



# Backup and Recovery of Microsoft SQL Server (Windows) databases on Clumio

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September 4, 2020

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## Introduction

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This white paper is to aid database administrators on how to leverage Clumio backups for performing recovery of SQL server databases. This document will cover both full restores from Clumio's backup and point in time recovery for the Microsoft SQL Server processes in detail.

Clumio is a secure, backup as a service for the enterprise that eliminates the complexity of infrastructure management with authentic SaaS. That means that Clumio's customers can backup your Microsoft SQL Server to the cloud, and the database can be restored to any other vCenter which is present in the cloud or any different on-premises datacenter.

## Prerequisites

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For doing the SQL Server backups and restores using Clumio, the following are mandatory:

1. VMWare version should be  $\geq 6.5$
2. VMTTools need to be installed on the Virtual machines which host Microsoft SQL Servers.
3. Volume shadow copy services (VSS) should be running on the Windows server.

## Test Environment

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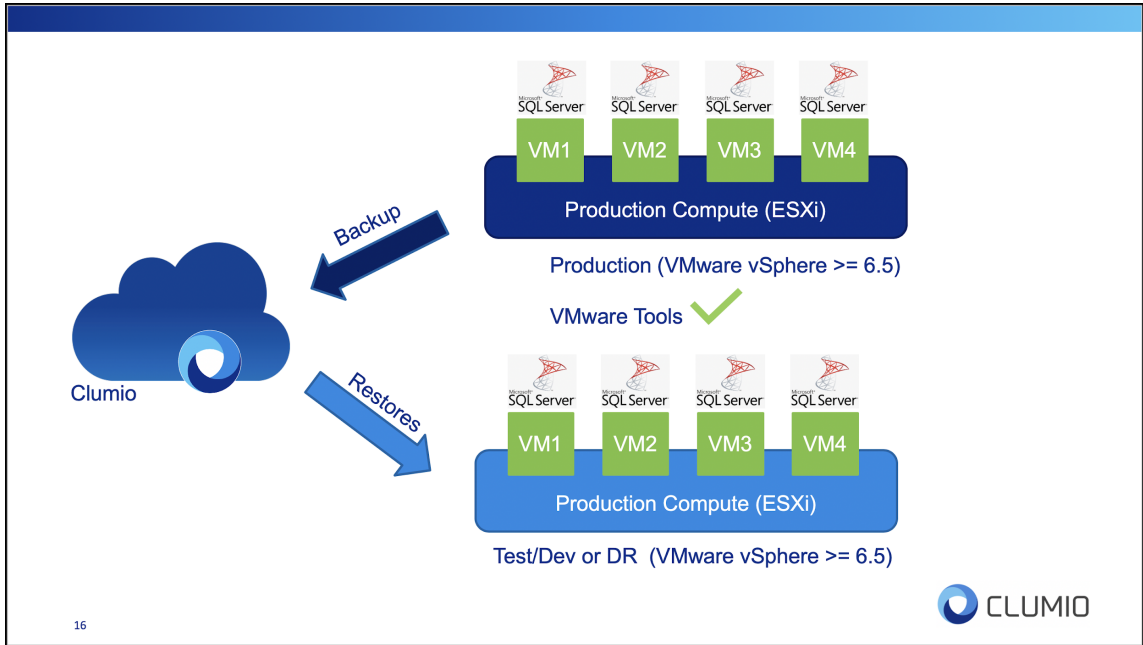


Figure 1: Test environment

Details about the test environment:

- Operating System: Windows Server 2019
- Database: Microsoft SQL Server Express(64 bit)
- Database version: 14.0.1000.169
- VMware vSphere version: 7.0.0.10100
- VMware tools version: 11.0.5
- Database recovery mode: Full

## HammerDB load generation

HammerDB is the leading benchmarking and load testing tool, and it supports most of the popular databases. The reason for running these tests with load testing tools is to generate real-time workloads on the databases and simulate customer's production databases. During this process of testing backups with Microsoft SQL Server, the HammerDB tool was continuously running on the source Microsoft SQL Server database. It was always running and generating ~65000 transactions per minute of TPC-C(OLTP) based data(See figure 2).

