15 Tips to increase the Survivability of your Database

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About_me

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IT 25 years

Started with PROGRESS

SQL On/Off (Since 6.5…Mostly 2008+)

Why this session?

- It is not a matter of IF corruption happens, but when (and it's never at a good time)
- Knowing about corruption AS SOON AS POSSIBLE is invaluable
- If you know about corruption immediately, you have more options in recovery:

- Most recent backups won't have the corruption (If you backup the corruption, well…)
- Restoring the database might be your best option.

- Your business won't be down as long if you are ready for problems

- Might just save your job!

The 15

1) Database mail (Operator + Account)
2) Create alerts for critical errors
3) Setup Alert notifications
4) Notifications for EVERY agent job
5) SQL Error Logs
6) DBCC CHECKDB Daily
7) Drive Space
8) Database page_verify_option = 2 (Page_verify_option_desc = “CHECKSUM”)
9) CHECKSUM during Backup & Restore
10) Backup logs for ALL User Databases in FULL recovery mode
11) Routinely restore databases
12) Business SLA / RTO / RPO on all databases
13) Benchmark / monitor system
14) What NOT to do
15) Practice your skills

0.5 What to do first

- **During an actual crisis…First: Step away from the keyboard**
- **How will help you best solve this problem?**

1) **Accurately assess the situation. Is this really as bad as first glance? Is it worse?**
2) **Where is my documentation**
3) **DO NO HARM – Don't do anything without making a backup, copy first and work on the backup for testing!**
4) **Do** you have the skills to successfully restore the data?

- **If NOT, THAT IS OK**
- It's better to ask for help, than to ask after the fact!

0.5 What to do first

If you start immediately without a plan you are effectively saying

“Hold my beer, watch this!”

#1 Database mail

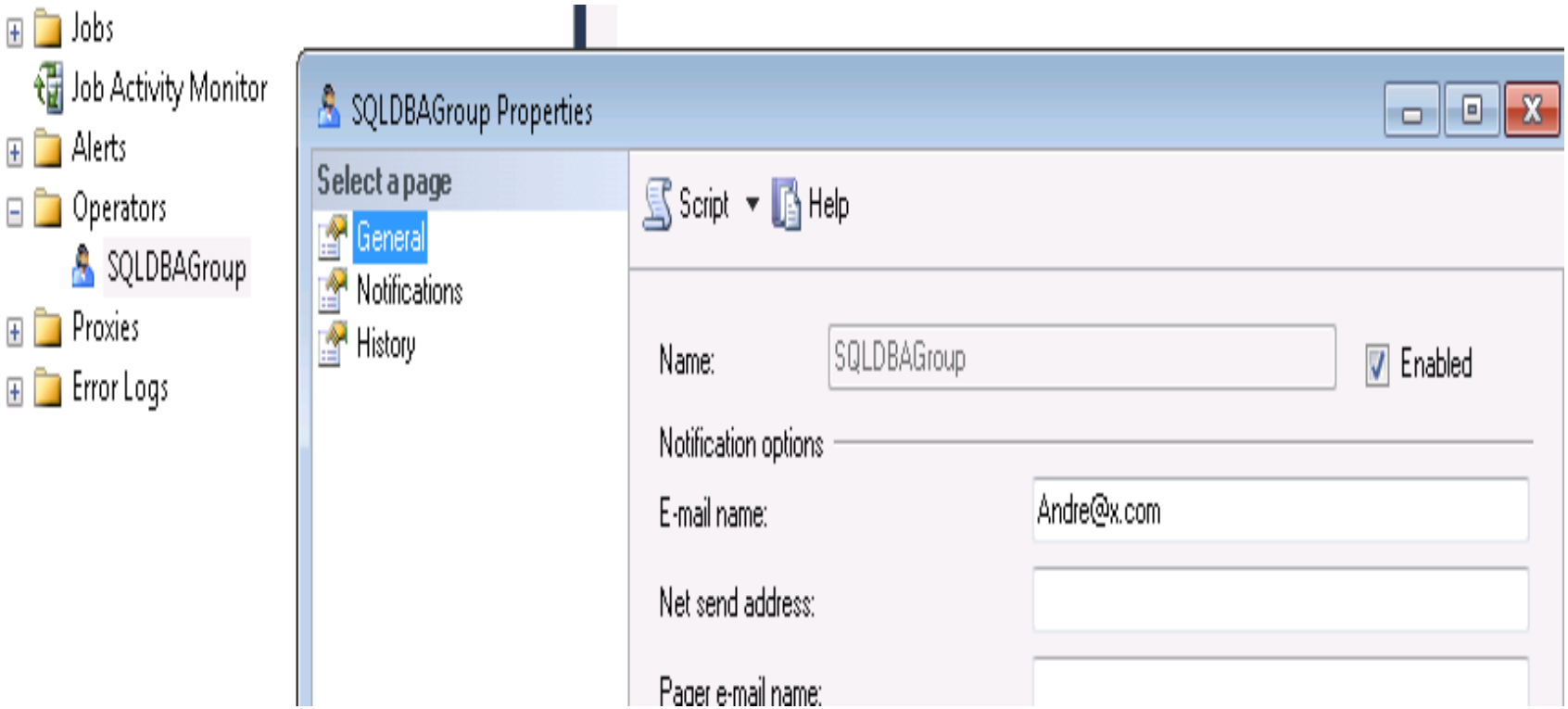
- Setup an operator (#1.1) and database mail (#1.2)
- Setup operators as group e-mail for DBA's (yes, DBAs do get sick/go on vacation/leave the company)
- **** Note: In the GUI, it falls under the SQL Agent, verify/change the SQL Agent to auto-start on reboot**
- **** Use SQL Server Configuration Manager (Default is Manual start) (#1.3)**
- Test the mail to the group (#1.4)
- NOTE: Anti-Virus can cause blocking of the email to send. You may need to enable sending of email via your anti-virus program.

