

IT PRO | DEV Connections

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Automating Azure SQL Database maintenance tasks

Sergio Govoni
@segovoni



Materials: github.com/segovoni/sql-server-demos

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Who I am



Sergio Govoni



twitter.com/segovoni



github.com/segovoni



linkedin.com/in/sgovoni

Agenda

- Azure SQL Database maintenance tasks
 - Required activities
 - Methods
 - Azure Services

The starting point

- Azure SQL Database hasn't got a native scheduling service similar to SQL Agent of the on-premise instances
- When a DB is deployed in Azure SQL Database, possible solutions to perform 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

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 be kept according to the retention period fixed
- <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

Methods for Azure SQL DB maintenance activities

- 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
 - Azure Elastic Job Agents
- It is advised to use the stored procedures of suite **SQL Server Maintenance Solution** done by Ola Hallengren
 - <https://ola.hallengren.com>

Maintenance Solution by Ola Hallengren

- Because Maintenance Solution is not completely supported by 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`

Demo

Run scripts of the Maintenance Solution to create all the objects that you need in you Azure SQL database

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

Schedule maintenance activities through a Linked Server

Database Maintenance Plan

Database Maintenance Plan

- Database Maintenance Plan 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
- As a Linked Server, Database Maintenance Plan needs an existing on-premises SQL Server instance or an instance running in an Azure VM