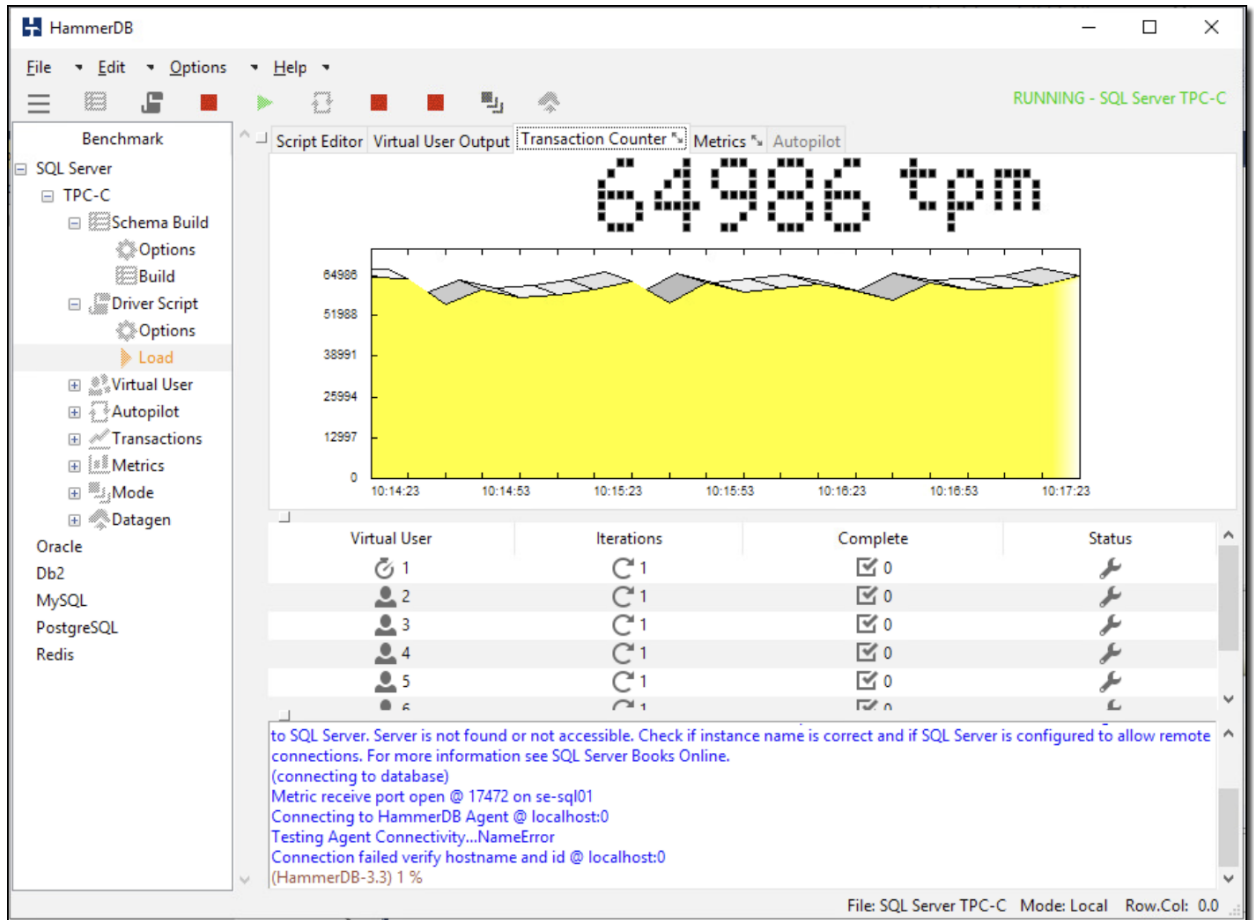


Figure 2: HammerDB load generation

## Rapid Recovery from Clumio backups

With Clumio, the recovery is going to be lightning-fast, which means terrific RTO. Rapid Recovery is a set of innovations from Clumio that enables very fast operational restores from cloud storage even when you are protecting on-premises workloads. With this feature, it took just 5 minutes to recover an active SQL Server AG environment with 500GB of data.

Please check these blogs for more details regarding Clumio Rapid Recovery:

[Rapid Recovery - The Fastest RTO for Production Workloads Delivered from Cloud](#)

[Clumio's Rapid Recovery is Amazing for SQL Server – Heraflux Technologies](#)

This section will showcase how the SQL server full restores can be performed using Clumio's backups, which uses VMTools to call volume shadow copy services. Because of

this call to Volume shadow copy services, the backup is going to be completely database or application consistent.

Check this whole process in detail below.

**Step 1:**

In the Microsoft SQL Server, there is a reference database (See figure 3) with a reference table that will be tracking to check full restores.

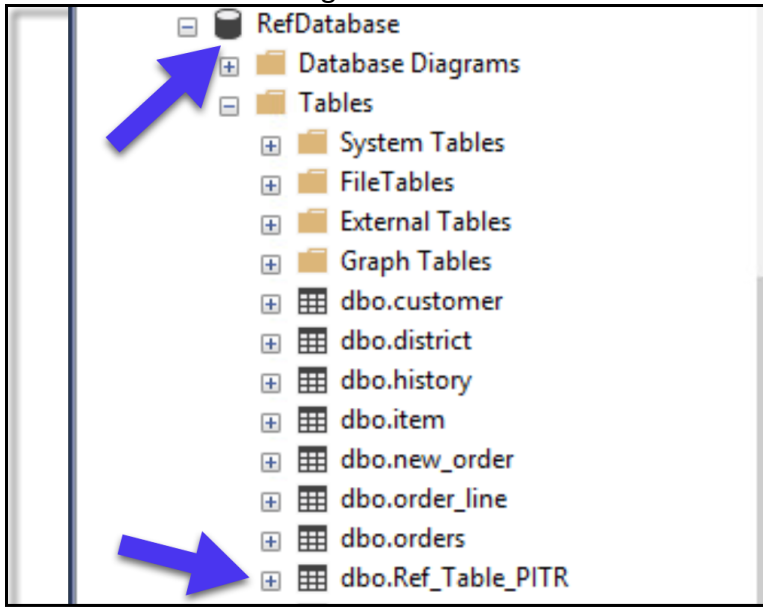


Figure 3: Reference table

Populate it with data, as shown below in figure 4.

	RowNum	Status	Timestamp
1	1	Initial Full	2020-08-05 10:19:00
2	2	Initial Full	2020-08-05 10:20:00
3	3	Initial Full	2020-08-05 10:20:00
4	4	After Full	2020-08-05 10:24:00
5	5	Transactional Log Backup 1	2020-08-05 10:26:00
6	6	Transactional Log Backup 2	2020-08-05 10:26:00
7	7	Transactional Log Backup 1	2020-08-05 10:27:00
8	8	Transactional Log Backup 2	2020-08-05 10:30:00
9	9	Transactional Log Backup 2	2020-08-05 10:31:00
10	9	Transactional Log Backup 2	2020-08-05 10:32:00
11	10	Transactional Log Backup 3	2020-08-05 10:42:00
12	11	Transactional Log Backup 3	2020-08-05 10:43:00
13	13	Transactional Log Backup 4	2020-08-05 11:08:00
14	14	Transactional Log Backup 4	2020-08-05 11:09:00
15	15	Transactional Log Backup 4	2020-08-05 11:10:00

Figure 4: Data in the reference table

**Step 2:**

In Clumio, apply a unified policy for this Virtual machine on which the Microsoft SQL Server is present. The unified policy is straightforward to create where backup frequency and backup window are configured, as shown in figure 5 below.

Figure 5: Unified policy



Or take an on-demand backup, as shown in figure 6.

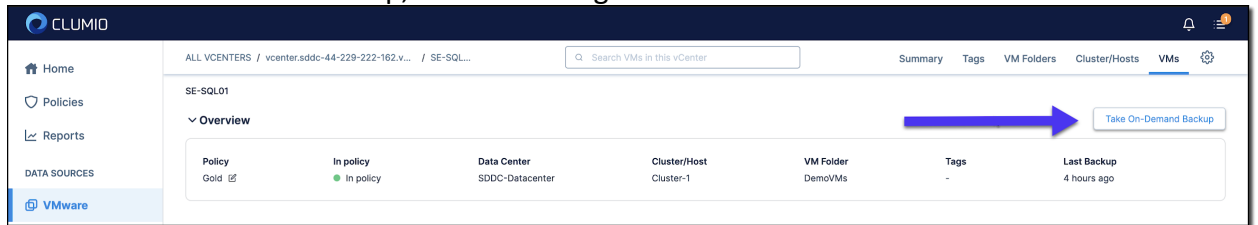


Figure 6: On-demand backup in Clumio

**Step 3:**

Whenever Clumio takes a backup of Virtual machine with Microsoft SQL Server, it updates the backupset history as Full backup(Copy only), as shown in figure 7 below. It is based on Volume Shadow Copy service, which is triggered by Clumio backup with VMTTools installed.