- Routinely, View Database Mail Log verify any messages sent don't have errors

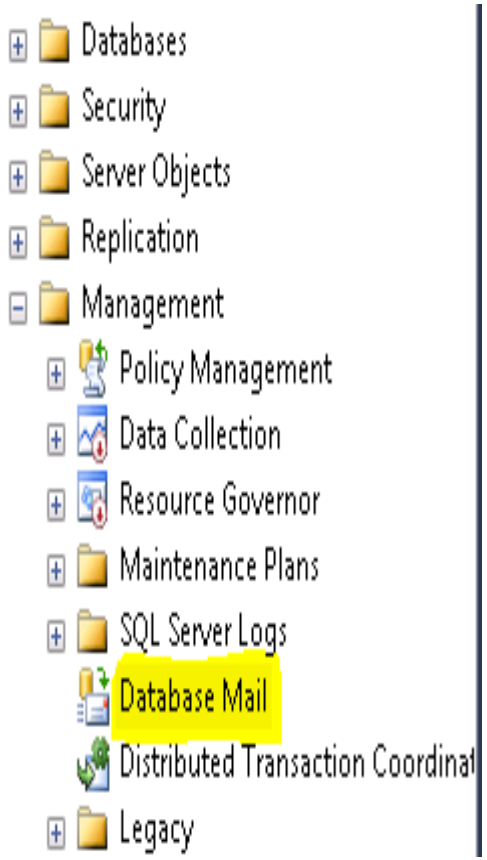
- NOTE: Azure does NOT support mail

https://azure.microsoft.com/en-us/documentation/articles/sql-database-transact-sql-information/

