Introduction to Database Corruption

WHEN CORRUPTION STRIKES, WILL YOU BE READY?

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Introducing our New Customer Account Manager

Kiana Bergsma
Kiana@StedmanSolutions.com

Will be screening questions during the session.

If you are a winner in the prize giveaway, she will be contacting you.

Prize Giveaway followed by Questions and Answers

We will be **giving away** 3 daily checkup subscriptions:

- 3-month subscription - a value of $300
- 6-month subscription - a value of $600
- 9-month subscription - a value of $900

Q&A after the prize giveaway

Agenda

Corruption Stories

Causes of corruption

Differences between corruption and ransomware

Preventing / reducing corruption

If you need help

Corruption Stories

Corruption Stories

TWICE FIXED

80+ tables corrupt.

All corruption was in recently updated areas.

Initial repair took about 36 hours.

As we repaired corruption in one table, other tables became corrupt.

Started on Thursday night, done by 6:00pm on Sunday.

Cause of corruptions was a bad switch between the SQL Server and the SAN.

THANKSGIVING

Reported Wednesday of Thanksgiving week. Unknown how long it had been corrupt.

Corruption in system tables prevented backups from being run.

Production and assembly lines were closed over holiday weekend.

We fixed it over Thanksgiving weekend, ready to go by Monday.

Not fixing would have shut down their production process.

Corruption Stories

HEALTHCARE

Just before New Years Eve: Medical clinic 100% down due to corrupt system tables.

Initial corruption occurred Christmas eve, but not detected due to holidays and no CheckDB alerting.

Could not run backups, could not run CheckDB.

Started on Tuesday night 6:00pm, complete by 9:00am Wednesday morning.

VM HOST ISSUES

Several tables corrupt.

We did the repair, and the corruption returned.

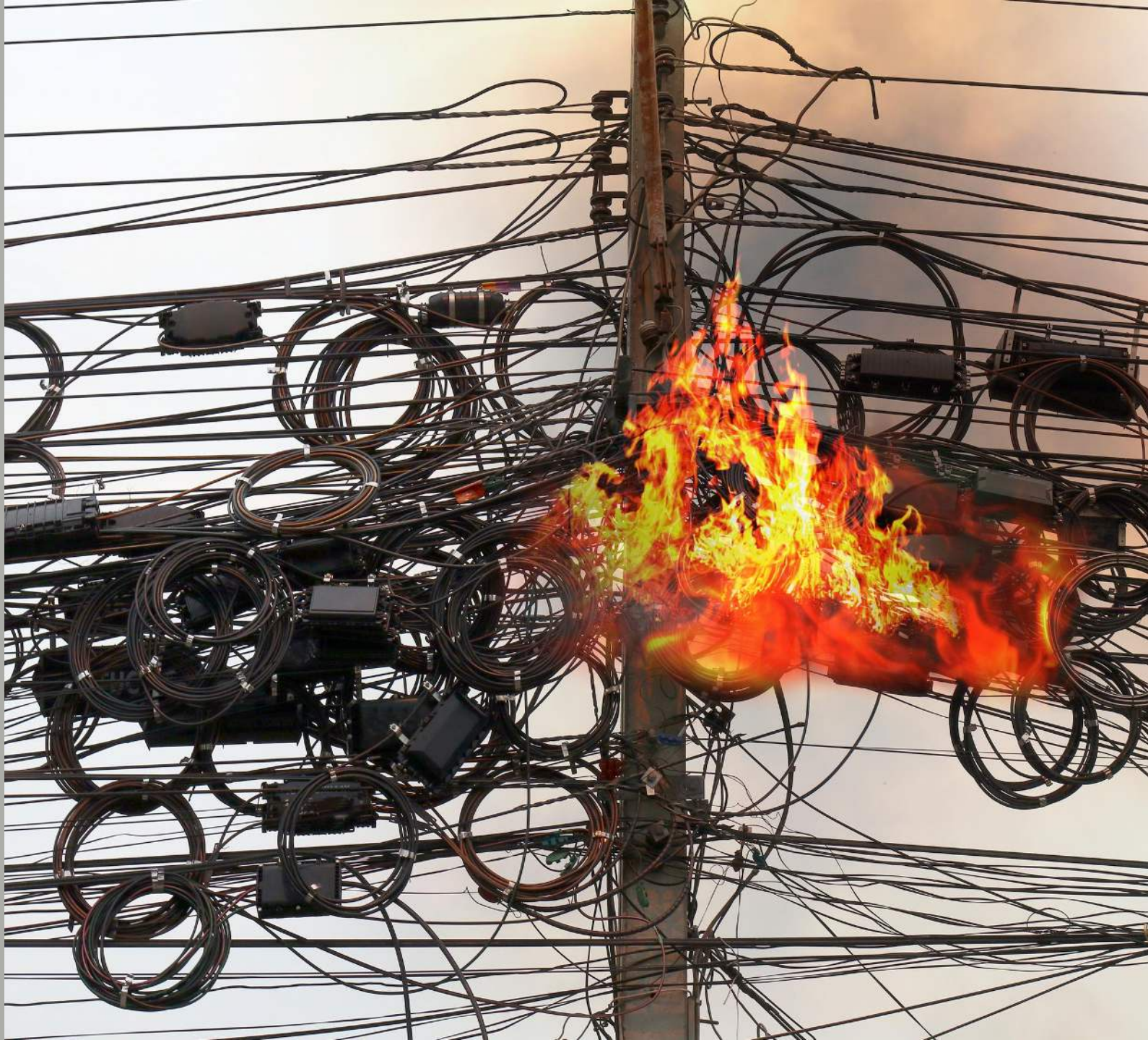
Discovered that every time we ran CheckDB, it was reporting a different table as being corrupt.

