BACKUP

DOCUMENTATION

The goal of this document is to describe the backup environment and the procedures for using the environment in a sufficient level of detail that an IT person with no knowledge of the unit will be able to perform essential backup functions.

Table of Contents

[Introduction 2](#_Toc67302921)

[Terminology 2](#_Toc67302922)

[Backup Configurations 3](#_Toc67302923)

[Backup System 3](#_Toc67302924)

[Backup objects 3](#_Toc67302925)

[Backup Jobs 4](#_Toc67302926)

[Log Backup (DBA - AXS\_LogBackup 5 min) 4](#_Toc67302927)

[Daily Backup (DBA - AXS\_Mentenanta L-V, D) 4](#_Toc67302928)

[Weekly Backup (DBA - AXS\_Mentenanta S) 5](#_Toc67302929)

[Job Owners 5](#_Toc67302930)

[Daily Tasks 5](#_Toc67302931)

[Recovery Testing 5](#_Toc67302932)

[Script implementation 5](#_Toc67302933)

[DatabaseBackup 5](#_Toc67302934)

[DatabaseBackupDBA 7](#_Toc67302935)

[Integrity checks 7](#_Toc67302936)

# Introduction

Database backups are the first line of defense against data losses. Therefore, it is the core of any database administrator's job. In AutoTotal, database backups are implemented as follows:

* FULL backups are taken weekly for all databases, each Saturday night at 11pm and every day for system databases at 11pm.
* DIFFERENTIAL backups are taken daily for system databases, each night at 11pm
* TRANSACTION LOG backups (or Log Backups) are taken every 5 minutes for the user databases

# Terminology

backup testing = testing the backup sets by trying to restore them onto a restore server  
source server = indicates the server where the tested backup was taken  
restore server = indicates the server used to restore the database for the purpose of testing the backups and timing the process  
recovery server = same as restore server

backup set = each backup of a database is named a backup set as it may contain more than one backup file in it and it can also hold multiple backup instances of the same type and of the same database  
backup device = native SQL backup files (.BAK files)  
restore location = the drive on the restore server where the required databases will be restored onto

# Backup Configurations

## Backup System

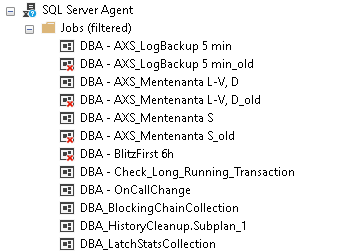
All backups are performed using Ola Hallengren’s script, which is stored in database DBA as “DatabaseBackup”. Additionally, there's a number of SQL Agent jobs that are used to run the backups as scheduled. The number of jobs is 3 (one for each backup type), but in certain use cases, there may be more than 3 (for example, databases with higher SLAs requiring different schedules or different backup types). The objects making up the framework can be seen in the screenshot below:

## Backup objects

|  |  |  |
| --- | --- | --- |
| **Object name** | **Object type** | **Description** |
| [dbo].[CommandLog] | Table | Logs every command that is executed for each backup. |
| [dbo].[dba\_EventLog] | Table | Logs every error that occurs in the backup process. |
| [dbo].[DatabaseBackup] | Stored Procedure | Ola Hallengren’s backup script. |
| [dbo].[DatabaseBackupDBA] | Stored Procedure | Implements Ola’s script in this environment. |
| [dbo].[dba\_Backup\_Generate\_Restore\_Scripts] | Stored Procedure | Creates a script on NAS that can be used to restore a database in case of disaster. |
| [dbo].[DatabaseIntegrityCheck] | Stored Procedure | A script that performs data integrity check for databases. |
| [dbo].[usp\_MailFinishJob] | Stored Procedure | Send a mail when a job finishes with the details of its execution. |
| [dbo][.IndexOptimize] | Stored Procedure | Performs index maintenance (rebuild and reorganize). |
| [DBA - AXS\_LogBackup 5 min] | Job | The log backup job. |
| [DBA - AXS\_Mentenanta L-V, D] | Job | The full sys + diff user backup job |
| [DBA - AXS\_Mentenanta S] | Job | The full backup job for all databases |

## Backup Jobs

The following backup jobs are configured. Targets are then added to the matching job to enable backups.



### Log Backup (DBA - AXS\_LogBackup 5 min)

Log backups are performed every five minutes for each user database and written to the NAS. Steps:

1. Execute [dbo].[DatabaseBackupDBA]
2. Execute [dbo].[dba\_Backup\_Generate\_Restore\_Scripts]
3. Execute [dbo].[usp\_MailFinishJob]

### Daily Backup (DBA - AXS\_Mentenanta L-V, D)

The backups are performed each day, apart from Saturday at 23:00. For user databases, a differential backup is done, while system databases have a full backup. The backup files are stored on the NAS until the next full backup. It must be combined with a weekly full backup to enable complete recovery. Steps:

1. Set recovery Bulked Logged for all user DBs
2. Execute [dbo].[IndexOptimize]
3. Set recovery Full for all user DBs
4. Execute [dbo].[DatabaseBackupDBA] – Differential for user databases
5. Execute [dbo].[DatabaseBackupDBA] – Full for system databases
6. Execute [dbo].[dba\_Backup\_Generate\_Restore\_Scripts]
7. Execute [dbo].[usp\_MailFinishJob]

### Weekly Backup (DBA - AXS\_Mentenanta S)

Full backups are performed weekly on Saturday at 23:00. Only one full backup is kept on the NAS. This is a complete backup used for complete recovery. Steps:

1. Execute [dbo].[IndexOptimize]
2. Execute [dbo].[DatabaseIntegrityCheck]
3. 4. Execute [dbo].[DatabaseBackupDBA] – Full for all databases
4. Execute [dbo].[dba\_Backup\_Generate\_Restore\_Scripts]
5. Execute [dbo].[usp\_MailFinishJob]

## Job Owners

The jobs are all owned by the default user “sa”.