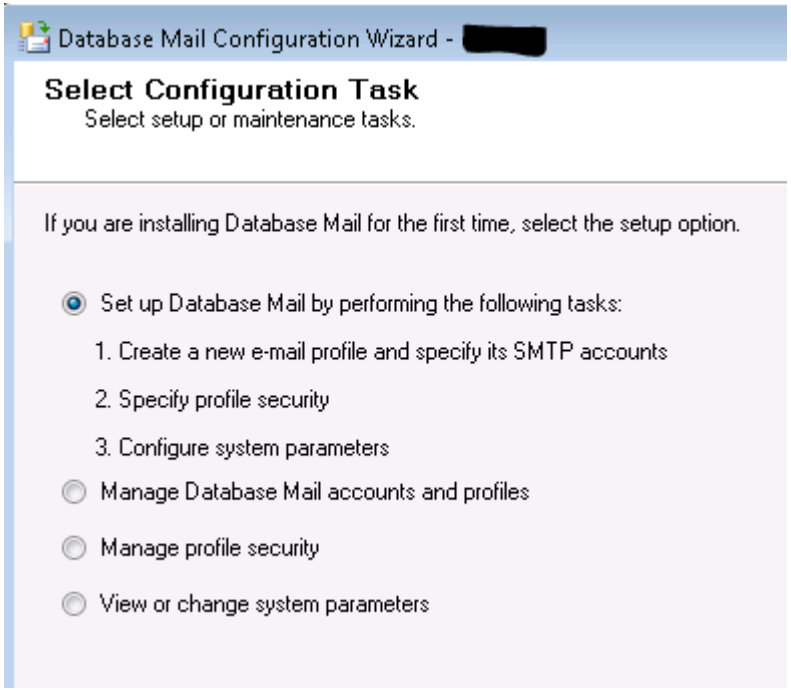
#1.1 Database mail



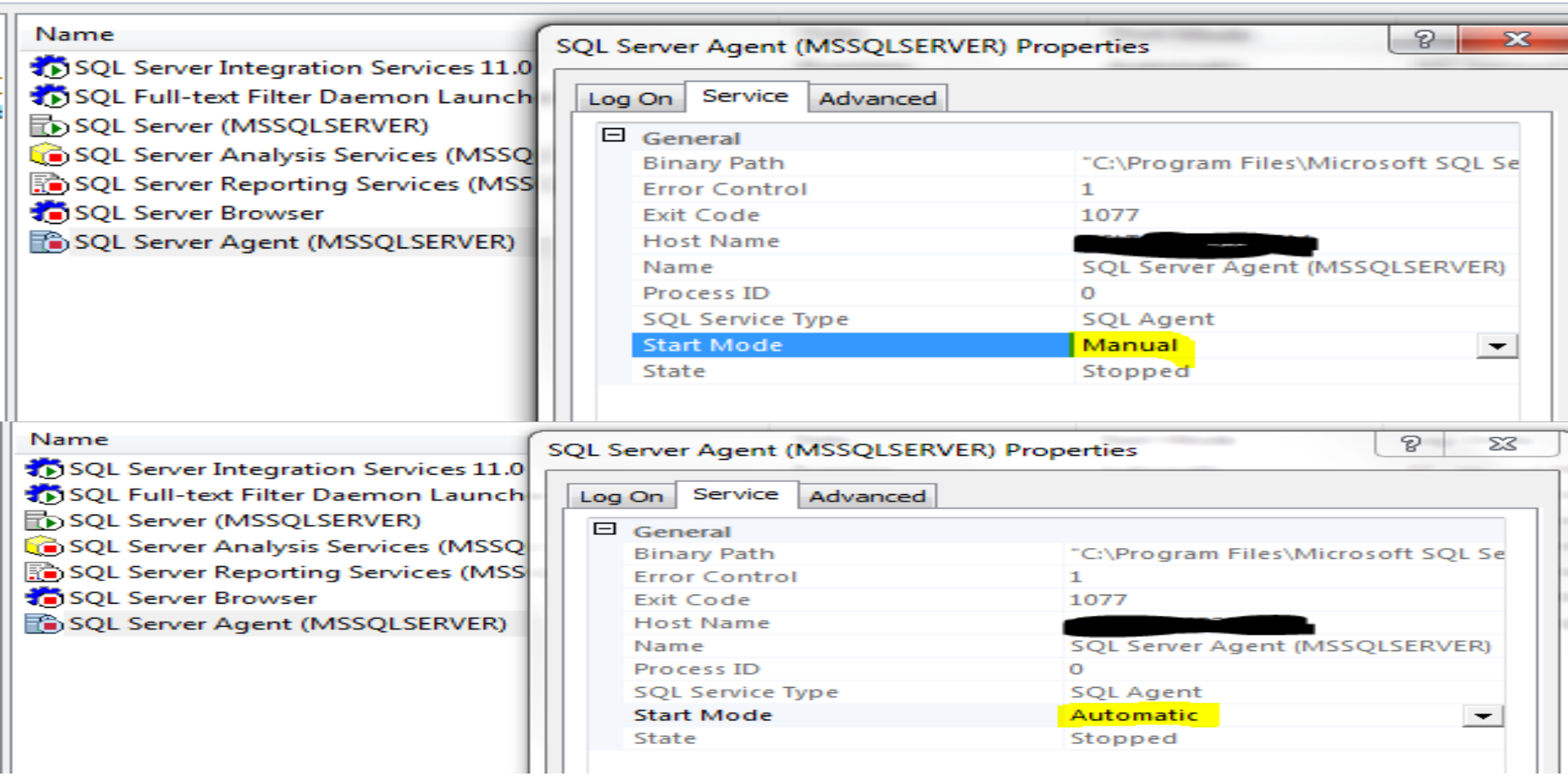
#1.2 Database mail



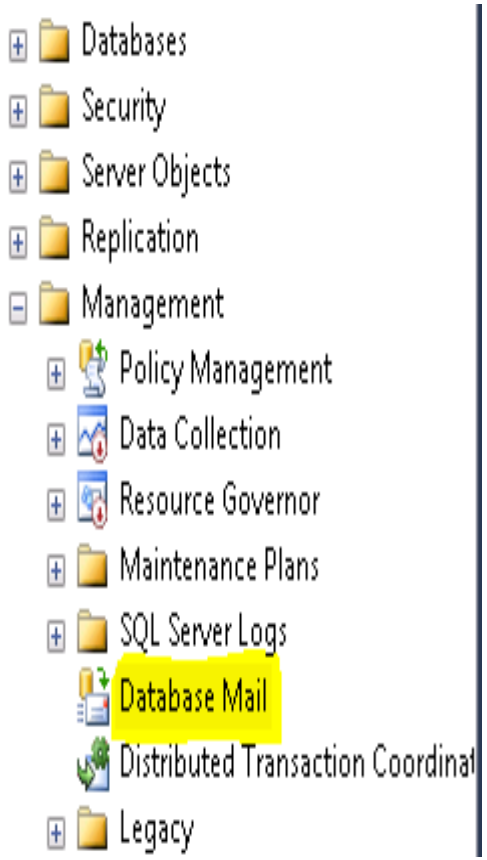
Right-Click on Database mail
Setup your profile



