



Automating Azure SQL Database maintenance tasks

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Sponsors



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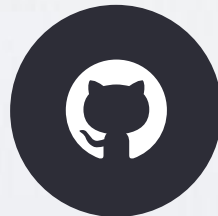
Speaker bio



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Agenda

- Required activities for Azure SQL DB maintenance
- Methods for Azure SQL DB maintenance
 - Linked Server
 - Database Maintenance Plan
 - Azure Automation Services (with PowerShell)
 - Azure Elastic Job Agents

The starting point

- Azure SQL Database hasn't got a native scheduling service similar to SQL Agent of the on-premise instances
- When database solutions are implemented in Azure SQL possible solutions to perform database maintenance activities have to be studied!

Required activities for Azure SQL DB maintenance

- Is database maintenance still an important factor even for Azure SQL Database?
 - **YES** it is!
 - Azure SQL Database is a PaaS solution but Microsoft is responsible for the **infrastructure** and **backup management**, nothing else
 - Logical corruption checks, Index and Statistics maintenance and so on are under the DBA responsibility

Required activities for Azure SQL DB maintenance

- Backups
 - Nope (*)
- Maintenance activities
 - Corruption checks
 - Reorganize or Rebuild fragmented indexes
 - Statistics updates

Backups

- Azure SQL Database automatically creates database backups
 - Full backups every week
 - Differential backups every 12 hours
 - Transaction log backups every 5-10 minutes
- Backups are stored in Read-access geo-redundant storage replicated to a paired data center

Backups can be used for..

- Restore
 - Existing database to a point-in-time
 - Deleted database to the time it was deleted
 - Database to another geographical region
 - Database from a specific long-term backup
 - <https://bit.ly/34Y1IY2>

Backups retention

- All Azure SQL databases have a default backup retention period of **7** days
- Backup retention period can be changed up to **35** days (at 7-days chunks)
- Backups of deleted databases will kept in the same way it would for an online databases
- <https://bit.ly/2SpEOq0>

Backups long-term retention (LTR)

- If you want to keep your backups for a period of time longer than the maximum allowed, you can evaluate the long-term backup retention service
- By using long-term retention you can store specific backups up to **10** years
- <https://bit.ly/2EOPVkr>

Maintenance activities

- The maintenance activities to undertake, when database solutions are implemented in Azure SQL, are:
 - Integrity check
 - Index rebuild (or Index defrag)
 - Statistics update
- Check if the default backup retention period is suitable for you (for your customers)

General methods for database maintenance

- The typical methods to do maintenance activities are:
 - Database Maintenance Plans
 - Ola Hallengren's Maintenance Solution Suite
 - Use of DBATools with PowerShell
- On-premise maintenance activities are scheduled with:
 - SQL Agent
 - Windows Scheduled Task
 - Cron in Linux environment
 - Third parties Tools

Methods for Azure SQL DB maintenance

- In Azure SQL Database we have several methods to do maintenance operations, this is the complete list:
 - Linked Server
 - Database Maintenance Plan
 - Azure Automation Services (with PowerShell)
 - Azure Elastic Job Agents
- Except for the Database Maintenance Plan method, it is advised to use the stored procedures of suite **SQL Server Maintenance Solution** done by Ola Hallengren
 - <https://ola.hallengren.com>

SQL Server Maintenance Solution by Ola Hallengren

Because SQL Server Maintenance Solution is not completely supported in Azure SQL Database, the cumulative script can't be executed so that there will be the creation of single database objects instead

1. `CommandExecute.sql`
2. `DatabaseIntegrityCheck.sql`
3. `CommandLog.sql`
4. `Queue.sql`
5. `QueueDatabase.sql`
6. `IndexOptimize.sql`

Methods vs Tools for Azure SQL DB maintenance

- SQL Server build-in maintenance tasks:
 - Database Maintenance Plan
- Ola Hallengren's stored procedure called by:
 - Linked Servers
 - Azure Automation Services with PowerShell
 - Azure Elastic Job Agents



Linked Server

Linked Server

- The creation of a Linked Server to an Azure SQL Database is one of the easiest and most common methods to schedule jobs for a remote database
- It's simple, just reference the Linked Server name in the job step to call the remote maintenance stored procedures
- It's necessary to have an existing on-premises SQL Server instance or an instance running in an Azure VM



Demo

Linked Server



Database Maintenance Plan

Database Maintenance Plan

- Database Maintenance Plan usage is another common method to schedule maintenance activities for Azure SQL Database
- Same rules and best practices you know for on-premise databases maintenance tasks, exception the server reference in the connection string; provide login credentials and let it run!
- As a Linked Server, Database Maintenance Plan needs an existing on-premises SQL Server or an Azure VM to schedule jobs



Demo

Database Maintenance Plan



Azure Automation Services

Azure Automation Services

- Azure Automation is an Azure based service that allows you to create Runbooks
- Runbooks can be Graphical, Python or PowerShell based
- PowerShell provides useful “cmdlets” to work with many services of Azure
- Using PowerShell scripts for database maintenance isn't much different than using T-SQL

