Technical Report

SQL Server Database Quiesce Tool (ScSqlApi)
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In partnership with

Abstract
This document describes the functionality, installation, and operation of the NetApp SQL Server Database Quiesce Tool to provide Microsoft SQL Server application consistency when used in combination with the Azure NetApp Files snapshot functionality.
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1 Introduction

Managing a very large database (VLDB) is a demanding task for a database administrator. Although there is no precise definition for a VLDB, a multi-terabyte database can currently add additional complexity for high availability and backup and restore operations. We are seeing SQL Server installations with database sizes of over 50TB up to around 200TB for some of our customers. Azure NetApp Files (ANF) dramatically simplifies the management of SQL Server VLDBs in on-premises environments. Database-consistent storage snapshots offer great advantages over the traditional built-in SQL Server backup functionality in terms of speed and added business value. Snapshots can, for example, be utilized for quickly syncing dev/test-systems or a fast recovery from failed operations or database corruptions.

Businesses have been increasingly migrating on-premises workloads to Azure for a number of reasons, including datacenter consolidation and cost effectiveness. For VLDB lift-and-shift scenarios with database sizes in the double-digit TB range, virtual machine (VM)-based, Infrastructure as a Service (IaaS) architectures are still a viable option. Memory-optimized Azure VMs like the E-series and M-series offer excellent compute capabilities for demanding database workloads like SQL VLDBs or SAP HANA. ANF is an Azure-native NAS storage solution for running high performance SQL workloads in combination with Azure VMs (Figure 1).

Figure 1) ANF overview.

SQL Server has supported Server Message Block (SMB) since version 20121. ANF offers access to storage through the multichannel-enabled SMB protocol, providing low-latency file storage to SQL Server combined with snapshot capabilities. The SQL Server Database Quiesce Tool (ScSqlApi) uses existing NetApp technology to quiesce a SQL Server database and take an application-consistent storage snapshot.

The challenge with crash-consistency versus application-consistency with database backups is that crash-consistent backups can cause unexpected and unpredictable backup results and corrupted data. There are definite differences in how crash-consistent and application-consistent backups handle application data such as Microsoft SQL Server databases. Crash-consistent backups are unaware of the

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in-memory data and pending I/O operations from these types of applications. In contrast, application-aware backups are aware of these types of transient data and are equipped to handle them. Application-aware backups use Volume Shadow Copy Service (VSS) writers in the Windows VSS service to correctly quiesce applications by flushing memory and pending I/O to disk, and thus back applications up properly with transactional consistency.

NetApp provides a tool that can be executed from within PowerShell that quiesces a SQL Server database, which in turn allows you to take the application-consistent storage snapshot for backup. After snapshot creation, the snapshots can be used for data recovery or test and development purposes by using the ANF Restore to New Volume feature.

2 Requirements

Currently, the tool works with Microsoft SQL Server 2016 and 2017 on all supported versions of the Windows operating system. The Microsoft .NET Framework 4.5.2 is also required.

3 Limitations

Consider the following limitations when using the SQL Server Database Quiesce Tool:

1. Works with one database at a time. If a quiesce operation is in process and another database requests quiescence, then the second operation fails.
2. Only supports full backup of the database. Log backups are not supported.
3. Can only be used with user databases.
4. Will not take a storage snapshot. Customers must use an external tool to do this. The purpose of the tool is to enable a typical, often scripted, three-step (quiesce, snapshot, unquiesce) application-consistent snapshot workflow.
5. SQL-instance-level quiesce and unquiesce operations are not supported.
6. Multiple database quiesce and unquiesce is not supported.
7. The tool does not provide restore functionality. Restores should be performed using external tools or the T-SQL command. Virtual-desktop-infrastructure-based restore is not supported.
8. Log backup and log recovery is not supported.
9. Always On availability groups and Always On failover cluster databases are not supported.
10. For heavily used, highly transactional databases, the quiesce operation can take more time to complete. This issue is to be expected because of the operations that must be flushed to SMB volumes before quiesce can occur.

