



# How to overcome SQL Server maintenance challenges

White Paper

White Paper on different SQL server storage and performance management challenges faced by administrators and how they can be overcome using Lepide SQL Storage Manager.

**2012**

Lepide Software (P) Limited B-57, Sector - 57, Noida, Uttar Pradesh - 201301, India, Phone No



<b>1. Abstract.....</b>	<b>3</b>
<b>2. SQL Server Storage Management – Challenges .....</b>	<b>4</b>
2.1 Taming unmanaged storage growth .....	4
2.2 Dealing with SQL server database fragmentations.....	4
2.3 Managing Performance Issues.....	5
2.4 Managing Instances, Databases and Objects .....	5
<b>3. Lepide SQL Storage Manager – Applications.....</b>	<b>6</b>
3.1 Database Defragmentation .....	7
3.2 Database Shrinking.....	7
3.3 Reorganizing Indexes and Heaps .....	8
3.4 Managing Partitions .....	8
<b>4. Advantages offered by Lepide SQL Storage Manager .....</b>	<b>9</b>
4.1 Forecast Storage requirements .....	9
4.2 Schedule Jobs.....	9
4.3 Get Real Time Alerts .....	10
4.4 Generate Dashboard Reports.....	10
<b>5. Benefits .....</b>	<b>11</b>
5.1 Efficient utilization of Storage Space.....	11
5.2 Improve SQL server performance .....	11
5.3 Better capacity planning.....	11
<b>6. Conclusion .....</b>	<b>12</b>



## 1. Abstract

MS SQL Server is a popular relational database management system supporting a range of small and big applications. As users continually perform various operations on the front-end applications, the underlying database is subjected to data addition, deletion and modification that may ultimately lead to exponential database storage growth, highly fragmented disk drives, and other performance constraints that might seriously undermine the performance and storage architecture of SQL server. As a SQL server administrator, you need to be geared up to analyze SQL server performance and storage structure closely, and generate matrix that will help to manage capacity, performance and storage issues and forecast future requirements. Administrators should be completely aware of the entire SQL server environment and the status of different performance and storage parameters so that they can perform the necessary storage and performance improvements tasks such as defragmentation, shrinking, partitioning, reorganizing indexes etc. at the right time for optimal server performance without disproportionate consumption of system resources.

This Whitepaper underlines different SQL server storage and performance challenges and how they can be overcome using this specialized software – Lepide SQL Storage Manager (LSSM). It also describes advantages offered by this software and its convergence with MS SQL server storage best practices.



## 2. SQL Server Storage Management – Challenges

As SQL databases continually grow in sizes, Admins face this task of ensuring high availability and optimum performance. There are a number of technological and operational ramifications of SQL server storage growth that needs to be handled by the administrators. They not only need to satisfy the business demands of the users but also plan for the future requirements by analyzing the current usage and taking into account future business requirements. Some of the major issues related to SQL server storage management are:

### 2.1 Taming unmanaged storage growth

As millions and millions of records pour in to the database, all your initial storage allocation may dry up unexpectedly. In a typical business scenario, it is very difficult to predict all the future requirements, hence, Admins must always continually monitor the storage growth rate and find out the probable date when the current resources may get consumed. Depending on the variations in growth rate, today's forecasting might not hold true for future's requirement. Hence, a provision to not only forecast the future requirements but to generate alerts to the concerned person in case the designated boundary is breached earlier is of utmost importance

### 2.2 Dealing with SQL server database fragmentations

When data stored on the SQL server database is not allocated in contiguous Extents (a set of eight contiguous pages), the I/O activity may significantly increase. This un-contiguous allocation of storage units leads to the fragmentation of databases, i.e. data related to a single record may be spread over the entire storage requiring high level of I/O activities. Some of the common reasons of the fragmentation are:

- Data addition, deletion and modification may leave free space on the database pages, causing the page density to go well below the normally accepted limit of 90 percent. Thus, database engine needs to read more pages to retrieve same amount of data.
- Automatic grow and shrink feature of SQL server may also increase the fragmentation level, as new spaces could be allocated anywhere in the disk.
- If the disk grows too full, the disk defragmenter tool – that needs sufficient free space to work properly, may become inefficient in removing fragmentation resulting in high fragmentation level.