Demo

Schedule maintenance activities through Database Maintenance Plan

Azure Automation Services

Now I'm going to show you the most important part of the session

Azure Automation Services

- Azure Automation is an Azure based service that allows you to create Runbooks
 - Runbooks can be Graphical, Python or PowerShell
- 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 have 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.DatabaseIntegrityCheck...'  
    'QueryTimeout'='0'  
}  
Invoke-Sqlcmd @params
```

PowerShell Runbooks

Published runbooks
can be scheduled

Test your runbook
before publishing

Home > Automation Accounts > DBMaintenance - Runbooks > DBCheckIntegrity > DBMaintenance/DBCheckIntegrity > Edit PowerShell Runbook*

Edit PowerShell Runbook*

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>

Runbooks “fairshare” feature

- Any runbook can run for 3 hours maximum, when the length of time is reached the runbook will be stopped to allow other runbooks to run
 - <https://bit.ly/2PMnDgB>
- In order to guarantee your runbook will complete the operations, you must add checkpoints and activities between one checkpoint and the next one. Activities must last 3 hours maximum
 - <https://bit.ly/2ZjkrMt>

Demo

Schedule maintenance activities through runbooks in Azure Automation

Azure Elastic Job Agents

Azure Elastic Job Agents

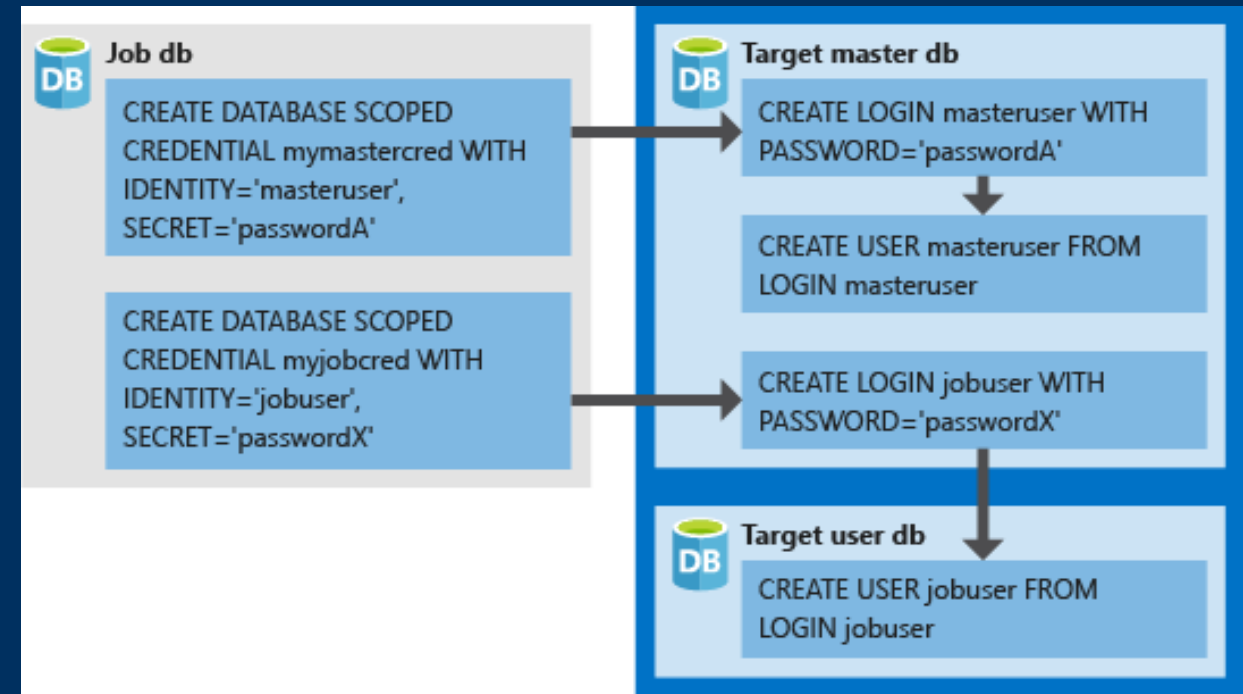
- Azure Elastic Job Agent is the most complete solution for automation of scheduled activities to be performed on Azure SQL databases
- Nowadays it's in Preview
- It runs jobs whose definitions are stored in a “Job database”
- Jobs are T-SQL scripts scheduled in order to act for a group of Azure SQL 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 either with T-SQL or with PowerShell



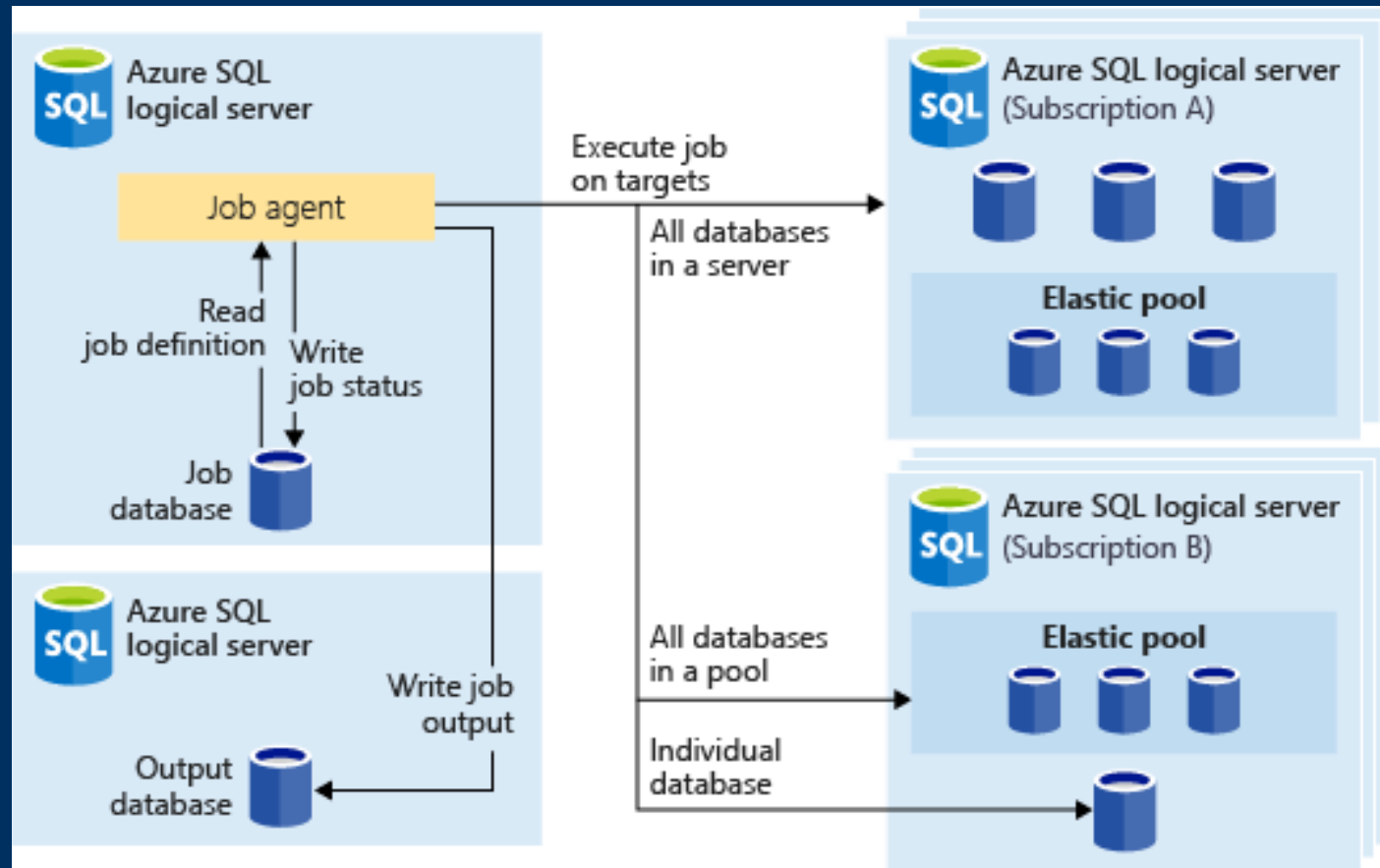
Elastic Database Jobs

- 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

Schedule maintenance activities through 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>

Ask your Questions

Thank you very much!