Data was loading, but quite often took several retries to get it from disk.

After days of troubleshooting, we moved the VM from one HyperV host to another. Corruption went away.

Moved test server back to original server corruption encountered.

Causes of Database Corruption



Causes of Database Corruption

- Lightning Storm
- Drive failures in network room next to next to train tracks
- Janitor / Vacuum cleaner
- Network switch errors
- Drive Failure

- Most of the time it is problems with I/O.

Difference between corruption and complete drive failure

Drive failure sometimes appears like a corrupt database.

- Worked with a medical group who had what appeared to be a corrupt database.
- Further investigation revealed a RAID 50 array holding the disk for the virtual machine that had multiple drive failures.
- It turns out one of the raid stripes was completely missing and damaged.
- Client had no backup, they later discovered they had a backup from over 6 months ago.
- Nothing we could do from the database perspective, roughly 20% of every large file on the drive was missing.
- This was drive failure, the data was just completely gone. No option for repair from the database side of things.

ERROLOG.1 - Notepad

Edit Format View Help

-05-11 22:06:23.60 spid142 The client was unable to reuse a session with SPID 142, which had been reset for connection pooling. The failure ID is 29. This error may have been caused by an earlier operation failing. Check the logs for failed operations immediately before this error messag

-05-11 22:25:58.28 spid137 Error: 18056, Severity: 20, State: 29.

-05-11 22:25:58.28 spid137 The client was unable to reuse a session with SPID 137, which had been reset for connection pooling. The failure ID is 29. This error may have been caused by an earlier operation failing. Check the logs for failed operations immediately before this error messag

-05-11 22:26:13.29 spid137 Error: 18056, Severity: 20, State: 29.

-05-11 22:26:13.29 spid137 The client was unable to reuse a session with SPID 137, which had been reset for connection pooling. The failure ID is 29. This error may have been caused by an earlier operation failing. Check the logs for failed operations immediately before this error messag

-05-11 22:00:57.70 spid137 This instance of SQL Server has been using a process ID of 1924 since 4/12/2017 11:26:03 AM (local) 4/12/2017 6:26:03 PM (UTC). This is an informa

-05-12 19:30:04.57 spid124 Error: 18056, Severity: 20, State: 29.