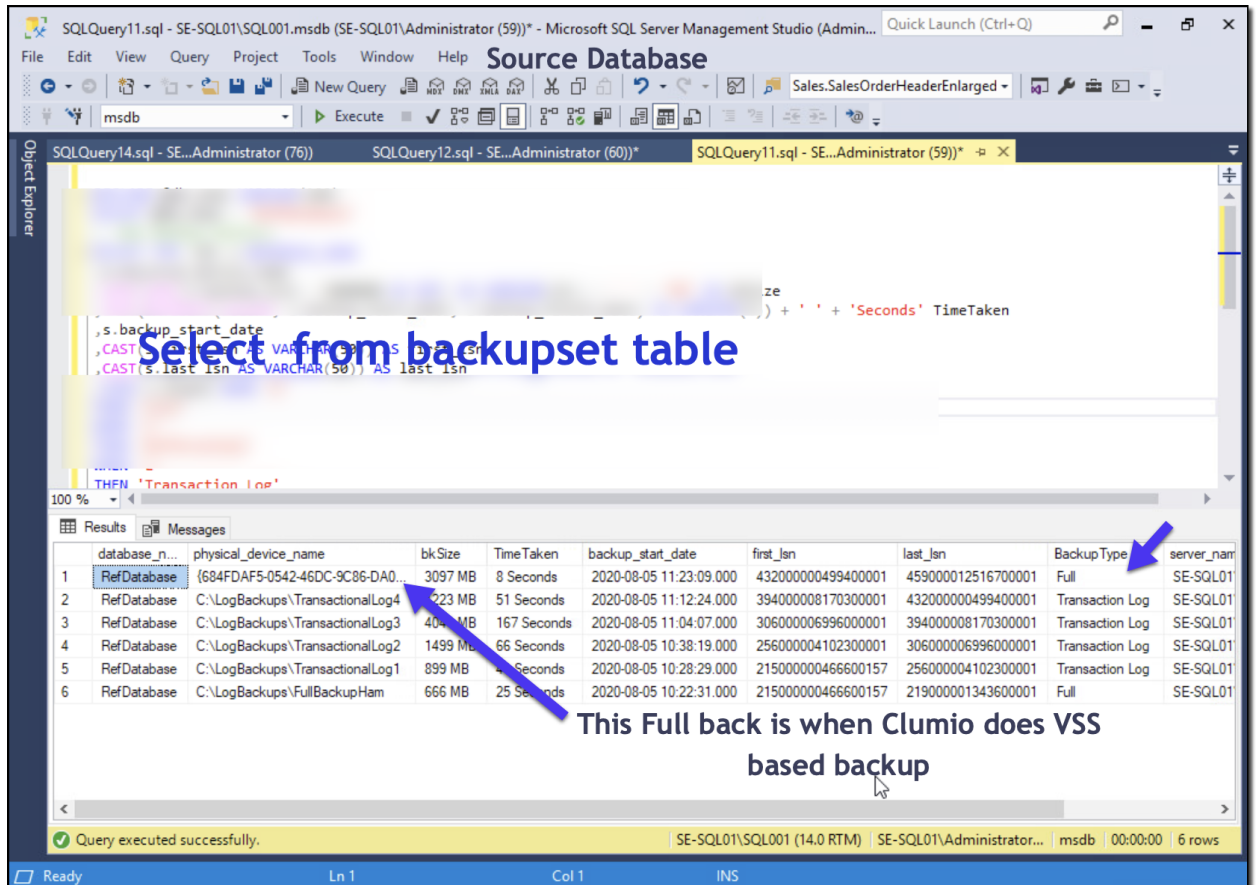


Figure 7: Output of the backupset table

**Step 4:**

Clumio makes full restores extremely simple, to perform the Full Restore of the Microsoft SQL Server Virtual machine.

- Select the virtual machine in Clumio
- Now it takes to the calendar view, choose the date we would like to restore the Microsoft SQL Server database.
- Then we need to select the time and perform Restore VM see figure 8.

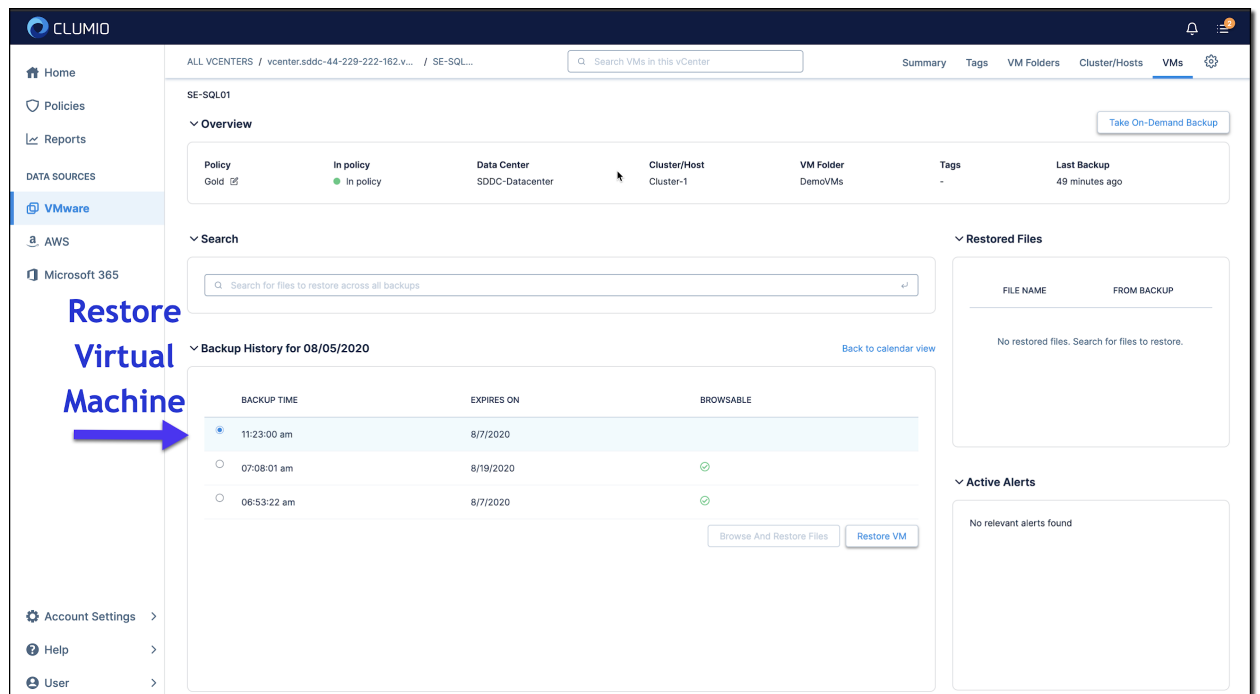


Figure 8: Clumio restore the virtual machine

### Step 5:

Once the Virtual machine is restored, and Microsoft SQL Server databases should be restored to the date and time we selected. Databases will be online as it is restored from an application or database consistent volume shadow copy based snapshot.