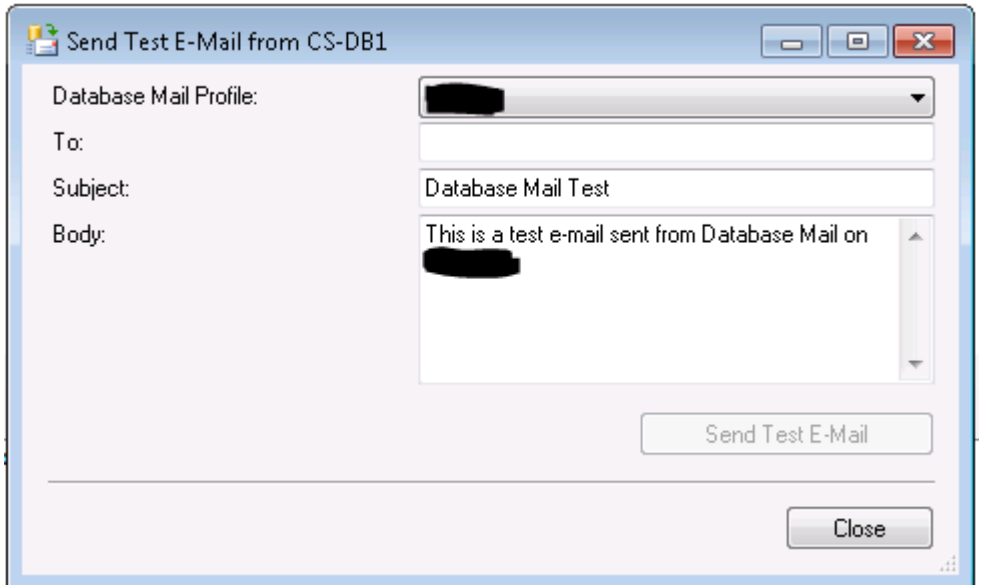
#1.3 Auto-Start SQL Server Agent



#1.4 Test Database mail



Right-Click on Database mail
Send Test E-Mail

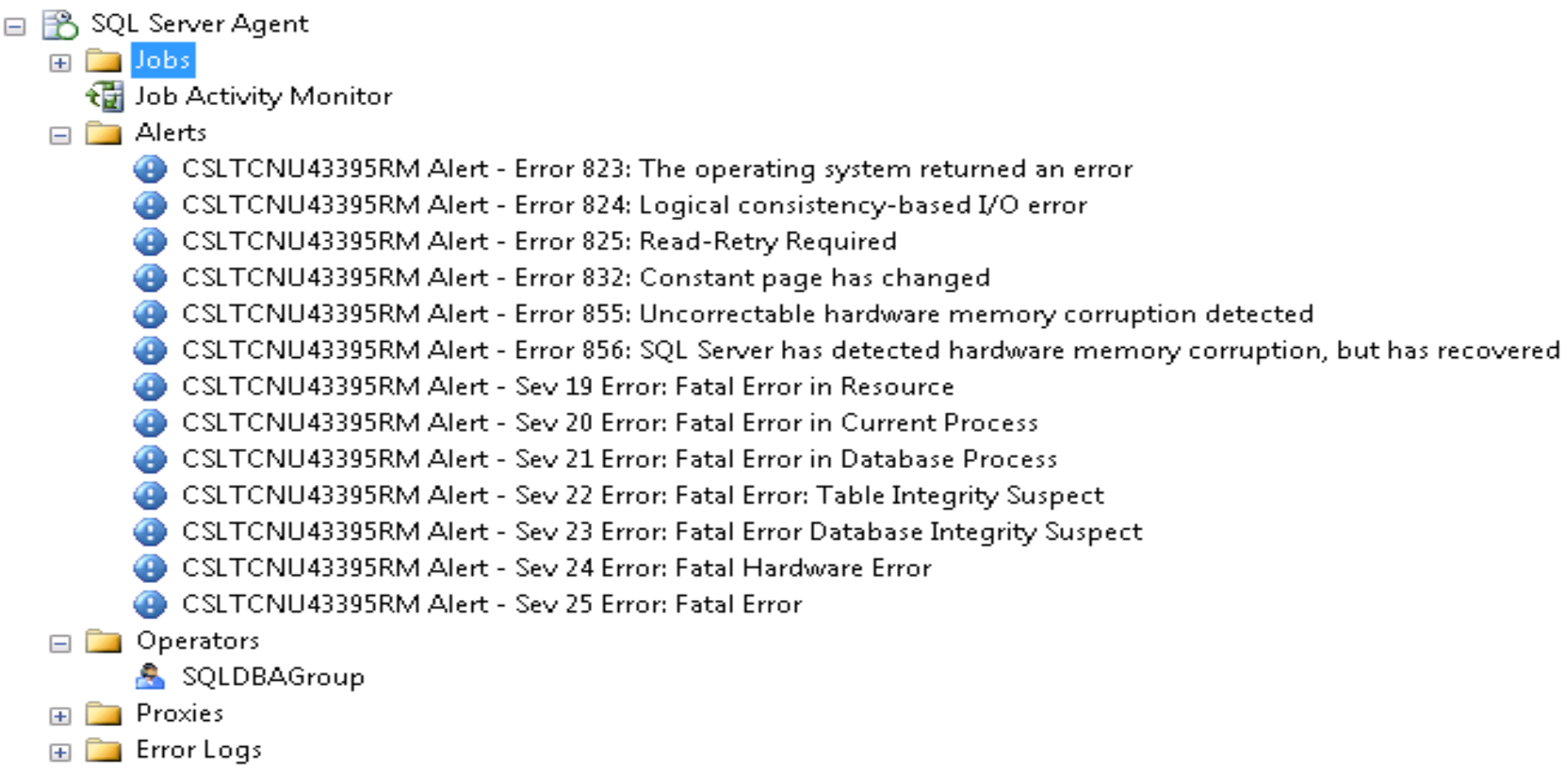


#2 Create Critical Alerts

- SQL Server is aware of database corruption as it happens, but if it isn't alerting you, how do you know it's there?
- Setting up alerts lets you know when it happens; receive an email upon SQL Server detecting it
- ***T-SQL to create the alerts***: See Reference
- ***Reference:***

http://www.sqlskills.com/blogs/glenn/creating-sql-server-agent-alerts-for-critical-errors/

