apriorit

Case Study: **System Performance Bottleneck Analysis**

The Client

The client company is one of the US home healthcare industry's leading technology solution providers processing and documenting thousands of Electronic Visit Verification (EVV) calls every hour within its Voice over IP (VoIP), Database, and Web Application servers from multiple Data Centers.

The Problem

The company uses a distributed infrastructure combining VoIP and MS SQL technologies. Several months ago, company specialists detected issues at one of the infrastructure clusters serving up to 40,000 calls daily. At some random moments each day, a number of calls were not connecting to the system because of service timeout errors.

After over six months of failing to identify and fix the problem working alone, the company decided to hire an expert team to identify and fix the performance/reliability issue.

The Startup

Apriorit assigned one expert to research the issue. This expert had to access the production infrastructure remotely, without any disruption to its normal functioning. This made it hard to reproduce the performance issues – he had to constantly monitor multiple parameters, waiting patiently for the random issue to reoccur. Another complex part was setting up monitoring of all required parameters for data capture and analysis in real time, again without affecting system performance or normal functioning. The basic strategy was to research and exclude potential reasons for the performance issues one by one, to isolate and identify the problem.

The General Research

First, the expert researched the influence of the third-party processes running on the servers, like antivirus and backup. Using overall performance monitoring tools and various configuration experiments, this cause was excluded. At the next stage, possible network performance problems were researched and excluded as a possible reason of the timeout issues. The third step was to research hardware bottlenecks. Monitoring of performance parameters under different loading showed that the hardware had significant performance reserve and could not be the reason for the incidents.

Thus, the problem was localized in the software part of the infrastructure. VoIP servers were determined not related to the problem after researching their functioning during the issues. SQL server code/stored procedures became the #1 suspect.

An additional difficulty was that the Client did not provide full access to the source code of the system, and thus the Apriorit expert had to model the situation by researching only selected fragments of code.

MS SQL Research

SQL Profiler, the built-in MS SQL request optimizer, analyzes incoming parameters and overall database activity to automatically set up an 'optimal' way to execute a query each time it is called. The problem was that in certain situations specific to this kind of highly concurrent transaction processing, Profiler built

considerably non-optimal (inefficient) schemes causing the timeout problems. Further research focused on finding the specific procedures and queries that were driving the timeout incidents.

As the Profiler query execution scheme is built from multiple current parameters, the issues were not easy to reproduce. Nevertheless, expert analysis involving parameter sniffing showed that execution of some specific queries and procedures coincided with the timeout incidents.

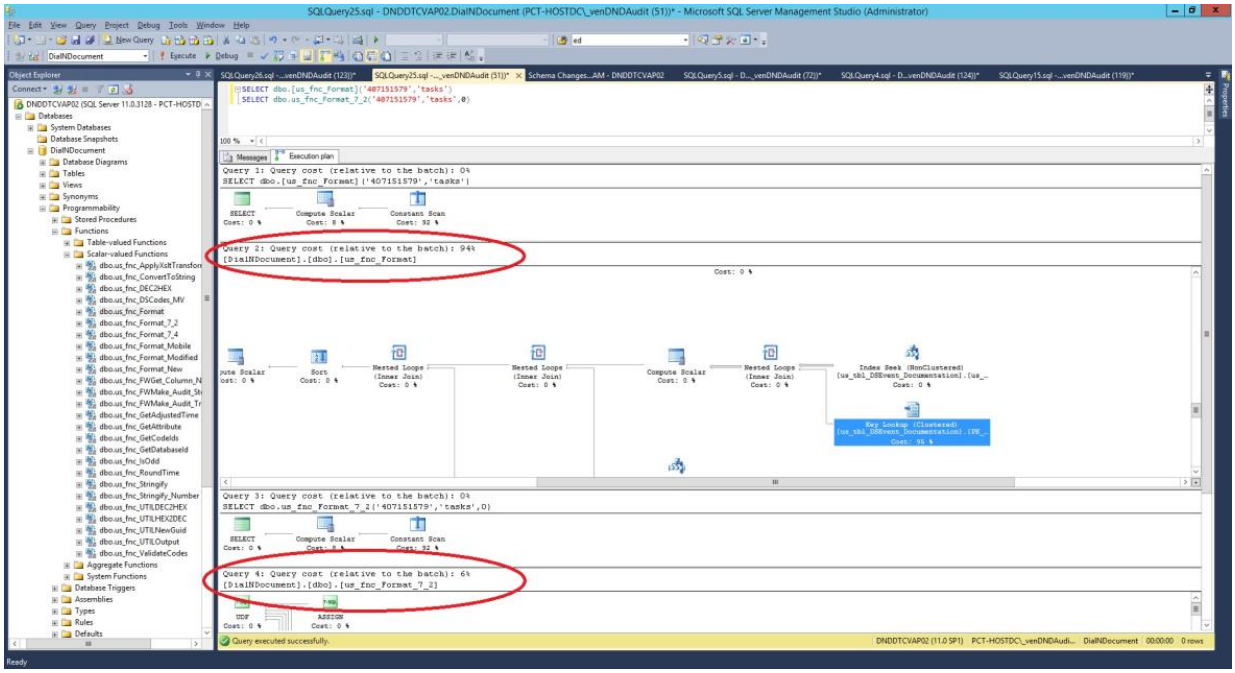
Three problem queries were detected. Two of them could be easily optimized by providing additional indexes described by the Apriorit expert. The third query was researched in detail, including provided source code, and the Apriorit expert made an additional index recommendation as well as some code refactoring inputs.

The Impact

The provided optimization recommendations cut the number of read operations within the researched queries from average 30,000 down to 1,000. After also introducing the additional indexes for the first two researched queries, per the Apriorit recommendations, the Client confirmed that 80% of the timeout problems disappeared.

After the code refactoring and additional index for the third researched query were implemented, the Client reported that all the timeout problems were resolved, and had not been reported during the next several weeks of normal system functioning.

The system monitoring continues within the 3-month warranty period. Meanwhile, Apriorit experts are negotiating about further research and next performance improvements aimed to provide problem-free system scaling for the fast growing Client.



Query Research and Analysis in SQL Server Profiler

About Apriorit

Apriorit is a world-class software development services provider to security, virtualization, cloud computing, system management, and application software vendors since 2002. Headquartered in Ukraine, Apriorit has an EU representation office in Budapest, Hungary plus 3 development offices in Eastern Europe. At the close of calendar year 2015, the company has 15 R&D teams and 200 on staff experts.

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