Open the database and select on the reference table (see figure 9) in the target database's reference table before the Clumio backup happened on the source database.

	RowNum	Status	Timestamp
1	1	Initial Full	2020-08-05 10:19:00
2	2	Initial Full	2020-08-05 10:20:00
3	3	Initial Full	2020-08-05 10:20:00
4	4	After Full	2020-08-05 10:24:00
5	5	Transactional Log Backup 1	2020-08-05 10:26:00
6	6	Transactional Log Backup 2	2020-08-05 10:26:00
7	7	Transactional Log Backup 1	2020-08-05 10:27:00
8	8	Transactional Log Backup 2	2020-08-05 10:30:00
9	9	Transactional Log Backup 2	2020-08-05 10:31:00
10	9	Transactional Log Backup 2	2020-08-05 10:32:00
11	10	Transactional Log Backup 3	2020-08-05 10:42:00
12	11	Transactional Log Backup 3	2020-08-05 10:43:00
13	13	Transactional Log Backup 4	2020-08-05 11:08:00
14	14	Transactional Log Backup 4	2020-08-05 11:09:00
15	15	Transactional Log Backup 4	2020-08-05 11:10:00

Figure 9: Post restore data in the reference database table

## Point in Time Recovery of Microsoft SQL Servers:

### Perform Full Backups every day with transaction logs on Microsoft SQL Server

#### Backup Methodology:

With this methodology, DBAs will be performing Full backup everyday and transaction logs backups, thereby. At the end of the cycle each day, the Clumio backup will run, and then the next cycle of Full backups and transaction log backups will be performed. The Full and transaction backups are performed by Microsoft's recommended approach which most of the DBAs are already familiar with, here is the link to it:

[Create a Full Database Backup - SQL Server](#)

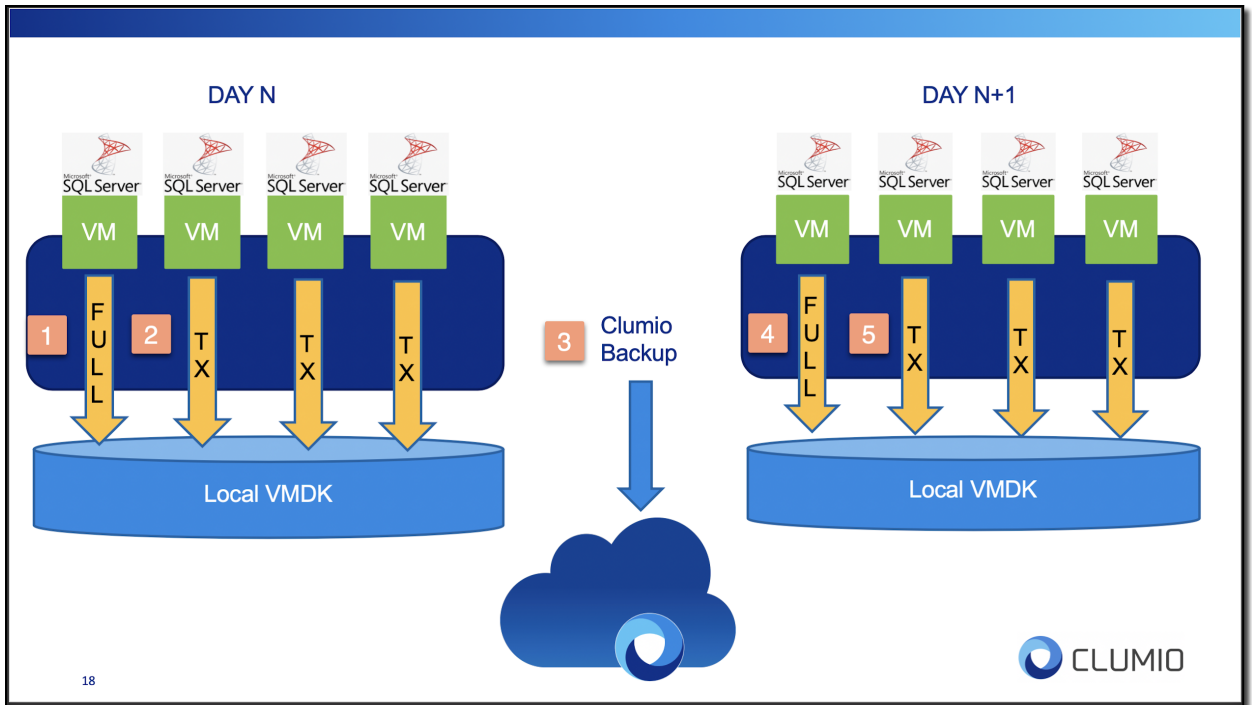


Figure 10: Backup methodology

In this methodology, the full cycle will look like, as shown in figure 10 above.

**Step 1:** Every day, start with Full Backup on the Microsoft SQL Server, which you can store in the local VMDKs directly.

**Step 2:** Take regular transaction backups on their usual frequency.

**Step 3:** Clumio backup will occur, and all the full backup files and transaction backups will be retained based on the policy used for this Virtual machine. This backup will be recorded in the backupset table.

Based on the policy shown in figure 11 below, the backups will be retained for 14 days, and backups will occur every day.