-05-12 19:30:04.57 spid124 The client was unable to reuse a session with SPID 124, which had been reset for connection pooling. The failure ID is 29. This error may have been caused by an earlier operation failing. Check the logs for failed operations immediately before this error messag

Confusion With Database Corruption

A full backup and restore of a corrupt database may help fix the corruption.

- FALSE. When you do a full backup a database, the corruption is backed up also. (If you can take a backup)

Rebooting the SQL Server may help with the corruption.

- FALSE. Once the file is corrupt a reboot will not help. It may make things worse.

If I just ignore the corruption it may go away or fix itself.

- UNLIKELY. If your regular process truncates the table with the corruption, then it may go away… Otherwise, very unlikely.

Detecting Corruption

Detecting Corruption

- DBCC CheckDB

```
DBCC CheckDB();
```

100 %

Messages

```
There are 0 rows in 0 pages for object "sys.sqlagent_jobs".
DBCC results for 'sys.sqlagent_jobsteps'.
There are 0 rows in 0 pages for object "sys.sqlagent_jobsteps".
DBCC results for 'sys.sqlagent_job_history'.
There are 0 rows in 0 pages for object "sys.sqlagent_job_history".
DBCC results for 'sys.sqlagent_jobsteps_logs'.
There are 0 rows in 0 pages for object "sys.sqlagent_jobsteps_logs".
Msg 8944, Level 16, State 13, Line 1
Table error: Object ID 245575913, index ID 1, partition ID 72057594040614912, alloc un
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Table error: Object ID 245575913, index ID 1, partition ID 72057594040614912, alloc un
Msg 8928, Level 16, State 1, Line 1
Object ID 245575913, index ID 1, partition ID 72057594040614912, alloc unit ID 7205759
Msg 8976, Level 16, State 1, Line 1
Table error: Object ID 245575913, index ID 1, partition ID 72057594040614912, alloc un
DBCC results for 'Revenue'.
There are 27 rows in 1 pages for object "Revenue".
CHECKDB found 0 allocation errors and 4 consistency errors in table 'Revenue' (object
DBCC results for 'sys.queue_messages_1977058079'.
```

Detecting Corruption

- DBCC CheckDB
- DBCC CheckTable

```
DBCC CheckTable(Revenue);
```

100 %

Messages

```
Msg 8944, Level 16, State 13, Line 8
Table error: Object ID 245575913, index ID 1, partition ID 72057594040614912, alloc ur
Msg 8944, Level 16, State 13, Line 8
Table error: Object ID 245575913, index ID 1, partition ID 72057594040614912, alloc ur
Msg 8928, Level 16, State 1, Line 8
Object ID 245575913, index ID 1, partition ID 72057594040614912, alloc unit ID 7205759
Msg 8976, Level 16, State 1, Line 8
Table error: Object ID 245575913, index ID 1, partition ID 72057594040614912, alloc ur
DBCC results for 'Revenue'.
There are 27 rows in 1 pages for object "Revenue".
CHECKTABLE found 0 allocation errors and 4 consistency errors in table 'Revenue' (obje
repair_allow_data_loss is the minimum repair level for the errors found by DBCC CHECKT
DBCC execution completed. If DBCC printed error messages, contact your system administ
```

Detecting Corruption

- DBCC CheckDB
- DBCC CheckTable
- DBCC Check_____
  (Constraints, Catalog,
  Alloc, FileGroup, Ident)

Detecting Corruption

- DBCC CheckDB
- DBCC CheckTable
- DBCC Check_____
- msdb..suspect_pages

```
SELECT * FROM msdb..suspect_pages;
```

.00 %

Results | Messages

	database...	file_id	page...	event_ty...	error_co...
1	11	1	244	4	8
2	11	1	244	1	4