Azure Automation Services

- Create a Runbook in existing (or new) Azure Automation Account
- Use PowerShell script to connect to Azure SQL DB and to execute maintenance stored procedures
- Test and publish your Runbook
- Schedule the Runbook and fun! 😊
- <https://bit.ly/35RL91I>

PowerShell Runbooks

Sample example of PowerShell script suitable for a Runbook:

```
$params = @{  
    'Database'='myDB'  
    'ServerInstance'='myServer.database.windows.net'  
    'Username'='myUserName'  
    'Password'='myStrongPassword'  
    'Query'='EXEC dbo.maintenance_sp...'  
    'QueryTimeout'='0'  
}  
Invoke-Sqlcmd @params
```

PowerShell Runbooks

Published runbooks
can be scheduled

Test your runbook
before publishing

Home > Automated Accounts > DBMaintenance - Runbooks > DBCheckIntegrity (DBMaintenance/DBCheckIntegrity) > Edit PowerShell Runbook*

Edit PowerShell Runbook*
DBCheckIntegrity

Save Publish Revert to published Test pane Feedback

- ▶ CMDLETS
- ▶ RUNBOOKS
- ▶ ASSETS

```
1 $params = @{
2     'Database' = 'wideworldimporters'
3     'ServerInstance' = '<server_name>.database.windows.net'
4     'Username' = 'Username'
5     'Password' = 'ComplexPassword'
6     'Query' = 'EXEC dbo.DatabaseIntegrityCheck @Databases = ''wideworldimporters'', @LogToTable=''Y''''
7     'QueryTimeout' = '0'}
8 Invoke-Sqlcmd @params
```

Invoke-Sqlcmd
<https://bit.ly/38YmCto>



Demo

Azure Automation Services

Runbooks “fairshare” feature

- Any runbook that runs for 3 hours is unloaded to allow other runbooks to run
 - <https://bit.ly/2PMnDgB>
- In order to guarantee your runbook will complete, you must add checkpoints at intervals that run for less than 3 hours
 - <https://bit.ly/2ZjkrMt>



Azure Elastic Job Agents

Azure Elastic Job Agents

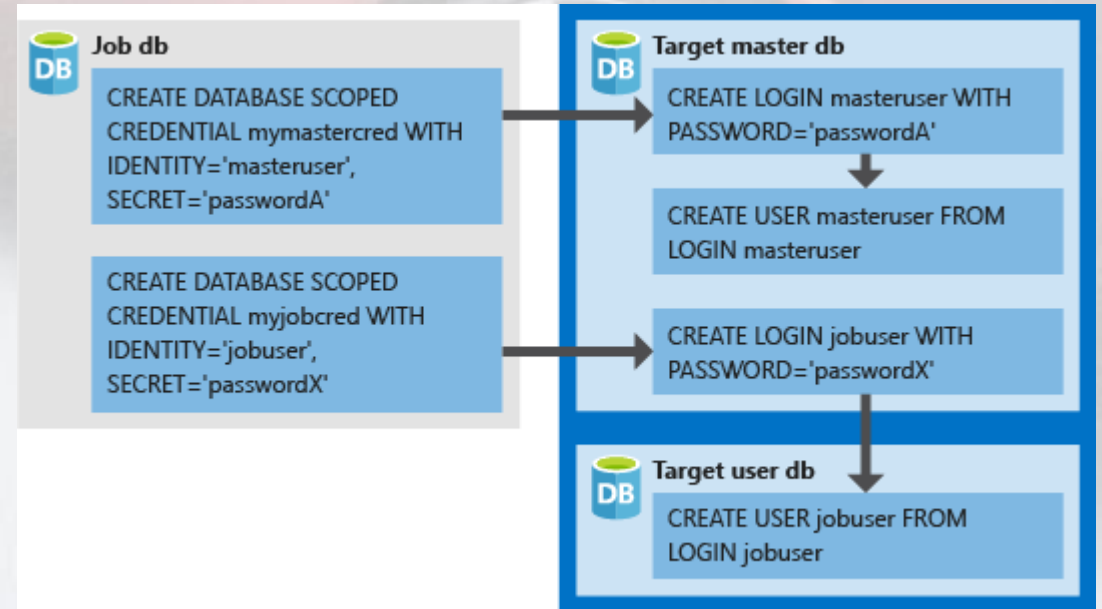
- Azure Elastic Job Agents is the most complete solution for automation of scheduled activities to be performed on Azure SQL databases
- Nowadays it's in Preview
- It runs jobs whose definitions are stored in a "Job database"
- Jobs are T-SQL scripts scheduled against a group of Azure SQL databases

Elastic Job Agent Database

- An Elastic Job Agent requires an empty database with service level objective of “**S0**” or higher hosted in an Azure SQL Database
 - This DB is also known as “Job database” and it’s like the MSDB for on-premises servers
 - The “Job database” is used for defining jobs and tracking the status and history of job executions

Elastic Database Job Credentials

- Jobs use database scoped credentials to connect to the target databases specified by the target group upon execution and execute scripts
- You can manage credentials both with T-SQL and PowerShell