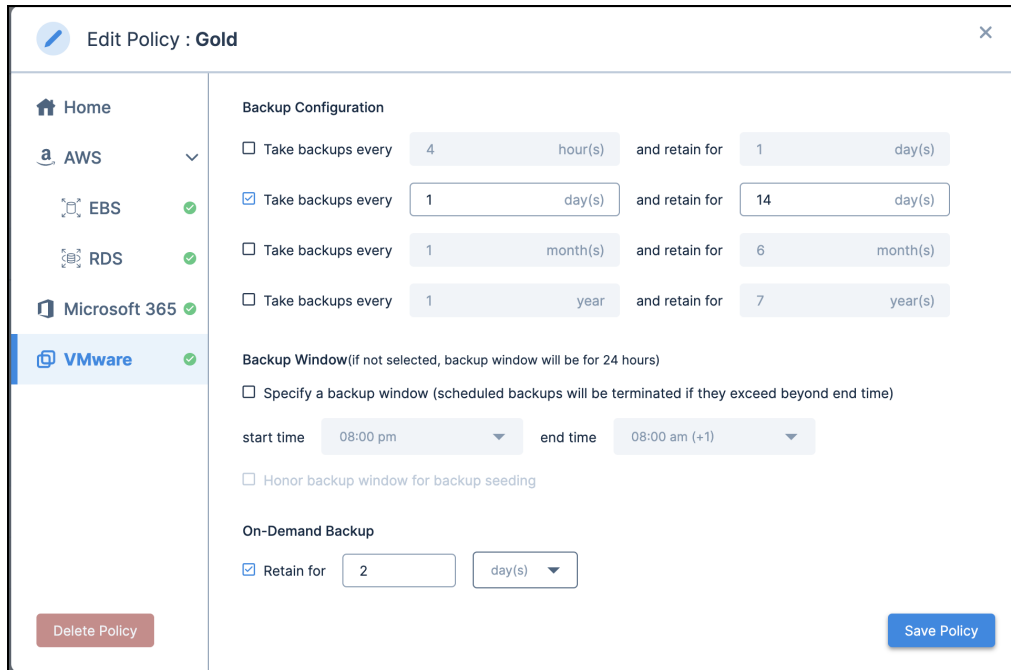


Figure 11: Unified policy in Clumio

**Step 4 and Step 5:** The cycle repeats with Full backup → transaction log backups → Clumio Backups.

## Restore based on this methodology:

**Step 1:** In Clumio, select the Virtual machine, which should take it to the recovery screen. This screen has a calendar view has shown in figure 12 below and choose the date from which you would like to do a point in time restore.

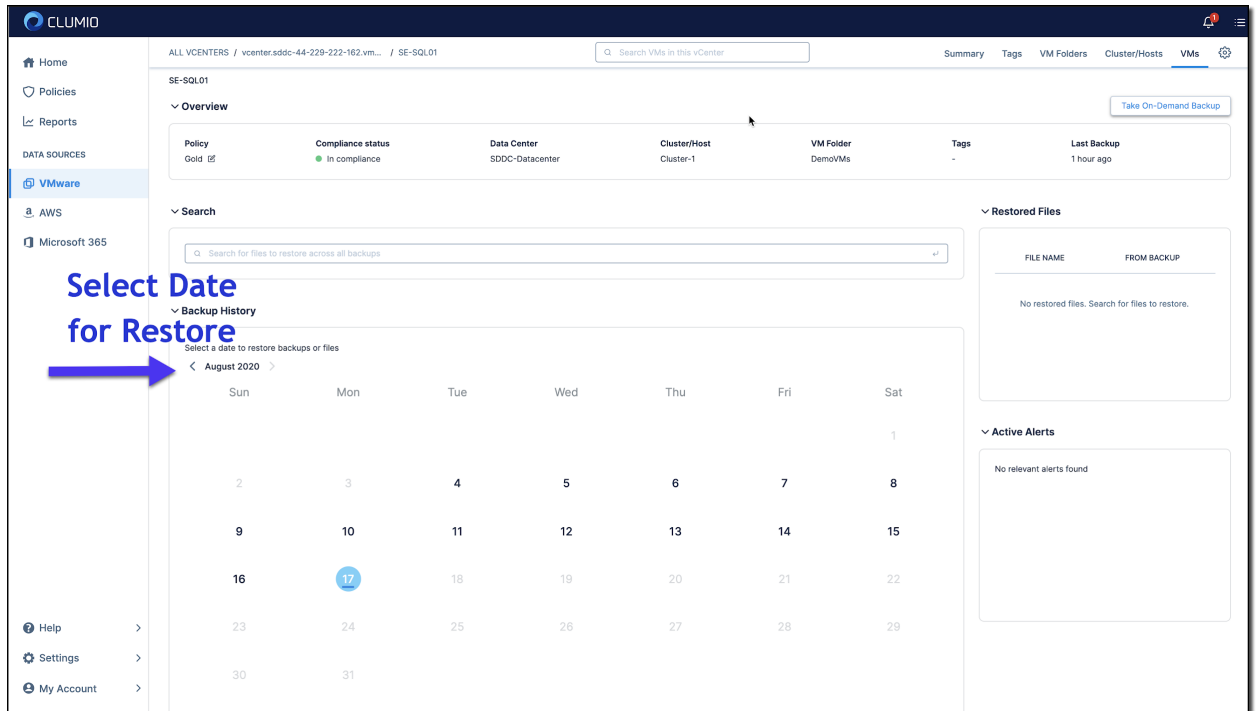


Figure 12: Virtual machine restore in Clumio

**Step 2:** Perform the VM restore since all the backup files, full and transaction backup files are present on the local file system. We can use this to do a point in time recovery, which can be performed from SQL Server Management Studio, as shown in figure 13.