#2.1 Critical Alerts



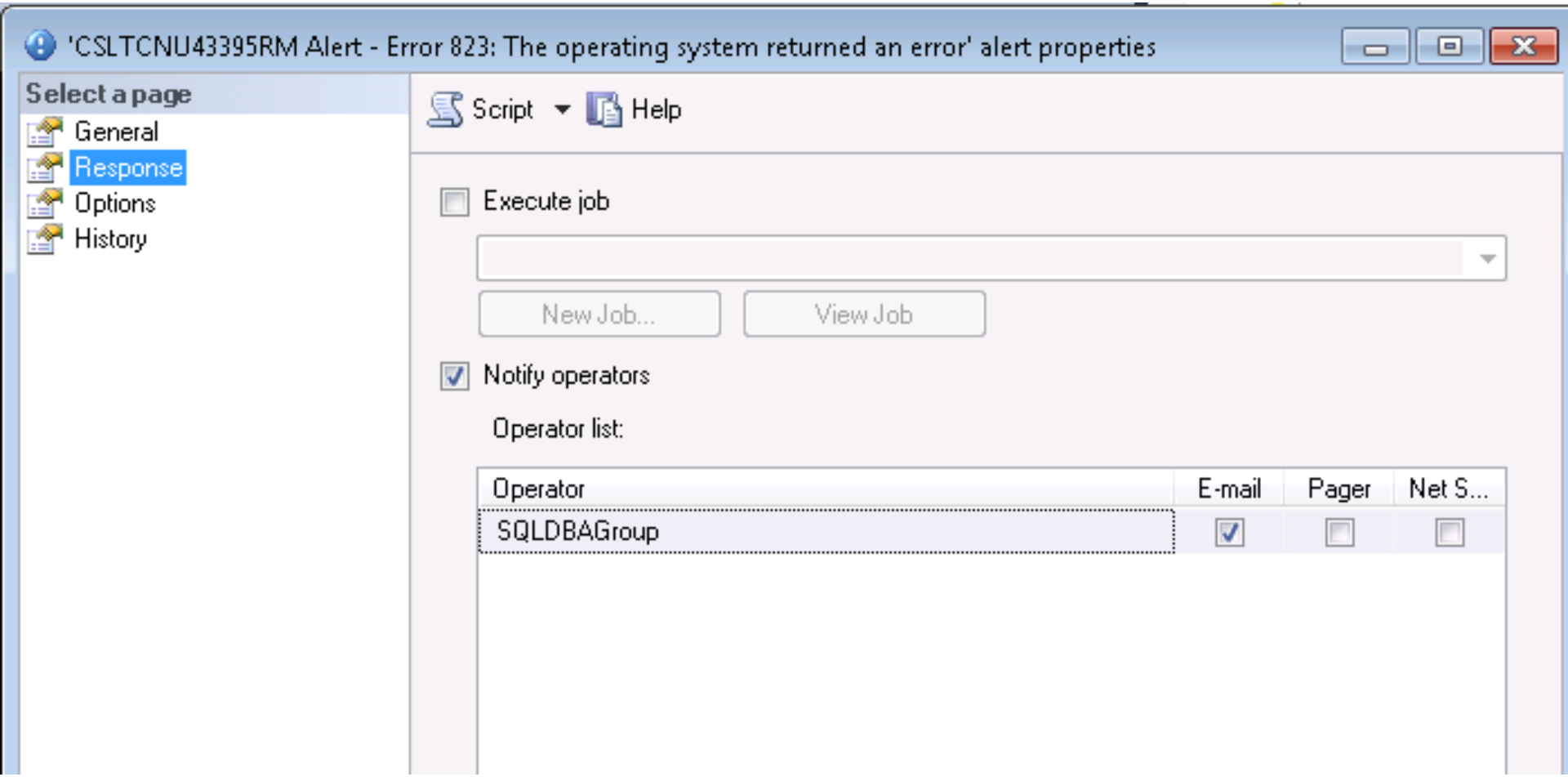
#3 Setup Alert Notifications

- Once the alerts are setup, you must tell SQL Server how you want to be notified.

- E-mail and the operator(s) to receive the message
- Pager <- Anyone carry a pager?

- This must be done for each alert

#3.1 Alert Notifications

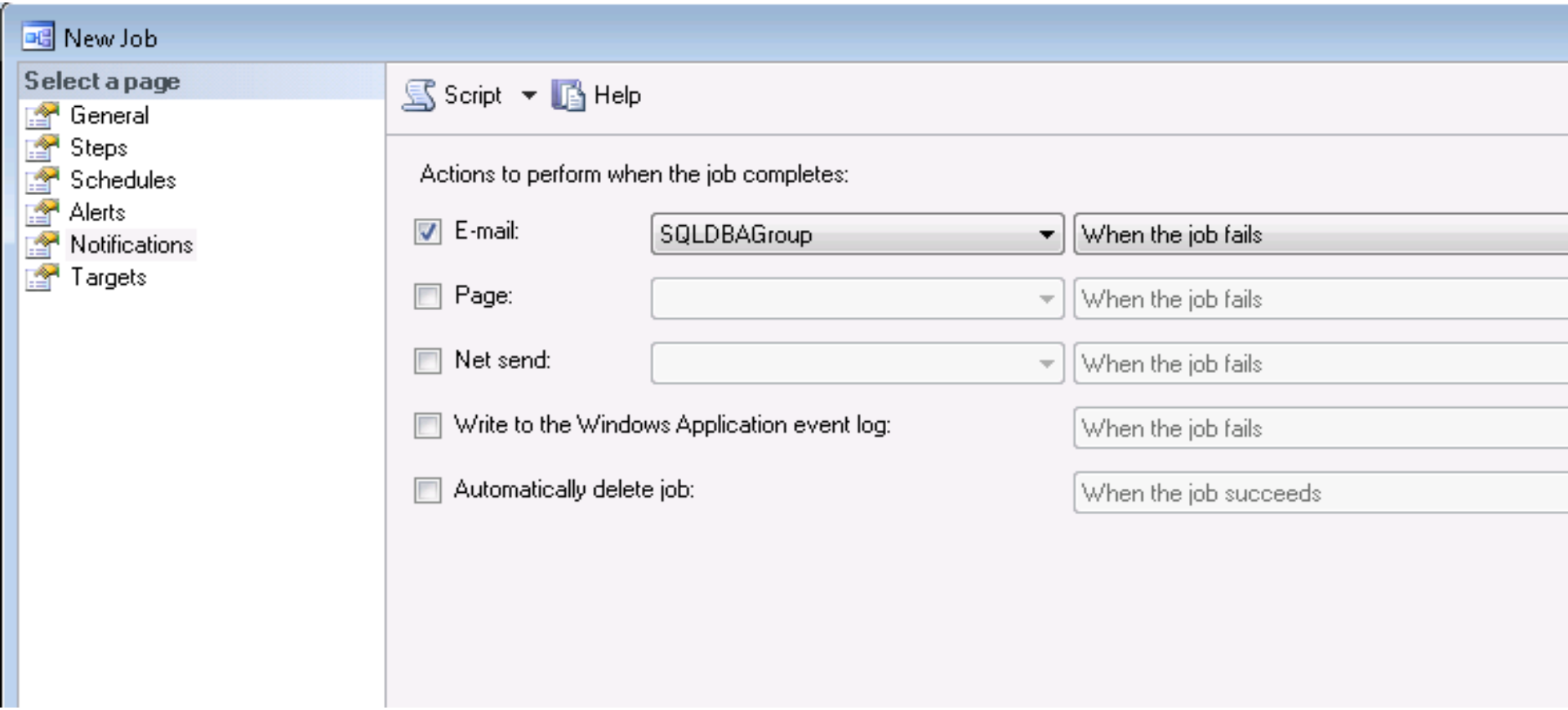


#4 Agent Jobs Failure

- Setup the same notifications on ALL Agent Jobs if they fail

- Know when:
- Backup Jobs fail
- DBCC CHECKDB fails
- Other housekeeping jobs fail

