

Backup & Recovery in SQL Server

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Abstract— in recent times, it is observed that most organizations are generating large volume of electronic data. this requires implementation of safe and secure storage services. Data Backup & recovery services are essential to reduce loss of data. We have discussed Backup & Recovery techniques for database in this review paper. this paper also represents comparative analysis of various database Backup & Recovery Techniques.

Keywords— Database Backup, Database Recovery, Recovery Model

1. INTRODUCTION

Backup & Recovery: Definition

Backup refers to the process of making copies of data or data files to use in the event the original data or data files are lost or destroyed. Secondly, a backup may refer to making copies for historical purposes, such as for longitudinal studies, statistics or for historical records or to meet the requirements of a data retention policy. Many applications, especially in a Windows environment, produce backup files using the .BAK file extension.[11].

Data recovery is the process of restoring data that has been lost, accidentally deleted [12].

1.1. Application Areas of Backup & Recovery

Database Backup

Database backup is the process of backing up the database data, architecture and stored data of database software. It enables the creation of a duplicate instance or copy of a database in case the primary database crashes, is corrupted or is lost [8].

Full PC Backup or Full Computer Backup

Full PC backup of full computer backup is backing up entire images of the computer's hard drives rather than individual files and folders. The drive image is like a snapshot of the drive. It may be stored compressed or uncompressed. With other

backups, only the user's document, pictures, videos and music files can be restored and the operating system, programs etc. require to be reinstalled from its source download or disc media [8].

Offsite Backup

When the backup storage media is kept at a different geographic location from the source, an offsite backup is a backup process or facility that stores backup data or applications external to the organization or core IT environment. Offsite backups are primarily used in data backup and disaster-recovery measures [8].

Cloud Backup (online backup)

Cloud backup, also known as online backup, is a strategy for backing up data that involves sending a copy of the data over a proprietary or public network to an off-site server. The server is hosted by a third-party service provider, which charges the backup customer a fee based on capacity, bandwidth or number of users. In the enterprise, the off-site server might be owned by the company, but the chargeback method would be similar [8].

Database Backup & Database Recovery Definition.

Database Backup is the procedure to save data in other location for future use. Backup is an additional copy of data that can be used for restore and recovery purpose the backup copy is used when the primary copy is lost or corrupted. Backup helps when we are suffering from the data loss.

Data recovery is the process of restoring data when we lost, accidentally deleted, corrupted or made inaccessible. Data recovery allow to the restoration of data to a desktop, laptop, server or external storage system from a backup. Recovery process depends on the type of failure. Recovery techniques are heavily dependent upon the existence of a special file known as a system log.

1.2 Challenges in database backup

Whenever we implement full Database backup at the time. Backup consuming more time it's up to 1 hours to 1 day maybe. At the end of the backup, we are getting an image of a particular fraction. Ex. We are starting Backup at 8 am and Backup will Complete 9 pm in between many updating are occurs. Because the database is dynamic as an example if we are taking backup of the ticket-reservation system. at that time reservation, is continues starting. At that time how we take the consistency of backup.in database internally divide in extents many extents are available in the database e.g. first extents are the size of 8 pages next extents are also 8 pages. It will take backups of every extents One after another. Problem is if changes are occurred in remaining extents which not backed up than ok. But changes are occurring in those extents which already backed up then database consistency not made

1.3 Method or Techniques that solve problem

Full Backup

This operation backs up all the data in the database. All the table, stored procedure and all other objects in the database are placed into a single backup file on a hard drive or tape.

The basic types of SQL Server backups are complete or full backups, also known as database backups. This backup provides a complete backup of your database as well as part of the transaction log, so the database can be recovered. This allows for the simplest form of database restoration, since all of the contents are contained in one backup [2].

How it works?

SQL Server provide one solution is LSN (Long sequence Number). Full database backup used to LSN number of reduce the problem. LSN number is nothing but record of updating in database. Whenever changes are occurred in database. One number assign to every change, ex. Change 1, Change 2. Basically, LSN is store in Log file. When backup is start at that time SQL Server remember last LSN number ex. 200 is last number. End of the database Backup check which LSN number is there in Log file now LSN number is 300 then SQL Server check which changes done and which is not done. And at end of the backup

one by one LSN number take and those changes will update in database. Those pages copy again and bind end of the backup [2].

Differential Backup

Differential Database Backup was introduced in Version 7. 0.. A differential backup all extents that have changed since the last full backup. As only updated extents are backed up, the differential backup is usually substantially smaller than a full Backup. E.g. if we will take a full back up on Sunday. On Monday's we will take differential backup back up all the changes since Sunday's full backup. The differential backup performed on Tuesday then back up all the changes since Sunday's full backup including all the changes that changed in Monday or Tuesday [2].