## 2.3 Managing Performance Issues

SQL server performance may be hit due to a number of reasons such as blocking, system resource contention, poor application architecture and low query performance. There are a number of logs using which you can determine the cause of the performance issues. One of the most important of them is the *SQL Server Performance Monitor* log that gives information on important bottlenecks such as CPU usage, Memory usage and File I/O. SQL server database administrator must keep in mind the following points, besides other best practices, to manage performance issues effectively:

- Determine the CPU usage, memory usage and File I/O usage to analyze the performance so that corrective actions could be taken.
- Increase data manageability through partitioning.
- Spread I/O to improve server performance by creating new Filegroups on new disks and switching objects between file groups.

## 2.4 Managing Instances, Databases and Objects

For efficient SQL server storage management, you should have the control of things at both macro and micro level. While it is important to analyze the growth and performance of database Instances, it is equally important to analyze various database and even objects within. Admins should be well aware that what are the largest databases and the fastest growing databases within the Instance so that disk requirements could be planned. However, just increasing the disk size is not the ultimate panacea as the concept of “the bigger the better” might ultimately serve the storage requirements but performance effectiveness could be compromised in the absence of object level control on SQL server. Administrators must be able to perform the following tasks at both database level and object level:

- Shrink databases and reorganize Indexes and Heaps.
- Manage Filegroups; create and switch objects within Filegroups.
- Manage individual Indexes by reorganizing indexes, partitioning indexes etc.
- Manage individual Tables – move tables, partition tables etc.












SQL Server includes different logs such as *SQL profile trace log*, *SQL Server Performance Monitor log* etc. that can be used in conjunction with different T-SQL functions to analyze the performance of SQL server and perform different SQL storage management activities. However, these native services lack the flexibility and proper scheduling features requiring significant manual intervention from Admins. Besides, comprehensive forecasting – the most important aspect of capacity planning, could not be achieved using the native tools. Specialized software such as Lepide SQL Storage Manager could, however, add a new dimension to your SQL server storage management capability by providing a centralized GUI based platform to perform a range of SQL server management activities.

### 3. Lepide SQL Storage Manager – Applications

Lepide SQL Storage Manager is a comprehensive tool to analyze performance and storage structure of SQL server. It allows administrators to observe space and performance of all or individual Instances, Databases and Objects and send alerts on capacity, performance and storage space issues to ensure optimal server performance and efficient storage usage. It provides a very user-friendly alternative in the form of an intuitive interface to support a number of SQL storage management tasks. It offers additional features such as job scheduling, alerts on critical issues and forecasting that makes it a complete SQL storage management solution. Some of the major applications of software are:

#### Software Features

-  [Dashboard Reports](#)
-  [Defrag Database](#)
-  [Disk Space Requirement Forecasting](#)
-  [Manage Partitions](#)
-  [Real Time Alerts](#)
-  [Reorganize Heaps and Indexes](#)
-  [Schedule Jobs](#)
-  [Shrink Database](#)
-  [Sliding Window Scenario](#)





### 3.1 Database Defragmentation

Database defragmentation frequency has been a debatable topic as running a defrag process creates resource overhead, and thus, cost in terms of resources of performing defragmentation on low fragmentation level can outweigh the performance enhancements. LSSM allows setting up fragmentation alerts and define fragmentation thresholds so that defrag tool runs always and only when required. Native T-SQL functions to find fragmentation extents and run defrag process have a number of limitations such as inefficient scheduling and inherent complexity that makes LSSM a must have tool for taking care of this important operation. With this software you can:

- Define fragmentation thresholds on the basis of Number of Pages, Logical Fragmentation, Extent Fragmentation and Scan Density.
- Get automatic alerts when fragmentation level bypasses the defined threshold.
- Reorganize Indexes on getting alerts.
- Comprehensive scheduling feature that eliminates any manual intervention.

