA and the HITECH Act, for example, have created numerous regulations around internal and external data security and present a robust set of guidelines that have to be adhered to.

Due to these laws, the words access, security, compliance, auditing are pretty much at the top of any healthcare DBA's "most used words". However, with a focus on security and compliance, are words like uptime, performance and speed being forgotten about or just assumed to be a given?

While these factors are not regulated in quite the same way, neglecting them can have massive implications for the organization. Uptime and performance should form the backbone of a DBA’s workload but the pressures of getting everything else right can mean there is less of a focus on these aspects. That’s not say performance isn’t important but keeping on top of it, as well as everything else, can be demanding.

There have been some recent cases, for example, of hospital EHR systems going down and staff having to resort to pen and paper. While not all of these cases involved a SQL Server issue, it shows how integral these systems are to the smooth running of modern healthcare. Even small outages or slowdowns can have an impact on healthcare professionals and the patients they look after.
The importance of performance

I was talking recently to a DBA who works for a healthcare provider in the US. He gave me a brief insight into his day.

“When doctors need to see patients, they’re busy and have to work fast. Besides seeing patients, they’re also getting lab results, radiology results, hospital discharge summaries, etc. This all goes into the EHR, which runs on a SQL Server database, and they have to review these throughout the day. This means they have a huge administrative workload, and the difference between the application being fast and slow can result in them leaving the office on time, or staying an hour late and working from home to catch up.

“So when a doctor clicks something and it takes two seconds, they’re not happy. At four seconds, I’ll get a support ticket because it’s unusual, and at ten seconds it’s pretty much considered a system down and they can’t work. If that happens, anything else I’m doing at work or in my personal life pretty much stops until it’s fixed.”

His description acutely shows how important the performance of the SQL Server is to the running of a clinic. And it’s a similar situation within the healthcare insurance industry too. The SQL Server database is central to the smooth running of the company. If performance is slow, patchy or experiences downtime, it can mean the difference between a claim being proceeded today, and a patient receiving treatment, or the treatment being delayed.

But it isn’t just a slow servers that can cause problems – things can sometimes go catastrophically wrong. In one real example relayed to me, a DBA working for a hospital saw that one of his main databases, the one that held most of the patient records, was offline. At that moment he had a call from the Sys Admin saying he had accidentally deleted the live transaction log. This was obviously why the database was offline. No problem, thought the DBA, everything is backed up. However, when he went to the backup location, nothing was there.
The Sys Admin had been saving the backups on the same location as the live transaction logs and then a job was run every day to copy the file to the location the DBA had been looking in. Except the job had been failing for the past month and nobody knew. The database was down and they had no backups! Thankfully, the story had a happy ending. With some clever work from the DBA, they were able to get the database back online, but not without several hours of downtime and some extremely stressful moments.

So performance is important, but where do you start? How do you monitor the performance of your SQL Servers while making sure you still have time in the day to enforce HIPAA and HITECH regulations? The answer is having knowledge about what’s happening on your SQL Servers at any point in time. But sometimes that’s not as easy as it sounds.
What’s required and why

To effectively monitor your servers, you must gather the metrics you need to diagnose any CPU, memory or I/O issues that arise. You should also be able to get a set of accurate, reliable, configurable alerts that will inform you when jobs fail or fail to run, database or server properties deviate from the established norm, there are sustained spikes in resource usage or abnormal trends, and so on.

Why do we need all this monitoring? Two reasons, the first of which is capacity planning. Unless you know the resource limits of your servers (storage space, memory, I/O capacity, and so on) and monitor current resource usage, you may not find out that you need to increase capacity until one of them literally runs out of space. So if you turn up in your boss’s office with the news that “Server x requires 2TB of extra disk space, immediately, due to unexpected growth”, then expect his or her first question to be: “Why wasn’t it expected?”

If you have proper monitoring together with reporting and trend analysis, you can see the train crash coming, and “re-route the tracks” to avoid disaster. You can show the boss a report that says “Server x will be out of space or memory in four months”, and advise them to account for this in the project budget.

The second but equally important element is reaction time. With effective monitoring, alerting and reporting, you can respond to an emergency before too many people are affected and the crisis escalates. When an organization under-invests in monitoring, DBAs are obliged to spend much of their time fighting fires. They respond when users complain of slow performance or other system problems. And with the constant pressures compliance brings, the last thing you want a DBA to be doing is constantly fighting fires.

You can extract a lot of the information needed to monitor SQL Server using built-in resources such as Profiler, PerfMon, Extended Events and the Dynamic Management Views. However a better alternative is to build or buy a monitoring tool that will collect the evidence from these resources, on an ongoing basis, and use it to start looking ahead, as well as back. Using predictive analysis of the monitoring data over time, you can detect looming issues before they become serious problems.
Build or buy?

This largely depends on how many servers you are looking to monitor and how much is going on with them. It’s perfectly feasible to gather the required diagnostic data by hand from the built-in resources, although you still need to consider how to automate the collection of all the required data, across all servers, as well as the configuration and management of a central location to store and analyze the data.

With the appropriate scripts and tools plus a means to collect data across all servers, it’s possible that DBAs can build their own “data monitoring warehouses”. However, most teams will find that the effort to build and maintain such a tool is considerable. As the number of monitored servers grows, there will come a point, quite quickly, where it saves time, money and resources to use a third-party monitoring tool. It will provide at least 90% of the coverage you need, certainly enough to cover basic server metrics, and performance monitoring metrics, relating disk, I/O and memory usage, as well as monitoring for specific problems such as prolonged blocking, abnormal job duration, and so on.

Importantly, most tools will offer a means to add custom monitoring scripts and alerts. Some offer built-in data analysis features such as the ability to examine the health and performance of a SQL Server environment at a specific point in the past, or directly compare a certain metric over two periods, for example comparing Tuesday this week with Tuesday last week, or with the averaged data for the previous seven Tuesdays.
Conclusion

The key aspect here is time. The life of a healthcare DBA is a hectic one. Relieve the pressure in an area such as monitoring and alerting, and they will then be able concentrate their efforts in other areas like security, compliance and auditing, or focus on project work that will have a positive impact on the organization.

With a good monitoring tool in place, life becomes easier. With accurate metrics and baselines, the time it takes to fight fires will be reduced, they will be able to predict potential capacity bottlenecks, and be alerted when key things are failing (like our unfortunate DBA’s missing backups mentioned above). But most of all, they will have a complete picture of the organization’s SQL Servers and be able to find and fix problems fast, before it has an impact on the rest of the organization or, indeed, patients.

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