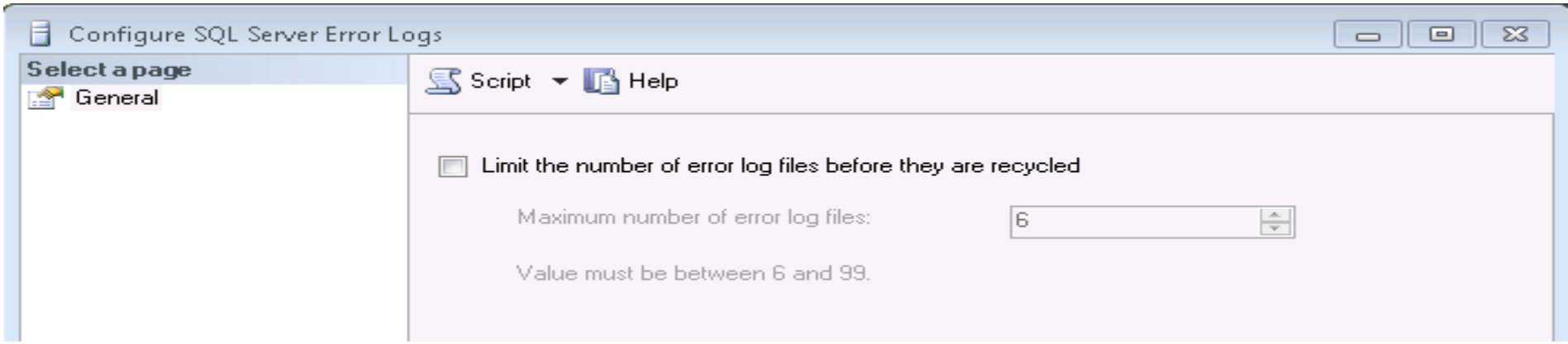
#4.1 Agent Jobs Failure

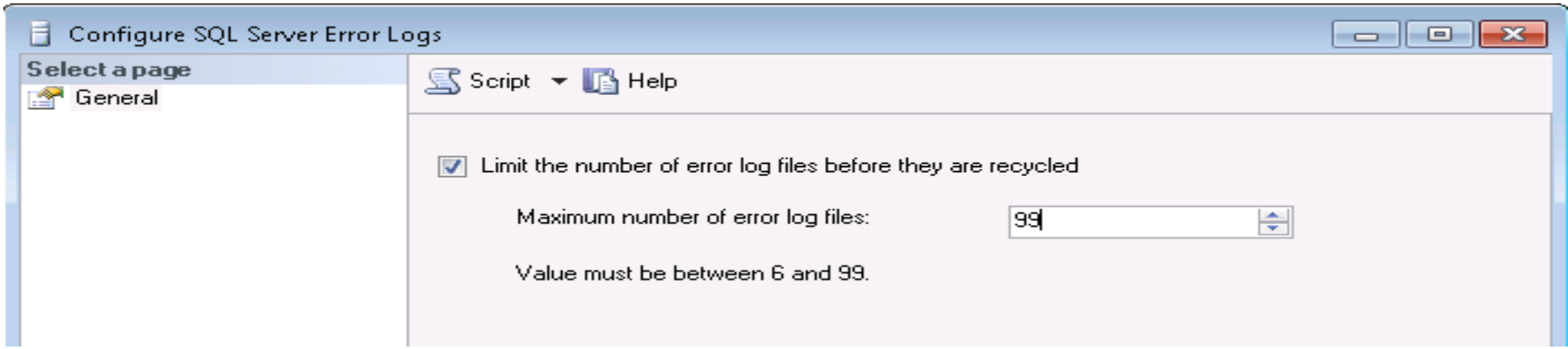


#5 SQL Error Logs

- This is an ERROR log, keep it as clean as possible
- Set to max # log files = 99 (#5.1)
- Recycle logs on a daily/weekly basis (#5.2)
- Read logs regularly (daily/weekly)
- If you need to go back further than 99 days to find an issue…you have bigger problems
- Set TF3226 to prevent backup database/log messages to go to logs (#5.3)
- Use SQL Server Configuration Manager to configure TF3226