### 3.2 Database Shrinking

As the databases grow in size, the unused spaces within the database not only affect the performance of the database but also lead to inefficient use of storage space. LSSM allows you to perform shrink operation on Instances, Databases, File Groups and Files to get more space out of the same storage area. Using SQL functions to perform the shrink operation is cumbersome as you manually need to specify arguments and take care of other intricacies; moreover, using different functions to perform the tasks makes the process even more complicated. LSSM allows you to:

- Schedule shrink operation to run at a convenient time without human intervention.
- Shrink the complete database, file groups or files using the intuitive interface of software.
- Specify the maximum free space in the file after shrinking.
- Receive notifications on the status of the scheduled shrink operation.



### 3.3 Reorganizing Indexes and Heaps

Reorganizing clustered and non-clustered Indexes improves the database performance by removing fragmentation from disks. Lepide SQL Storage Manager provides a simplified option to reorganize Indexes and improve database performance. But, reorganizing Indexes may increase the database size significantly; hence, LSSM also displays the current size of the Filegroups and estimated size after the operation. LSSM offers a number of advantages for the users while reorganizing Indexes and Heaps:

- It lets you specify the threshold of Logical fragmentation, Extent fragmentation, number of Index pages and Scan density before running the Index Reorganization.
- Software allows you to reorganize only the objects that are used frequently; avoid working on static objects to save resources.
- Schedule Jobs to run periodically and auto-delete after completion.
- Get notification on the status of the Job to ascertain its success and completion time.

### 3.4 Managing Partitions

Partitioning a table may significantly increase its performance, scalability, and manageability if the table size is large and is growing significantly. LSSM allows creating, altering, removing and switching partitions on Tables and Indexes so that no resources are wasted in dealing with static data within a Table. Managing partitions using vendor provided software is not an easy task, as you will have to deal with complex functions and time consuming procedures. Lepide SQL Storage Manager offers simple and intuitive wizard that guides you through partition management process step-by-step; it displays all the options at each step and you just need to select the required option rather than running separate queries for these steps. With LSSM you can:

- Alter, Remove and Switch partitions through just a few clicks rather than running complex commands.
- Schedule the task to run at specified time in your absence and get notification on the completion of the task.

In order to manage partitions more effectively, LSSM allows you to configure sliding window scenario to automate partition creation for the new data. Using Sliding Window scenario you can automate creating new partitions in the production table for the new data and archive old partitions to the archive table.





## 4. Advantages offered by Lepide SQL Storage Manager

The usage of the Lepide SQL Storage Manager is not limited to the normal SQL storage management operations. So, don't take it just as a user-friendly and efficient alternative to native tools. This software is much more than that. Based on our findings from survey of DBA requirements, this software boasts of features that are on almost all SQL server administrators' wish list. Apart from providing convenience to performing day-to-day administrations needs, it also offers other options such as forecasting future storage requirements, scheduling jobs, generating real time alerts and proving information-laden reports; these reports help to know the status of different performance and storage parameters and maintain a healthy SQL server environment that offers high availability, good performance and is supportive to business continuity plans. Some of the prominent added advantages of software are:

### 4.1 Forecast Storage requirements

DBAs are usually required to suggest the probable future storage requirements well in advance so that they get the necessary allocations from the IT budget for this purpose. Storage requirements may significantly deviate from the current trend, if the change in business plan leads to sudden inflow of huge bulk of data. Assuming that this "external" variable is taken into account, as a DBA, you should be better prepared to analyze the current data growth and predict future requirements as accurately as possible. Moreover, analyzing current growth rate helps you to manage the existing infrastructure efficiently as you know when to move the production data to archive and when to add new disks to spread database over spindles. Lepide SQL Storage Manager offers a number of features that analyze current trend and predicts future storage requirements for Instances, Databases, Tables and Indexes; software allows you to:

- Generate graphical and tabular report on Instance growth and individual drive growth.
- Get an idea of the per-day Instance growth in terms of MB and percentage.
- Get forecasted value of date and time when your disks might run out of space to avoid out-of-disk situations.
- Set notification threshold to get alerted when disk occupancy reaches critical level.
- Manage Storage space efficiently by analyzing the size and growth rate of individual Database, Tables and Indexes.

