



BRENT OZAR
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Deduping & Eliminating: Index Tools And Their Weaknesses

It's just reads and writes, right?
How bad can it be?

1.3 p1

Agenda

The two SQL Server index usage views:

- By plan: sys.dm_db_index_usage_stats
- By index: sys.dm_db_index_operational_stats

Why they're not as accurate as you might suspect

How sp_BlitzIndex shows the results

How I interpret the results to do the D.E. parts



1.3 p2

SQL Server has a lot of metrics.

Old-school, operating system level: Perfmon counters

System & database level: “system tables & views”

- Dynamic Management Views (DMVs)
- Dynamic Management Functions (DMFs)

Tracing: Profiler, Extended Events



1.3 p3

Dynamic Management Views

The good:

- Well-documented by both Microsoft and blogs
- It's easy to find scripts and tools that use 'em

The bad:

- A lot of the user-written documentation is wrong
- Many of the DMVs don't mean what you think
- Contents can reset at surprising times
- Hit-or-miss coverage in Azure, keeps changing



1.3 p4

sys.dm_db_index_usage_stats

Shows # of executions where a plan included an operator

- Does NOT show if the operator was used (or how often it was accessed)

Number and last date of reads (seeks, scans, lookups)

Number and last date of last write

- Insert/update/deletes all called “updates”

Data is since startup or when the index was modified



1.3 p5

sys.dm_db_index_operational_stats

Lower level, more transitory

Lock waits (page and row)

Access counts

- Doesn't distinguish between full scans/range scans, or even range scans and seeks

Data only persisted while object's metadata is in memory

No good way when to tell it was last cleared



1.3 p6

A lot of tools use this data.

T-SQL scripts: sp_BlitzIndex, sp_HelpIndex, Glenn Berry's DMV scripts

Apps: SentryOne Plan Explorer, lots of monitoring tools like Quest Spotlight, Red Gate SQL Monitor

You may have written your own scripts too
(let's be honest, you copied it from someone else's online, and you don't really know what it's doing)



1.3 p7

I'm going to be using my favorite.

sp_BlitzIndex in the First Responder Kit:

- Github repo: [FirstResponderKit.org](https://github.com/BrentOzar/FirstResponderKit)
- Zip download: BrentOzar.com/first-aid
- Slack chat: SQLslack.com, #FirstResponderKit

Lots of code contributors, used all over the world

Open source, free as in speech, MIT License



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1.3 p9

What this means

You can deploy this anywhere, forever, for free.

No one can take it from you.

You can use it at clients or other companies.

You can even take the code and use it in products.



1.3 p10

Running it for one table: sp_BlitzIndex @TableName = 'Users'

sp_BlitzIndex @TableName = 'Users'

100 %

Results Messages

	Details: db, schema/table/index/colname	Definition: (Property) ColumnName (datatype, maxbytes)	Source Column	Fillfactor	Usage Stats	Op Stats
1	Database [StackOverflow] as of 2017-11-21 20:36 (sp_...)	http://FirstResponderKit.org	From Your Community Volunteers	NULL	NULL	NULL
2	dbo.Users PK, Users_Id (1)	[CQ] [PK] [1 KEY] Id (int 4)		0	Reads: 24 (24 lookups) Writes: 0	23 singleton lookups, 0 scans/seeks, 0 deletes
3	dbo.Users (X, LastAccessDate (4))	[1 KEY] LastAccessDate (datetime 8)	[1 KEY] Id (int 4)	0	Reads: 0 Writes: 0	0 singleton lookups, 0 scans/seeks, 0 deletes
4	dbo.Users (X, LastAccessDate, DisplayName, Reputation...)	[3 KEYS] LastAccessDate (datetime 8), DisplayName...	[1 KEY] Id (int 4)	0	Reads: 24 (24 scans) Writes: 0	0 singleton lookups, 24 scans/seeks, 0 deletes
5	dbo.Users (X, Reputation, Includes (2))	[1 KEY] Reputation (int 4) [1 INCLUDE] Views (int 4)	[1 KEY] Id (int 4)	0	Reads: 0 Writes: 0	0 singleton lookups, 0 scans/seeks, 0 deletes
6	dbo.Users (X, Views, Includes (3))	[1 KEY] Views (int 4) [1 INCLUDE] Reputation (int 4)	[1 KEY] Id (int 4)	0	Reads: 0 Writes: 0	0 singleton lookups, 0 scans/seeks, 0 deletes

Finding	URL	Estimated Benefit	Missing Index Request	Estimated Impact	Create TSQL
1 Missing index	http://BrentOzar.com/go/indexaphobia	[StackOverflow].[dbo].[Users] Est. Benefit: 505...	EQUALITY: [DisplayName]	24 users, Impact: 100.0%, Avg query cost: 44.2351	CREATE INDEX [ix_Users_DisplayName] ON [Stack...