#5.1 SQL Error Logs





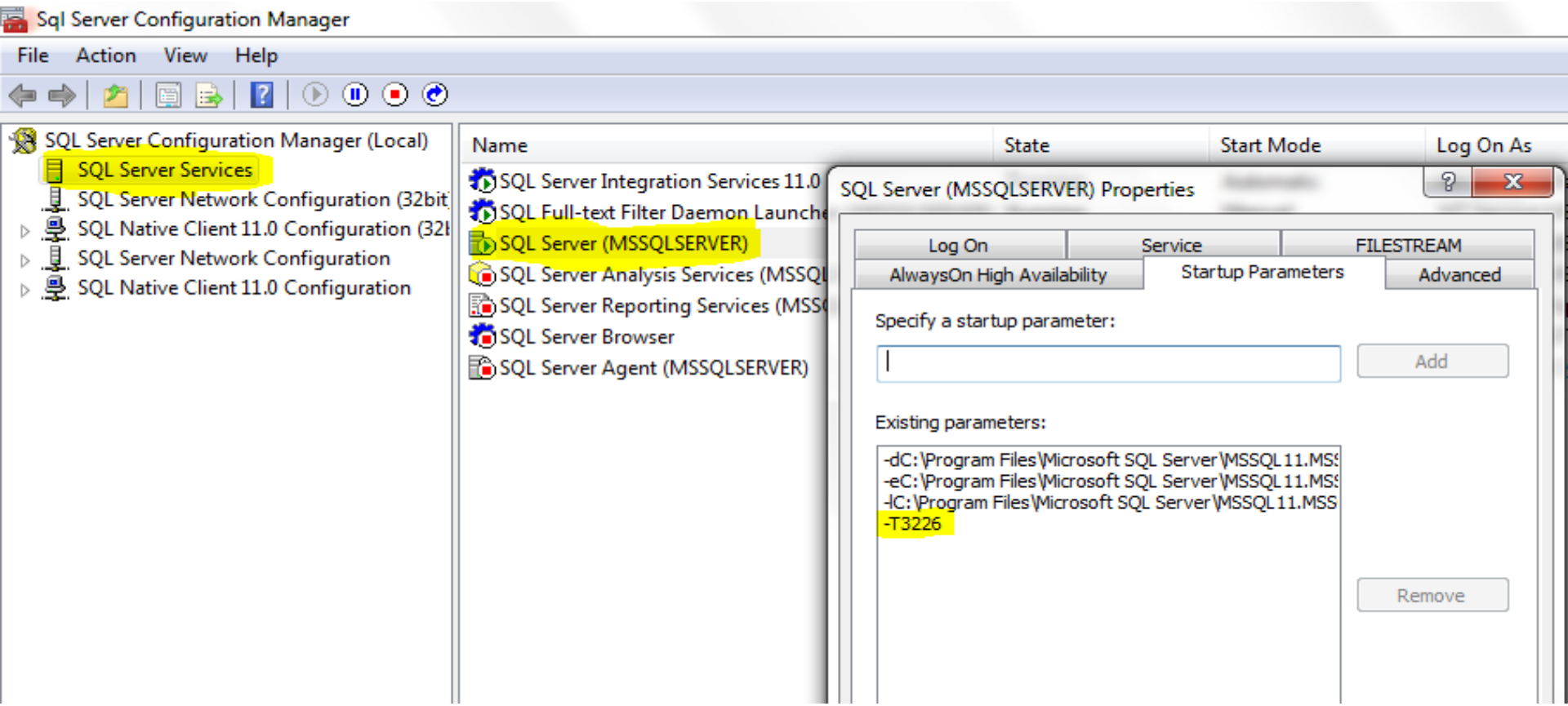
#5.2 SQL Error Logs

T-SQL:

```
USE master;
GO


-- cycle error log
EXEC sp_cycle_errorlog;
GO
```

#5.3 SQL Error Logs



#6 DBCC CHECKDB

- Run daily when possible
- Exception is when it doesn't run in your maintenance window

#7 Drive Space

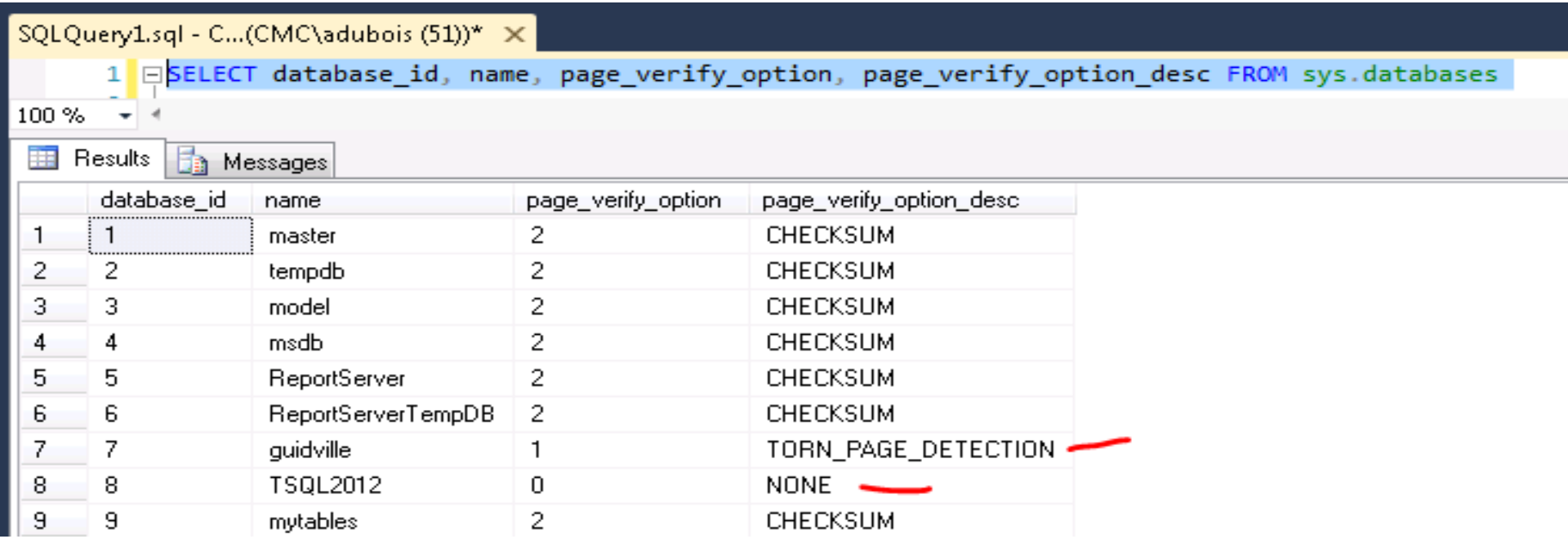
Don’t put databases on C:\

Don’t place backups on same drive as database!

Routinely Check Disk space on whatever drive you have Databases & Logs

#8 page_verify_option

SELECT database_id, name, page_verify_option, page_verify_option_desc FROM sys.databases



	database_id	name	page_verify_option	page_verify_option_desc
1	1	master	2	CHECKSUM
2	2	tempdb	2	CHECKSUM
3	3	model	2	CHECKSUM
4	4	msdb	2	CHECKSUM
5	5	ReportServer	2	CHECKSUM
6	6	ReportServerTempDB	2	CHECKSUM
7	7	guidville	1	TORN_PAGE_DETECTION
8	8	TSQL2012	0	NONE
9	9	mytables	2	CHECKSUM

#8.1 page_verify_option

```
SELECT database_id, name, page_verify_option, page_verify_option_desc
FROM sys.databases
WHERE page_verify_option_desc <> 'CHECKSUM'


USE [master];
GO

ALTER DATABASE [database-name]
SET PAGE_VERIFY CHECKSUM
WITH NO_WAIT;

GO
```

#8.2 page_verify_option

Setting the Page_verify_option is good.

However, you don’t have a checksum on any pages until they are written to disk.