### 4.2 Schedule Jobs

SQL storage management initiative could not be considered complete without having scheduling feature, as you can't expect the DBAs to be present all the time and run administrative jobs at off-peak hours. Lepide SQL Storage Manager allows you to run various SQL server storage and performance improvement jobs such as database shrinking, defragmentation and sliding window partitioning at a scheduled time without interference. You can schedule the job to run at a specified time periodically or only when required by specifying the threshold values for the parameters that indicate the need to run



such jobs. You can realize a number of benefits using job scheduling features of the Lepide SQL Storage Manager, such as:

- Save time in running periodic jobs by scheduled auto run at off-peak hours.
- Save system resources by running the intensive, resource-consuming jobs only when required.
- Manage SQL storage smartly by automating most of the storage management and performance improvement jobs.

### 4.3 Get Real Time Alerts

Since most of the performance improvement and storage management jobs associated with SQL server are highly resource intensive, you should run these jobs only when required. For example, shrinking a database to manage space may leave the disk fragmented lowering the performance. To determine the appropriate time when to run these jobs, you either need to keep on checking different parameters or devise a mechanism to get alerted when the need arises. No doubt, we all would go with the second option. LSSM generates two types of alerts: 1. SQL Events' Alerts - generate error alerts for all or selected database of an instance; assign severity code to the alerts according to the urgency. 2. Database Performance Alerts - generate alerts when performance parameters reach threshold level. Alert mechanism of software offers various benefits to administrators such as:

- Get alerts through emails, net-send and pager.
- Get notified when any critical error takes place in your database and take corrective steps.
- Efficiently identify events and errors that may affect server performance.

### 4.4 Generate Dashboard Reports

Dashboard reports help determine the Instance size and disk size on which that Instance is registered. Using dashboard reports you can analyze the selected server including both free and used spaces. Reports are generated in the graphical format and in tabular format displaying information on Instance, Instance current size and free space on disk. Software also indicates the status as Normal, Warning and Critical which can be represented as: Normal - Disk has enough space and you can skip looking for additional storage. Warning – Disk space is filling fast and you should arrange for additional storage as early as possible. Critical – Disk space is almost full and you might be staring at a disaster if you don't arrange for storage at the earliest. Dashboard reports allow administrators to get insight into disk usage and availability and manage SQL storage effectively.



## **5. Benefits**

### **5.1 Efficient utilization of Storage Space**

Lepide SQL Storage Manager allows you to better utilize the existing storage space. Ability to perform various storage management tasks such as database shrinking and object switching between partitions help you to get more out of the same storage area. Besides, you can also better manage disk space using this software; disk status indicating usage and free space lets you decide when to go for additional disk.

### **5.2 Improve SQL server performance**

Enhance SQL server performance by performing various performance improvements jobs such as defragmentation, partitioning, object switching, reorganizing Indexes and Heaps. Performing these tasks lead to more efficient interaction with data stored in tables and improves overall server performance.

### **5.3 Better capacity planning**

Forecast future requirements by studying performance statistics such as I/O busy time, CPU usage, system idle time, memory usage and their forecasted value. Analyze storage usage and forecast future values of Instance growth, Data and Log files growth, fastest growing database and their estimated size for better capacity planning.



## 6. Conclusion

Lepide SQL Storage Manager is a comprehensive solution to analyze performance and storage structure of SQL server. It allows DBAs to save storage space, improve server performance and manage disk space by providing a simple interface to observe storage and performance of all instances. It also generates real-time alerts that notify administrators of critical issues that needs immediate attention. Another important feature of software is to forecast future SQL server storage requirements that help in better capacity management. Lepide SQL Storage Manager is a complete SQL storage management solution that helps DBAs to get most out of their SQL server environment.