Detecting Corruption

- DBCC CheckDB
- DBCC CheckTable
- DBCC Check_____
- msdb..suspect_pages
- Just running a query may show corruption.

```
SELECT *
    FROM Revenue;
```

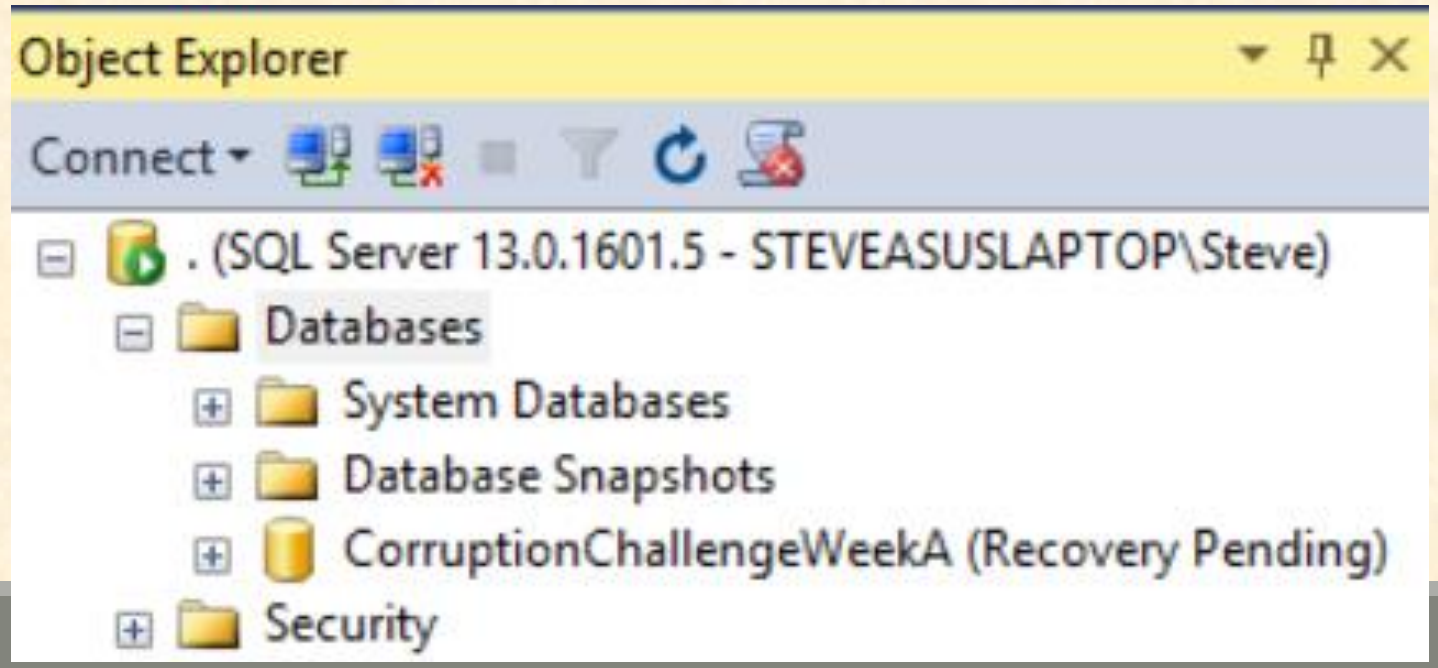
100 %

Results | Messages

```
Msg 824, Level 24, State 2, Line 2
SQL Server detected a logical consistency-based I/O error: invalid protection
option. It occurred during a read of page (1:244) in database ID 9 at offset
0x000000001e8000 in file 'C:\SQL_DATA\CorruptionChallenge2.mdf'.  Additional
messages in the SQL Server error log or system event log may provide more detail.
This is a severe error condition that threatens database integrity and must be
corrected immediately. Complete a full database consistency check (DBCC CHECKDB).
This error can be caused by many factors; for more information, see SQL Server
Books Online.
```