Select doesn’t work (Reads Only)

Best way to get checksum? Re-index

#9 CHECKSUM

- CHECKSUM IS NOT ONLY FOR page_verify_option
- Use when backing up your databases

Reference:

http://www.sqlskills.com/blogs/paul/a-sql-server-dba-myth-a-day-2730-use-backup-with-checksum-to-replace-dbcc-checkdb/

http://sqlmag.com/blog/does-using-checksum-ensure-successful-backup

#10 T-Logs

- Make sure T-logs of databases in FULL recovery are being backed up

- Pre-size databases and Logs

Reference:

https://www.simple-talk.com/books/sql-books/sql-server-transaction-log-management-by-tony-davis-and-gail-shaw/

#10.1 T-Logs

```
1  use master; -- Change to Database you want to check
2  go
3
4  DBCC LOGINFO
5
6  -- OR you can do it this way
7  DBCC LOGINFO ('ZDBA_Utility')
```

100 %

Results | Messages

	RecoveryUnitId	FileId	FileSize	StartOffset	FSeqNo	Status	Parity	CreateLSN
1	0	2	253952	8192	37	0	128	0
2	0	2	253952	262144	38	2	128	0
3	0	2	286720	516096	36	0	64	0

#11 Routinely Test Restores

- Know where scripts to restore are
- Don’t have any hesitation with verifying scripts moving db and log to correct drive.
- Know what the script does
- Monitor how long it takes to restore a database…might you need to update SLA?

#11.1 Routinely Test Restores

Results | Messages

	DatabaseName	SLAType	IsCompressed	StartTime	EndTime	Total Time (Seconds)
1	WSS_UsageApplication	CHECKDB	0	2015-09-08 14:13:37	2015-09-08 14:19:42	365
2	WSS_UsageApplication	Restore	1	2015-09-08 14:06:08	2015-09-08 14:10:53	285
3	Word Automation	CHECKDB	0	2015-09-08 14:03:15	2015-09-08 14:03:15	0
4	Word Automation	Restore	1	2015-09-08 14:03:04	2015-09-08 14:03:05	1
5	WFResourceManagementDB	CHECKDB	0	2015-09-08 14:00:27	2015-09-08 14:00:28	1
6	WFResourceManagementDB	Restore	1	2015-09-08 14:00:06	2015-09-08 14:00:06	0
7	WFManagementDB	CHECKDB	0	2015-09-08 13:58:42	2015-09-08 13:58:43	1
8	WFManagementDB	Restore	1	2015-09-08 13:58:31	2015-09-08 13:58:31	0
9	WFInstanceManagementDB	CHECKDB	0	2015-09-08 13:57:22	2015-09-08 13:57:23	1
10	WFInstanceManagementDB	Restore	1	2015-09-08 13:57:13	2015-09-08 13:57:13	0
11	Sync	CHECKDB	0	2015-09-08 13:55:43	2015-09-08 13:55:56	13
12	Sync	Restore	1	2015-09-08 13:55:02	2015-09-08 13:55:13	11

#12 SLA

- Meeting with managers and end-users
- Determine SLA which consists of
- RTO – Recovery Time Objective
- RPO – Recovery Point Objective

- Know when to try and repair vs when to restore from backup.

#13 Monitor

- Benchmark your system
- Continue to monitor
- Might be possible to see a problem before it strikes

#14 NEVER EVER

- **When you are having problems**

- NEVER EVER Just Start during emergency! Grab a cup of coffee first!
- NEVER EVER Detach a Database
- NEVER EVER Reboot SQL or machine
- NEVER EVER Remove (Delete) the Log File
  - http://www.sqlskills.com/blogs/paul/a-sad-tale-of-mis-steps-and-corruption-from-today/
- NEVER EVER Make modifications to a database without an up to the minute backup (If backup is possible)

- http://www.sqlskills.com/blogs/paul/corruption-last-resorts-that-people-try-first/
- http://www.sqlskills.com/blogs/paul/technet-magazine-february-2009-sql-qa-column/

- NEVER EVER DO ANYTHING IF YOU AREN'T 100% SURE YOU KNOW WHAT THE COMMAND DOES

#15 Practice

Introducing the Database corruption challenge

Steve Stedman

Stevestedman.com

@SQLEMT

http://stevestedman.com/2015/04/introducing-the-database-corruption-challenge-dbcc-week-1-challenge/

Russ Thomas Challenge

https://sqljudo.wordpress.com/monthly-dba-challenge/

BONUS

- This is a performance tip, but recovering your database log as fast as possible is important
- What are VLF's and why should I care?
- Set your default auto-grow to fixed length not default %
- Pre-size your database and logs – Capacity Planning.
- Logs:
- Adding < 64 MB = 4 VLFs
- Adding < 1GB = 8 VLFs
- Adding > 1GB = 15 VLFs
- NO Magic # of VLFs that you should try to achieve? For example: Any logs > 50 VLFs (Not a hard number) should be looked at and determine if you have log file growth set up correctly
- References:
- http://www.sqlskills.com/blogs/kimberly/transaction-log-vlfs-too-many-or-too-few/
- http://www.sqlskills.com/blogs/kimberly/8-steps-to-better-transaction-log-throughput/

Double BONUS

- Before you have a problem, know where to find additional help
- #SQLHelp
- Find a consultant you trust

Resources

Pond's Twelfth Law: In Your Pursuit of Five Nines, Don't Practice in Front of the CIO
http://blogs.technet.com/b/wardpond/archive/2009/09/09/pond-s-twelfth-law-in-your-pursuit-of-five-nines-don-t-practice-in-front-of-the-cio.aspx

Glenn Berry on Pluralsight
Glenn Berry on Simple Talk
https://www.simple-talk.com/sql/database-administration/provisioning-a-new-sql-server-instance-–-part-one
https://www.simple-talk.com/sql/database-administration/provisioning-a-new-sql-server-instance-%e2%80%93-part-two/
https://www.simple-talk.com/sql/database-administration/provisioning-a-new-sql-server-instance-%e2%80%93-part-three/

Paul Randal on Pluralsight
SQLSkills.com

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