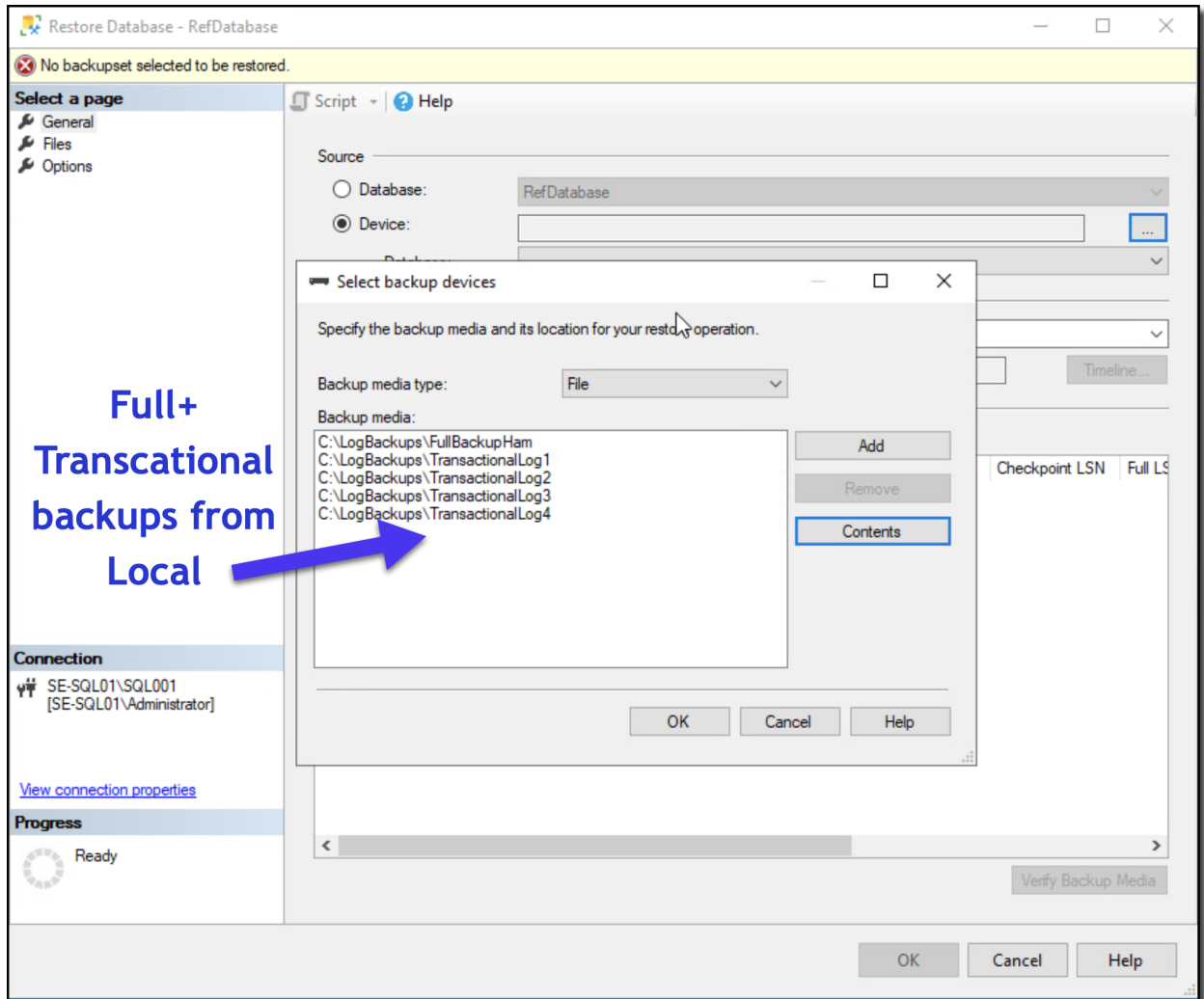


Figure 13: Restore database in SQL Server Management Studio

**Step 3:** Make sure to Overwrite the existing database (with replace) and also no need to take the tail-log backup before the restore then, you should be able to perform point in

time restore, check figure 14.

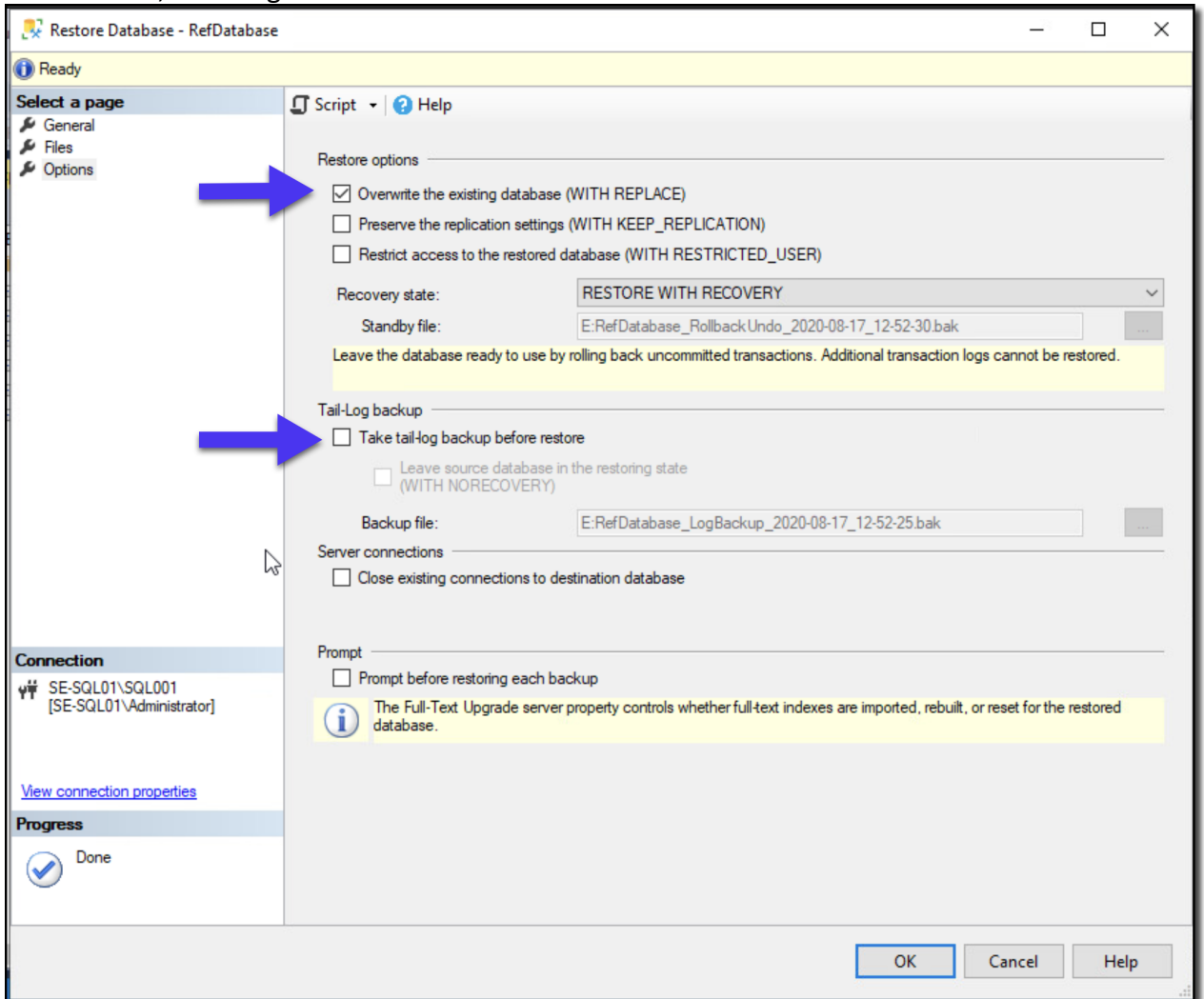


Figure 14: Restore database(Options) in SQL Server Management Studio

**Step 4:** In the Backup Timeline in SQL Server Management studio(shown in figure 15), select the time to which the database needs to be restored.