4 Installation

4.1 Prerequisites

- Install SharedManagmentObjects and SQLSysClrTypes from the SQL Server 2016 Feature Pack.
  Note: This is not required if you are using SQL Server 2016 and the client modules are already installed.
- Install the x86 version of Visual C++ Redistributable for Visual Studio 2012.

4.2 Installation Instructions

1. Download ScSqlApi.zip.
2. Copy or extract all files in ScSqlApi.zip to the folder C:\Program Files\NetApp\ScSqlApi.
3. Start PowerShell as administrator, and run the following commands to register the service with automatic start after reboot:

```powershell
$service = 'ScSqlApi'
$path = 'C:\Program Files\NetApp\SCSQLAPI\'

Set-Location $path
$binary = $path+'ScSqlApiServiceHost.exe'
New-Service -Name $service -BinaryPathName "$binary"
Set-Service -Name $service -StartupType Automatic
Start-Service -Name $service
Get-Service -Name $service
```

```powershell
Administrator: Windows PowerShell

PS C:\Users\Administrator\Sea-TM> $service = 'ScSqlApi'
PS C:\Users\Administrator\Sea-TM> $path = 'C:\Program Files\NetApp\SCSQLAPI\'
PS C:\Users\Administrator\Sea-TM> Set-Location $path
PS C:\Program Files\NetApp\SCSQLAPI> $binary = $path+'ScSqlApiServiceHost.exe'
PS C:\Program Files\NetApp\SCSQLAPI> New-Service -Name $service -BinaryPathName "$binary"
PS C:\Program Files\NetApp\SCSQLAPI> Get-Service -Name $service
```

### Status

<table>
<thead>
<tr>
<th>Status</th>
<th>Name</th>
<th>DisplayName</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stopped</td>
<td>ScSqlApi</td>
<td>ScSqlApi</td>
</tr>
</tbody>
</table>

```powershell
PS C:\Program Files\NetApp\SCSQLAPI> Set-Service -Name $service -StartupType Automatic
PS C:\Program Files\NetApp\SCSQLAPI> Start-Service -Name $service
PS C:\Program Files\NetApp\SCSQLAPI> Get-Service -Name $service
```

### Status

<table>
<thead>
<tr>
<th>Status</th>
<th>Name</th>
<th>DisplayName</th>
</tr>
</thead>
<tbody>
<tr>
<td>Running</td>
<td>ScSqlApi</td>
<td>ScSqlApi</td>
</tr>
</tbody>
</table>
5 Usage

To use the service, run the following steps:

1. Open Windows PowerShell, switch to the directory from step 2 in the installation instructions and run the following command to import the PowerShell Module.

   ```
   Import-Module .\ScSqlApiPS.dll
   ```

2. Use the following command to quiesce and unquiesce the SQL Server database.

   ```
   New-ScSqlBackup -Database <databaseName> -SQLInstance <sqlInstance> -Operation Quiesce -Authentication Windows/SQL -Credential "Windows\Credential"
   New-ScSqlBackup -Database <databaseName> -SQLInstance <sqlInstance> -Operation Unquiesce
   ```

3. For copy-only backup, specify the copy only option.

   ```
   New-ScSqlBackup -Database <databaseName> -SQLInstance <sqlInstance> -Operation Quiesce -CopyOnly -Authentication Windows/SQL -Credential "Windows\Credential"
   New-ScSqlBackup -Database <databaseName> -SQLInstance <sqlInstance> -Operation Unquiesce
   ```

4. The following example scripts show you how to encrypt your password and use a credential object.

   ```
   $password = ConvertTo-SecureString "<SqlUserPassword>" -AsPlainText -Force
   $cred = New-Object System.Management.Automation.PSCredential (<SqlUserName>, $password)
   New-ScSqlBackup -Database <databaseName> -SQLInstance <sqlInstance> -Operation Quiesce -Authentication Windows\Credential $cred
   ```

5. The following example script shows you how to create encrypted files to conceal SQL Server credentials and read the credentials back to a credential object.