## Daily Tasks

Every morning, the employee that is on-call reviews the status for the previous day’s backup jobs (on Mondays, review the entire weekend’s activity) to verify that all jobs completed successfully.

# Recovery Testing

Once per month, the DBA team conducts recovery tests to verify the recovery procedures and validate the proper functioning of the backup system, while also keeping the Disaster Recovery server up to date.

The restore process is the part of the whole backup and backup testing process where the required databases are restored onto the recovery server.

Recovery testing is timed, and the results used to verify if the RTO for backup targets is achievable.

# Script implementation

The script used for the backup process across the 3 jobs is Ola Hallengren’s backup script (DatabaseBackup), which can be found in a stored procedure in database DBA. This script is called by another procedure when a backup is performed, DatabaseBackupDBA.

## DatabaseBackup

Ola's maintenance solution is widely accepted in the community and large organizations. It is very complex and can take up to 60 arguments for full control. It’s open source and issues have a high likelihood of getting it fixed very fast. Its flexible and scalable. It has extensive documentation and FAQs and is constantly updated to accommodate newer SQL Server versions.

This procedure is invoked with the following arguments:

@Databases = Select databases. The keywords SYSTEM\_DATABASES, USER\_DATABASES, ALL\_DATABASES, and AVAILABILITY\_GROUP\_DATABASES are supported. The hyphen character (-) is used to exclude databases, and the percent character (%) is used for wildcard selection. All of these operations can be combined by using the comma (,).

@Directory = Specify backup root directories, which can be local directories or network shares. If you specify multiple directories, then the backup files are striped evenly across the directories. Specify multiple directories by using the comma (,). If no directory is specified, then the SQL Server default backup directory is used.

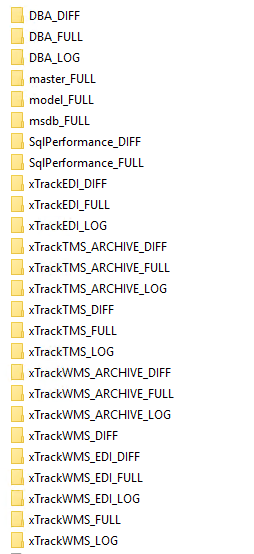
 @DirectoryStructure = Specify the backup sub-directory structure for databases that are not in an availability group. '{DatabaseName}\_{BackupType}' is used (see Figure 1).

Figure 1

@BackupType = Specify the type of backup: full, differential, or transaction log.

@CleanupTime = Specify the time, in hours, after which the backup files are deleted. If no time is specified, then no backup files are deleted. DatabaseBackup has a check to verify that transaction log backups that are newer than the most recent full or differential backup are not deleted. 108 hours is used in this implementation.

@CleanupMode = Specify if old backup files should be deleted before or after the backup has been performed. AFTER\_BACKUP is used.

@Compress = Compress the backup. Compression is enabled in this implementation.

@Checksum = Enable backup checksums. Checksum is not enabled in this implantation.

@FileName = Specify the file name for databases that are not in an availability group. The following is used: {DatabaseName}\_{BackupType}\_{Partial}\_{CopyOnly}\_{Year}{Month}{Day}\_{Hour}{Minute}{Second}.{FileExtension}

@Verify = Verify the backup. Verify is disabled in this implementation.

@LogToTable = Log commands to the table dbo.CommandLog.

The jobs call another stored procedure in order to invoke Ola’s script, “DatabaseBackupDBA”, which is a procedure created by the DBA team.

DatabaseBackupDBA has the following uses:

* Maps the NAS to SQL Server (although it uses the same NAS, we map it to disk A:\ for log backups and to disk B:\ for differential and full backups. This is in order to ensure that log backups are done while a full or differential backup executes).
* Executes DatabaseBackup
* Logs any error to [dbo].[dba\_EventLog]
* Send a mail to the DBA team in case of 3consecutive log fails or a full or differential fail.

The procedure only takes three arguments, which are passed to DatabaseBackup:

@Databases = Select databases. The keywords SYSTEM\_DATABASES, USER\_DATABASES, ALL\_DATABASES, and AVAILABILITY\_GROUP\_DATABASES are supported. The hyphen character (-) is used to exclude databases, and the percent character (%) is used for wildcard selection. All of these operations can be combined by using the comma (,).

@Directory = Specify backup root directories, which can be local directories or network shares. If you specify multiple directories, then the backup files are striped evenly across the directories. Specify multiple directories by using the comma (,). If no directory is specified, then the SQL Server default backup directory is used.

@BackupType = Specify the type of backup: full, differential, or transaction log.

# Integrity checks

The job that runs on Saturdays, [DBA - AXS\_Mentenanta S], runs an integrity check against all the databases on the server. [dbo].[DatabaseIntegrityCheck] is the stored procedure for checking the integrity of databases.

The following parameters are used:

*@Databases* = Select databases. The keywords SYSTEM\_DATABASES, USER\_DATABASES, ALL\_DATABASES, and AVAILABILITY\_GROUP\_DATABASES are supported. The hyphen character (-) is used to exclude databases, and the percent character (%) is used for wildcard selection. All of these operations can be combined by using the comma (,). ‘ALL\_DATABASES’ is used.

*@CheckCommand* = Specify the integrity check commands to be performed. ‘CHECKDB’ is used.

*@LogToTable* = Log commands to the table dbo.CommandLog. ‘Y’ is used.