File and File group Backup

This backup introduces in SQL Server 2000. File and Filegroup Backup is another feature designed with the VLDB (Very Large Database) in mind. Databases can be backed up file-by-file, or alternatively, file group-by-file group. Suppose we take a 500 GB database consisting of five 100GB files could have filed backup Monday, file. Tuesday, and so on. This allows backups to be done in a much smaller. Window. The restrictions on file and filegroup backups are that if tables and their indexes are stored on separate files or filegroups (this is sometimes done for performance reasons) these must be backed up and restored together, and you must be doing transaction log backups. In a file restore, only the corrupted file needs to be restored. This technique a huge time saver in a large database. Why restore why we are restoring the entire database when only one file is damaged? Of course, the restored file will now be out of sync with the rest of the database. This is why you must have the log backups, including a backup of the log that was active at the time of failure. We restore the file, and then apply all transaction logs taken after the file backup. This brings that file into sync with the rest of the database [2].

Transaction log Backup

It's Backup copies the transactions in 'the transaction log and then deletes all but the active portion of the log to free up space. As the transaction log is a recorder of all transactions

since the last log backup, the log backups can be applied during the restore process to bring the database forward to the point of failure. When we are performing log backups, we can also restore from the log backups to a specific point in time. When a transaction-log has been backed up, it is then truncated. This truncation keeps the log from filling up, or from growing too large if the log is set to automatically grow the file [2].

Recovery Techniques

Simple Recovery Model

Name itself says “simple”. It’s Gives you a simple backup that can be used to replace your entire database in the event of a failure or if you have the need to restore your database to another server. When using the simple recovery model, only full and differential backups are allowed. With the simple recovery model, you are exposed to any failures since the last backup completed. It is the most basic recovery model for SQL Server. All transaction is still written to the transaction log. But once the transaction is complete and All the data has been written to the data file the space that was used in the transaction log file is now re-usable by new transactions. The transaction log will not grow forever

Full Recovery Model

It’s the most complete recovery model and allows you to recover all of your data to any point in time as long as all backup files are useable. in this model all operations are fully logged which means that you can recover your database to any point. In addition. If the database is set to this model, we need to also issue transaction log backups otherwise your database transaction log will continue to grow forever

Bulk log Recovery Model

It names itself says “Bulk log”. With this model there are certain bulk operations such as BULK INSERT, CREATE INDEX, and SELECT INTO, etc... That are not fully logged in the transaction log and this model do not take as much space in the transaction log. Our transaction logs will not get that large if you are doing bulk operations and it still allows you to do

point in time recovery as long as our last transaction log backup does not contain a bulk operation.

2. Related Work

In this section, we will discuss related study of research work done by researchers on backup

Kruti Sharma et.al. [13] proposed Online Data Backup and Disaster Recovery Techniques The objective of this review papers to summarize the powerful data backup recovery techniques that are used in cloud computing domain.

Dr. Khalid N. Alhayan [14], in this paper. Researcher introduces a research study proposal for extracting the most effective cognitive database recovery techniques that individual DBAs may utilize during the activity of recovering a failed database.

In [15] this paper researcher, provides some guidance for developing a data backup plan by summarizing data backup media and hardware technologies, data backup procedures and services, and data recovery services. It also provides an outline for disaster recovery planning

3. Observations

A comparison of different backup operations

Operation	Full Backup	Differential Backup	File Backup	Transaction log Backup
Time	More time consuming	Less time Consuming then full backup	Less time consuming then full, differential backup	Less time consuming then full backup and differential backup and file backup
Memory	More memory Consuming	Less memory consuming	Less memory consuming	Less memory consuming
Simple recover	Support	Support	Support	Not support

ry model support				
Full Recovery Model	Support	Support	Support	Support
Bulk-log Recovery model	Support	Support	Support	Support
Pros.	Fast and easy recovery	Only full backup and the last differential backup needed for restore	This allows backups to be done in a much smaller	restore from the log backups to a specific point in time.
Cons.	More storage space is	If one of the backups fails , then	A media failure can make a complete	Possible data loss when the

4. Conclusion

This study, concludes that full database backup is more time consuming than other backup. And full database backup requires more memory than other backups. Whenever Full server is failed or all the data deleted that time full backup very useful. Based on study differential backup is suitable when the only some data is loss or some file are deleted. Differential backup requires less memory comparatively full backup. And when only file is lost that time file group backup is more suitable. And in this paper explain based on study simple recovery model is classic recovery model. Full recovery model is support with all the database. Simple recovery model not support with transaction log backup. And Full recovery model provide point in time recovery.

	needed	recovery will be incomplete	database unrecoverable if a damaged file lacks a backup.	primary server fails
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Possible Restore Scenarios that are supported for recovery model

Operation	Full Recovery Model	Bulk-logged Recovery Model	Simple Recovery Model
Data Recovery	Complete Recovery (if the log is available)	Some data-loss exposure.	Any data since last full or differential backup is lost
Point-in-time	Any time covered by the log backups.	Disallowed if the log backup contains any bulk-logged changes	Not Supported
File Restore	Full Support	Sometimes	read-only
File Group restore	Full Support	Sometimes	Read-only

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