   ```
   (get-credential).password | ConvertFrom-SecureString | set-content "C:\Program Files\NetApp\ScSqlApi\sqlpasswd.txt"
   ```

6. Use the following command to get the password credentials that are required to access SQL Server.

   ```
   $passwd = Get-Content " C:\Program Files\NetApp\ScSqlApi\sqlpasswd.txt" | ConvertTo-SecureString
   ```

6 Support

For support, please contact ng-scsqlapi-feedback@netapp.com.
The following is an example PowerShell script used to execute the 3-step quiesce, snapshot, and unquiesce process to create an application-consistent snapshot of the database:

```powershell
########################################################################
#This section below is to run to generate encrypted Files for password and tenantid
$Global:apifolder = 'C:\Program Files\NetApp\ScSqlApi\'
$Global:Poolname = 'DEMOPOOL01'
$Global:RGname = 'ANFdemo rg'
$Global:Accountname = 'ANF-Demo-Account'
$Global:Location = 'West US 2'
$Global:SQLLogin = 'leejilesoutlook\pats'
$Global:azLogin = 'pats@leejilesoutlook.onmicrosoft.com'
$Global:vols = ('SQLProd01Data01', 'SQLProd01Data02', 'SQLProd01Log')

Function Get-Password ($PasswordType){
    Switch ($PasswordType){
        'az' {$passwd = Get-Content ($apifolder+'azpasswd.txt') | ConvertTo-SecureString }
        'sql' {$passwd = Get-Content ($apifolder+'sqlpasswd.txt') | ConvertTo-SecureString }
    }
    return $passwd
}

Function New-Snapshot{
    $ss = 'ss- '+ (Get-Date -Format "MM-dd-yyyy-HH-mm-ss")
    $TakeSnapshot = {
        param($vol, $ss)
        New-AzNetAppFilesSnapshot -PoolName $Poolname -ResourceGroupName $RGname -AccountName -VolumeName $vol -Location $Location -name $ss
    }
    foreach ($vol in $vols){
        write-host $vol
        Start-job -ScriptBlock $TakeSnapshot -ArgumentList $vol, $ss
    }
    Get-job | Wait-Job
}

Function Set-DB ($action){
    Set-Location $apifolder
    Import-Module $apifolder\ScSqlApiPS.dll
    $password = Get-Password 'sql'
    $credential = New-Object System.Management.Automation.PSCredential($SQLLogin, $password)
    New-ScSqlBackup -Database SeattleRetail -SQLInstance 'SQLProd01' -Operation $action -Credential $credential
}

$Connect_Az = {
    Import-Module Az
    Import-Module Az.NetAppFiles
    $secretStuff = Get-Content -Path ($apifolder+'tenant.txt') | ConvertTo-SecureString
}
```

This script is provided for example purposes only.
8 Appendix B: Known Error Messages

See the following known error messages:

1. Incorrect instance name provided.
   
   Starting Quiesce operation on database [Test1] ...  
   New-ScSqlBackup : Failed to connect to server SCSPR177851003\INST1.

2. Incorrect username and password provided.
   
   Starting Quiesce operation on database [Test2] ...  
   New-ScSqlBackup : The user name or password is incorrect.

3. Quiesce has been repeatedly issued.
   
   Starting Quiesce operation on database [Test2] ...  
   New-ScSqlBackup : Backup already running for database: Test2

4. Unquiesce has been repeatedly issued.
   
   Starting Unquiesce operation on database [Test2] ...  
   New-ScSqlBackup : No running backup found to Unquiesce

5. SQL Server instance is stopped.
   
   Starting Quiesce operation on database [Test2] ...  
   New-ScSqlBackup : Failed to connect to server SCSPR1778511003\INST1

6. Quiesce is issued simultaneously on two DBs.
   
   Starting Quiesce operation on database [Test4] ...  
   New-ScSqlBackup : Backup already running for database: Test3

7. Unquiesce is issued simultaneously on two DBs.
   
   Starting Unquiesce operation on database [Test1] ...  
   New-ScSqlBackup : No running backup found to Unquiesce

8. Parameters are not completely specified.
   
   New-ScSqlBackup : Missing an argument for parameter 'Database'. Specify a parameter of type 'System.String' and try again

9. Database is not existing.
   
   Starting Quiesce operation on database [Test2ww] ...  
   New-ScSqlBackup : GetConfiguration timed out
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