	Column Name	Found In	Type	Computed?	Length (max bytes)	Prec	Scale	Nullable?	Identity?	Replicated?	Spars?	Filestream?	Collation
1	Id	4	int		4		10	0		yes			NULL
2	/aboutMe	0	nvarchar (max)		1		0	0	yes				SQL_Latin1_General_CP1_CS_AS
3	Age	0	int		4		10	0	yes				NULL
4	CreationDate	0	datetime		8		23	3					NULL
5	DisplayName	1	nvarchar (40)		80		0	0					SQL_Latin1_General_CP1_CS_AS
6	DownVotes	0	int		4		10	0					NULL

Finding

1 No foreign keys

Running it for one table: sp_BlitzIndex @TableName = 'Users'

sp_BlitzIndex @TableName = 'Users'

100 %

Results Messages

	Details: db, schema/table/index/foreignid	Definition: [Property] ColumnName: (datatype, maxbytes)	Source Column	Fillfactor	Usage State	Op State
1	Database [StackOverflow] as of 2017-11-21 20:36 (sp_...)	http://FirstResponderKit.org	From [User] Community Volunteer	NULL	NULL	NULL
2	dbo.Users PK, Users_Id (1)	[CQ] [PK] (1 KEY) Id (int 4)		0	Reads: 24 (24 lookups) Writes: 0	23 singleton lookups, 0 scans/seek, 0 deletes
3	dbo.Users (X, LastAccessDate) (4)	[1 KEY] LastAccessDate (datetime 8)		0	Writes: 0	0 singleton lookups, 0 scans/seek, 0 deletes
4	dbo.Users (X, LastAccessDate, DisplayName, Reputation) (3 KEYS)	LastAccessDate (datetime 8), DisplayName (nvarchar(40)), Reputation (int 4) (1 INCLUDE) Views (int 4)		0	Reads: 24 (24 scans) Writes: 0	0 singleton lookups, 24 scans/seek, 0 deletes
5	dbo.Users (X, Reputation, Includes) (2)	[1 KEY] Reputation (int 4) (1 INCLUDE) Views (int 4)		0	Writes: 0	0 singleton lookups, 0 scans/seek, 0 deletes
6	dbo.Users (X, Votes, Includes) (3)	[1 KEY] Votes (int 4) (1 INCLUDE) Reputation (int 4)	[1 KEY] Id (int 4)	0	Reads: 0	Writes: 0

Result set 1: Index definitions

Finding	URL	Estimated Benefit	Missing Index Request	Estimated Impact
1	Missing index: http://BrentOzar.com/go/indexaphobia	[StackOverflow].[dbo].[Users] Est. Benefit: 505...	EQUALITY: [DisplayName]	24 users, Impact: 100.0%, Avg query cost: 4...

2: Missing indexes

Column Name	Found In	Type	Computed?	Length (max bytes)	Prec	Scale	Nullable?	Identity?	Replicated?	Spase?	Filestream?	Collation
1	Id	int		4				yes				NULL
2	/aboutMe	nvarchar(max)		1								SQL_Latin1_General_CP1_CS_AS
3	Age	int		4								NULL
4	CreationDate	datetime		8								NULL
5	DisplayName	nvarchar(40)		80								SQL_Latin1_General_CP1_CS_AS
6	DownVotes	int		4								NULL

3: Columns & data types

Finding: No foreign keys

4: Foreign keys

Dedupe/eliminate: focus on set 1.

sp_811tzIndex @TableName = 'Users'

100 %

Results Messages

	Details: db.schema.table.index (index)	Definition: [Property] ColumnName (datatype, nullable)	Source Column	Fillfactor	Usage Stats	Op Stats
1	Database [StackOverflow] as of 2017-11-21 20:36 (sp_811tzIndex)	http://FirstResponderKit.org	From Your Community Volunteers	NULL	NULL	NULL
2	dbo.Users PK_Users_Id (1)	[CQ] [PK] [1 KEY] Id (int 4)		0	Reads: 24 (24 lookups) Writes: 0	23 singleton lookups; 0 scans/weeks; 0 deletes
3	dbo.Users IX_LastAccessDate (4)	[1 KEY] LastAccessDate (datetime 8)	[1 KEY] Id (int 4)	0	Reads: 0 Writes: 0	0 singleton lookups; 0 scans/weeks; 0 deletes
4	dbo.Users IX_LastAccessDate_DisplayName_Reputation	[3 KEYS] LastAccessDate (datetime 8), DisplayName	[1 KEY] Id (int 4)	0	Reads: 24 (24 scans) Writes: 0	0 singleton lookups; 24 scans/weeks; 0 deletes
5	dbo.Users IX_Reputation_Includes (2)	[1 KEY] Reputation (int 4) [1 INCLUDE] Views (int 4)	[1 KEY] Id (int 4)	0	Reads: 0 Writes: 0	0 singleton lookups; 0 scans/weeks; 0 deletes
6	dbo.Users IX_Votes_Includes (3)	[1 KEY] Votes (int 4) [1 INCLUDE] Reputation (int 4)	[1 KEY] Id (int 4)	0	Reads: 0 Writes: 0	0 singleton lookups; 0 scans/weeks; 0 deletes

Definitions: reliable

Stats: Sorta UNreliable

For now, I'm going to focus on usage stats & operational stats to explain the DMV gotchas.