Detecting Corruption

- DBCC CheckDB
- DBCC CheckTable
- DBCC Check_____
- msdb..suspect_pages
- Just running a query may show corruption.
- Recovery Pending or Suspect



YOUR FILES ARE ENCRYPTED
Your photos, documents and other important
files have been encrypted with unique key,
generated for this computer.
NEXT

Ransomware

Differences between corruption and Ransomware

Corruption

- Something we can usually fix.
- Parts of the data file may be destroyed, or corrupt.

Ransomware

- Entire file encrypted.
- Backups are the best option. Good backups.
- Paying the ransom may not help. It appears some of the ransomware doesn’t do a very good job unencrypting really big files.

Differences between corruption and Ransomware

Corruption

- We can help with the repair.
- May not need backups.

Ransomware

- We can help you restore backups.
- May be no options without backups.
- May require offsite backups to recover.

Prevention

Preventing and Detecting Corruption

No way to completely prevent

Goals:

- Reduce the likelihood
- Increase the change of survival

Regular CheckDB

Regular CheckDB

- As often as possible
- All databases

Alerting on CheckDB Failures

- Email and text notification
- Something that won’t get buried in other alerts

Immediate Response

- React as though your job depends on it
- Could be a resume generating event (RGE)

Alerting on known errors

Errors 823, 824, 825

- Email notification and text messaging.
- These are very serious.

Severity 22 – 25 errors

- Serious.
- 19 to 25 is good, but you may get some false positives.

Immediate Response

- React as though your job depends on it
- Could be a resume generating event (RGE)

Updates

- Firmware Updates
- Windows Updates
- SQL Server Updates

Reducing impact

- SQL backups
- VM / System backups
- Backups must be confirmed good, recent and tested

Virtualization and Storage

- Notification on alerts
- Don’t rely solely on VM backups, like Veeam
- Do you have insight into these systems?
- Do you have hardware/software support?

When Corruption Strikes

DO NOT USE REPAIR_ALLOW_DATA_LOSS

- REPAIR_ALLOW_DATA_LOSS Just throws data away on corrupt pages.

- Okay to use on a copy of a database, but not on your production system.
- Never use on CHECKDB. You may be missing more data than you expect when it is done.
- If you do have to use it, only use on CHECKTABLE once you have rescued any data from the table.

What if we get hit with corruption

- Do not reboot
- Do not restart the SQL instance
- Are my backups working?
- When was the last pre-corruption backup?
- Consider just going to the pre-corruption backup if business case would allow it.
- Can you reply transaction logs to get past corruption?

What if we get hit with corruption

- Don’t let stress drive your decision process.

Can I Get a “Do Over”?

What if you go through the whole process, but determine that part of your cleanup lost that could have been saved in the beginning?

Before Fixing or Removing Corruption

- Do you have a way to start over if something goes wrong?
- Do you have a backup of the current state?
- If your solution is going to cause data loss, can you save anything before causing that data loss?
- Do you have someone to review your ideas before proceeding?

Reducing Risk

WHAT CAN I DO?

01

Practice your database restores, including transaction logs and diffs.

02

Practice VM restores.

03

Practice repair: Database Corruption Challenge

Practice, Practice, Practice

If you need help

Contact Stedman Solutions

Review your plan with someone else

Ask for help if you need it

Prize Giveaway

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- 9-month subscription - a value of $900

Q&A after the prize giveaway

For the winners, expect an email from Kiana. If you don't hear from her, please reach out:

Kiana@StedmanSolutions.com

Q&A

Thanks for attending. Stay tuned for future sessions.

Recording will be available for a limited time.

Related Links:

- http://SteveStedman.com
- http://StedmanSolutions.com
- http://stevestedman.com/server-health/database-corruption-challenge/

Any Questions?