Elastic Database Jobs

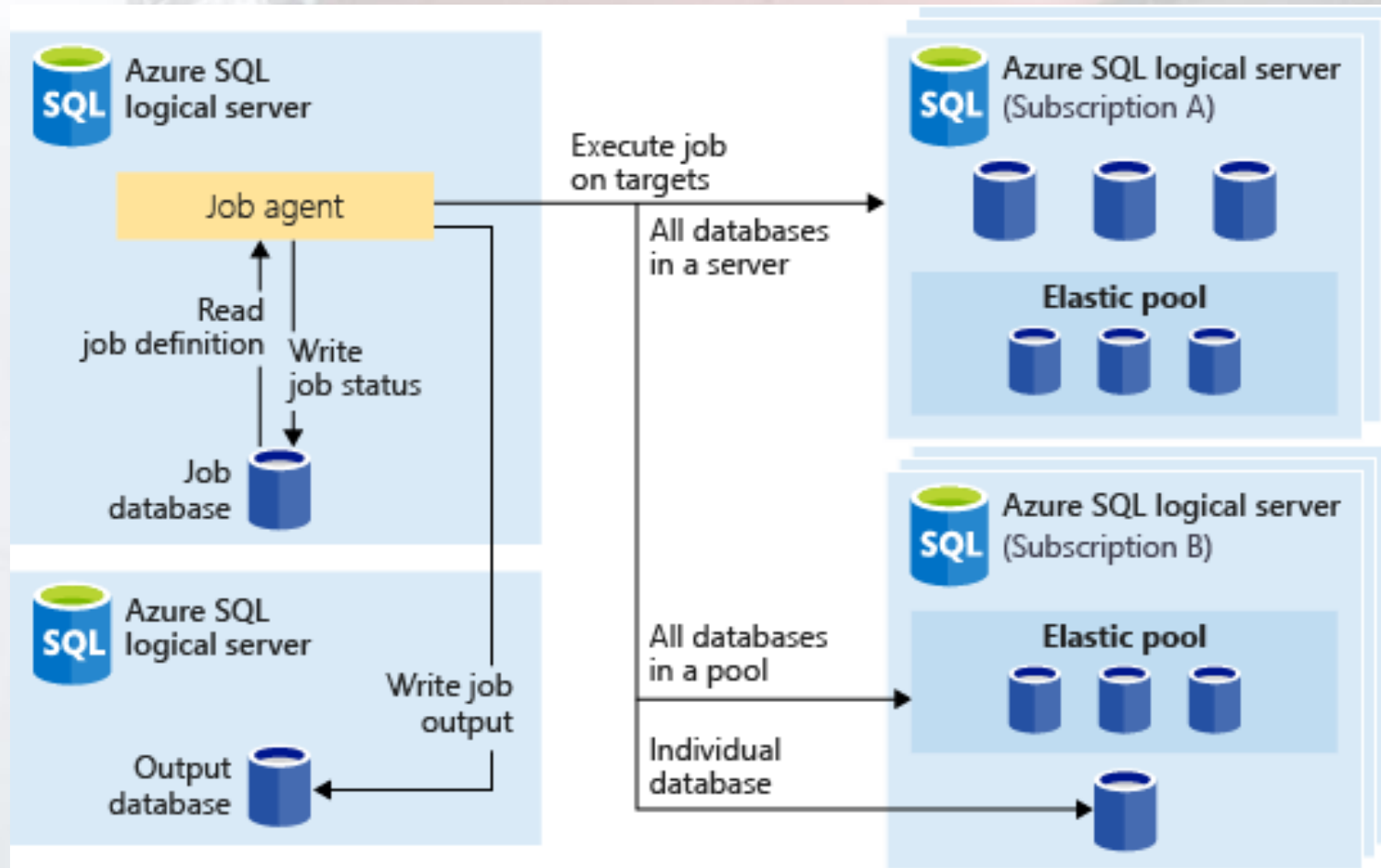
- T-SQL or PowerShell are used to create, configure, execute and manage jobs
- T-SQL can not be used to create Elastic Job Agent
- Job stored procedures (to manage jobs) are available in the “Job Database” configured during the creation of the Elastic Job Agent



Demo

Azure Elastic Job Agents

Azure Elastic Job Agents: The big picture!





Summary and Resources

Summary

- Database maintenance is an important factor also for Azure SQL databases
- Azure SQL Database doesn't have a native scheduling service like SQL Agent for on-premises instances
- We learned which activities are required for maintenance Azure SQL databases and which methods are more appropriate for scheduling those types of activities

Resources

- Automating Azure SQL Database maintenance tasks
 - 1° Part: <https://bit.ly/3clqzJE>
 - 2° Part: <https://bit.ly/2wOpJG6>
- Azure Automation Methods
 - <https://bit.ly/2wLQlYe>
- Azure Automation account and runbook
 - <https://bit.ly/34MIXJT>
 - <https://bit.ly/2VE4saz>
- Create, configure, and manage Elastic Jobs Agents
 - <https://bit.ly/2KhBo3e>



Thanks

Questions?



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