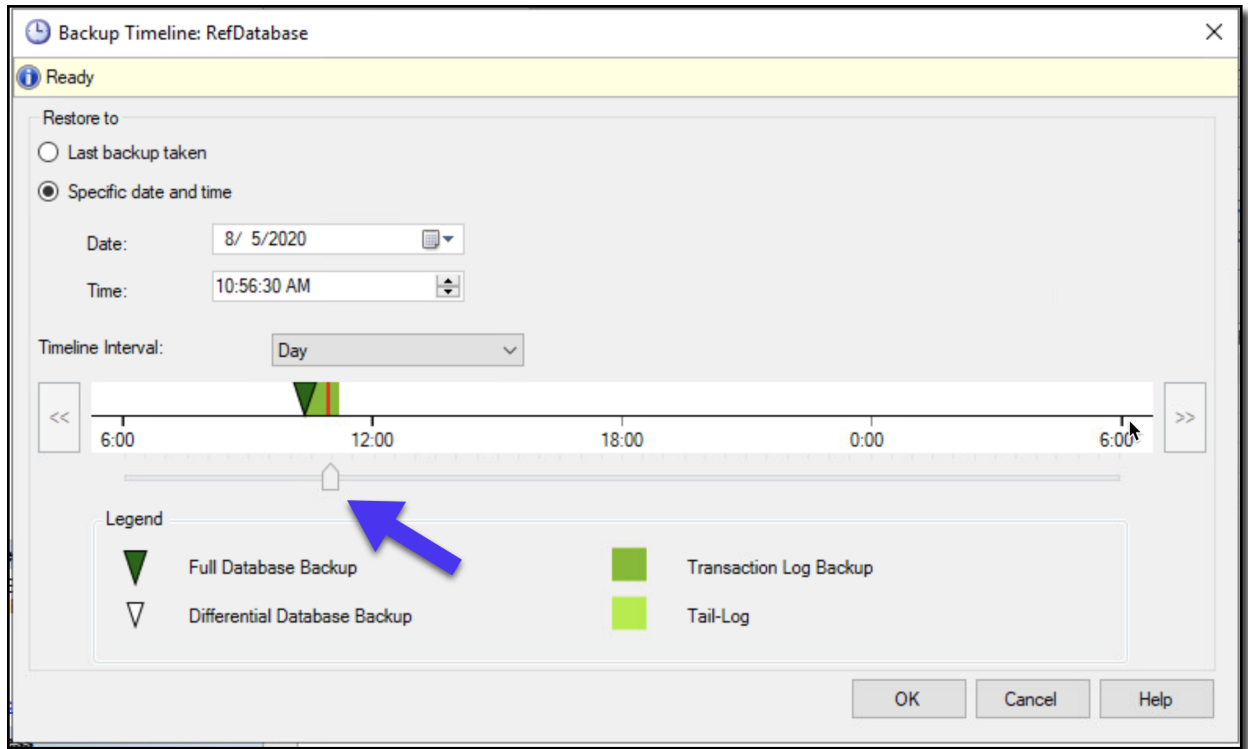


Figure 15: Backup Timeline in SQL Server Management Studio

## Important To dos for DBAs:

1. DBA must schedule Full Backups, best time would be after Clumio backup is completed.
2. DBA must schedule Transaction log Backups after the Full Backups and after their last transaction log backup should schedule the Clumio Backup
3. DBA needs to allocate extra space to accommodate at least two-three days worth of Full and Transaction log backups on the local disk.
4. DBA needs to provide an expiration script so that backups older than two days are cleaned up in the Virtual Machine.

# Perform Full and then Differential backups every day with transaction logs on the Microsoft SQL Server

## Backup Methodology:

Previously methodology is suitable for Microsoft SQL Servers where database sizes are small, but for big databases, we recommend the method with differential backups.

The backup cycle begins with the Full backups and transaction log backups, and then there is no need to take full backups, only differential backups, and transaction backups. The backup cycle is shown in the figure below:

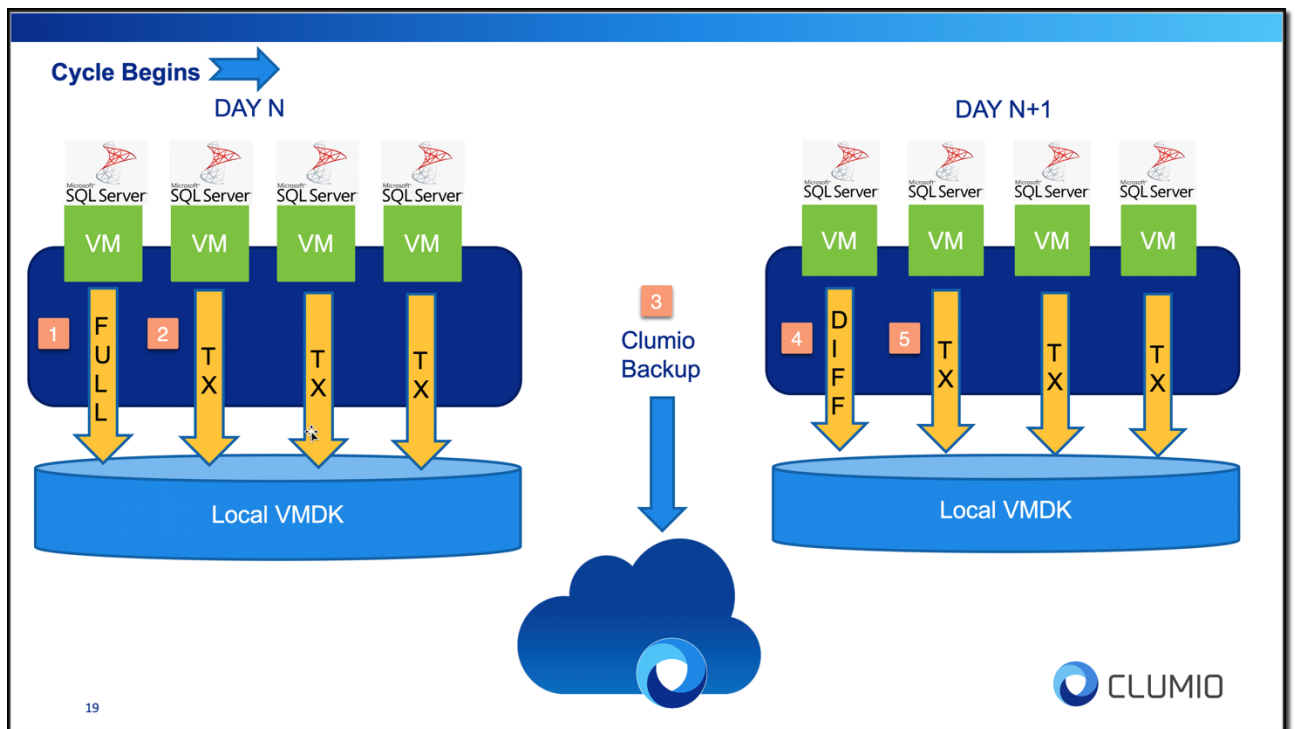


Figure 16: Backup methodology using Fulls and Differential backups

In this methodology, the full cycle will look like, as show in figure 16.

**Step 1/2:** The backup cycle begins with Full backup of the Microsoft SQL Server and the corresponding transaction log backups.

**Step 3:** Clumio backup will be performed based on the policy governing this SQL Virtual machine.

**Step 4/5:** Then do the differential backups followed by transaction log backups.

## Restore based on this methodology:

The restore remains the same as the previous Full backups based methodology. Since the backup log chain is not broken, we can apply the differential backups and transaction logs back up to make a point in time recovery. Also, make sure to Overwrite the existing database (with replace) and even no need to take the tail-log backup before the restore.

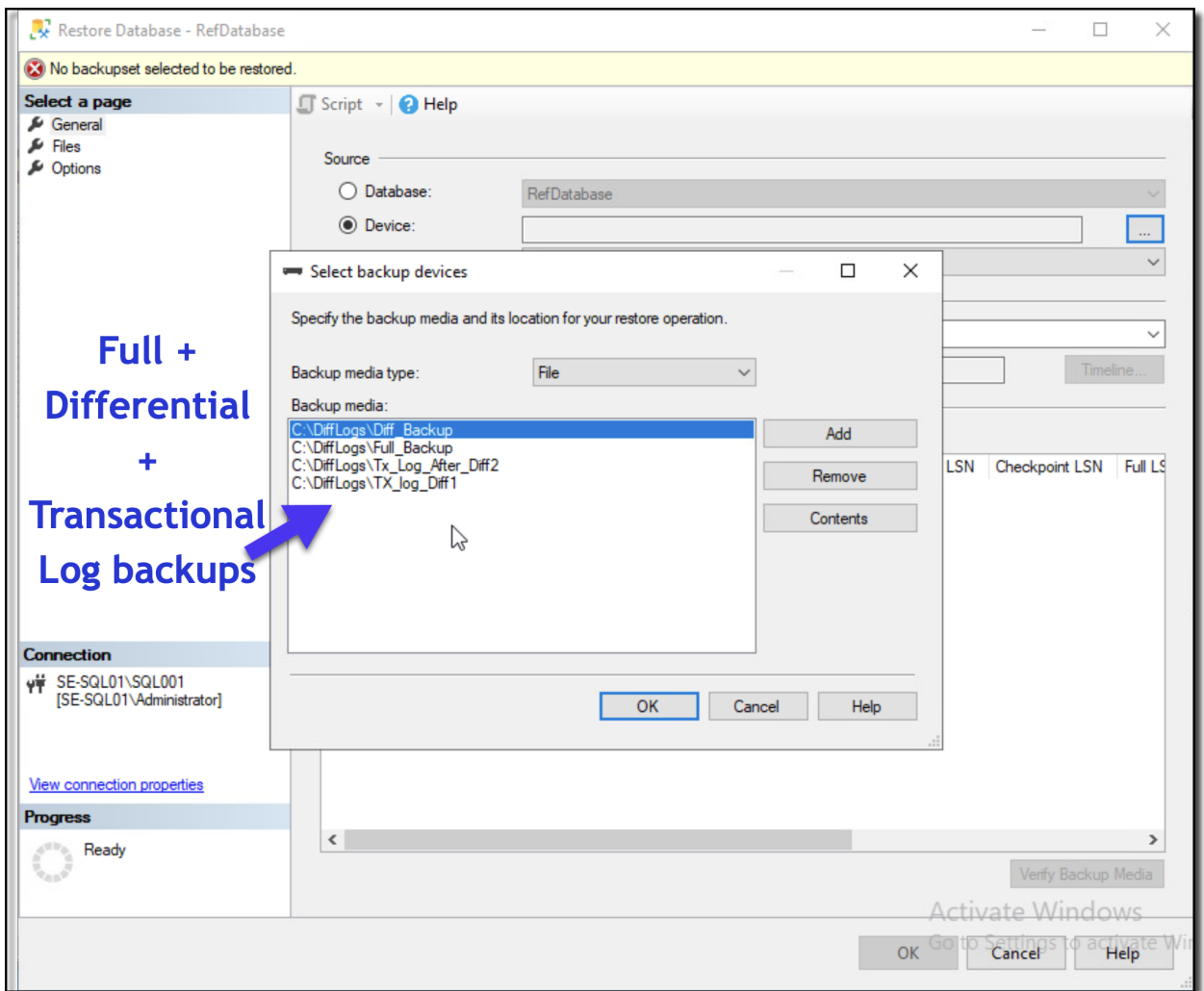


Figure 17: Restore database in SQL Server Management Studio

## Important To dos for DBAs:

1. DBA must schedule Full Backups and then Differential backups, best time would be after Clumio backup is completed.
2. DBA must schedule Transaction log Backups after the Full Backups and Differential backups and after their last transaction log backup should schedule the Clumio Backup
3. DBA needs to allocate extra space to accommodate at least two days worth of Full, Differential and Transaction log backups on the local disk.
4. DBA needs to provide an expiration script so that differential /transactional backups older than two days are cleaned up in the Virtual Machine. Full backup should not be deleted during each complete backup cycle.

## Summary:

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We have shown how Clumio can help with the backup and recovery of Microsoft SQL Servers. The procedures described in this document is something the DBAs are already very familiar with. They have to tweak very little to leverage Clumio's backups for Microsoft SQL Servers, which will simplify this arduous backup and recovery task.

## Contact Clumio Support

For technical support with Clumio products, contact us in the following ways:

**Telephone**      +1 (855) 596-3391

**Online**            <https://support.clumio.com>

**Email**             support@clumio.com

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