Later, I'll use it across a database.

Defaults to the current database,
or you can pick one with @DatabaseName parameter

sp_BlitzIndex

00 %

Results Messages

Priority	Finding	Database Name	Details: schema.table.index(indexid)	Definition: (Property) ColumnName (datatype maxbytes)	Secret Columns	Usage
1	sp_BlitzIndex(TM) v5.9.5 - November 15, 2017. Database...	NULL	http://FirstResponderKit.org			
2	50 Indexaphobia: High value missing index with Low Impact	StackOverflow	[StackOverflow].[dbo].[Users] Est. benefit per day: 424,656	EQUALITY: (DisplayName)		24 use
3	150 Index Hoarder: Unused NC index with Low Writes	StackOverflow	0 reads: dbo.Badges.IX_Userid (2)	[1 KEY] Userid (int 4)	[1 KEY] Id (int 4)	Reads
4	150 Index Hoarder: Unused NC index with Low Writes	StackOverflow	0 reads: dbo.Comments.IX_Postid (2)	[1 KEY] Postid (int 4)	[1 KEY] Id (int 4)	Reads
5	150 Index Hoarder: Unused NC index with Low Writes	StackOverflow	0 reads: dbo.Comments.IX_Userid (3)	[1 KEY] Userid (int 4)	[1 KEY] Id (int 4)	Reads
6	150 Index Hoarder: Unused NC index with Low Writes	StackOverflow	0 reads: dbo.Posts.IX_AcceptedAnswerid (4)	[1 KEY] AcceptedAnswerid (int 4)	[1 KEY] Id (int 4)	Reads
7	150 Index Hoarder: Unused NC index with Low Writes	StackOverflow	0 reads: dbo.Posts.IX_LastActivityDate_includes (2)	[1 KEY] LastActivityDate (datetime 8) [1 INCLUDE]	[1 KEY] Id (int 4)	Reads
8	150 Index Hoarder: Unused NC index with Low Writes	StackOverflow	0 reads: dbo.Posts.IX_LastEditorUserid (5)	[1 KEY] LastEditorUserid (int 4)	[1 KEY] Id (int 4)	Reads
9	150 Index Hoarder: Unused NC index with Low Writes	StackOverflow	0 reads: dbo.Posts.IX_OwnerUserid (5)	[1 KEY] OwnerUserid (int 4)	[1 KEY] Id (int 4)	Reads
10	150 Index Hoarder: Unused NC index with Low Writes	StackOverflow	0 reads: dbo.Posts.IX_Parentid (7)	[1 KEY] Parentid (int 4)	[1 KEY] Id (int 4)	Reads
11	150 Index Hoarder: Unused NC index with Low Writes	StackOverflow	0 reads: dbo.Posts.IX_PostTypeId (8)	[1 KEY] PostTypeId (int 4)	[1 KEY] Id (int 4)	Reads
12	150 Index Hoarder: Unused NC index with Low Writes	StackOverflow	0 reads: dbo.Posts.IX_ViewCount_includes (3)	[1 KEY] ViewCount (int 4) [1 INCLUDE] LastActivity...	[1 KEY] Id (int 4)	Reads
13	150 Index Hoarder: Unused NC index with Low Writes	StackOverflow	0 reads: dbo.Votes.IX_Postid_Userid (2)	[2 KEYS] Postid (int 4), Userid (int 4)	[1 KEY] Id (int 4)	Reads
14	150 Index Hoarder: Unused NC index with Low Writes	StackOverflow	0 reads: dbo.Votes.IX_Userid (3)	[1 KEY] Userid (int 4)	[1 KEY] Id (int 4)	Reads
15	150 Index Hoarder: Unused NC index with Low Writes	StackOverflow	0 reads: dbo.Votes.IX_VoteTypeId (4)	[1 KEY] VoteTypeId (int 4)	[1 KEY] Id (int 4)	Reads

For now, I'm focusing here:

sp_8111zIndex @TableName = 'Users'

100 %

Results Messages

	Details: db:archana1414/indexes/index1	Definition: [Property] ColumnName: (data type: varchar(255))	Source Column	Fillfactor	Usage Stats	Op Stats
1	Database [StockOnline] as of 2017-11-21 20:36 (sp_8111zIndex @TableName = 'Users')	http://FirstResponderKit.org	From Your Community Volunteers	NULL	NULL	NULL
2	dbo.Users PK_Users_Id (1)	[C] [PK] [1 KEY] Id (int 4)		0	Reads: 24 (24 lookups) Writes: 0	23 singleton lookups; 0 scans/weeks; 0 deletes
3	dbo.Users IX_LastAccessDate (4)	[1 KEY] LastAccessDate (datetime 8)	[1 KEY] Id (int 4)	0	Reads: 0 Writes: 0	0 singleton lookups; 0 scans/weeks; 0 deletes
4	dbo.Users IX_LastAccessDate_DisplayName_Reputation (3)	[3 KEYS] LastAccessDate (datetime 8), DisplayName (nvarchar 100), Reputation (int 4)	[1 KEY] Id (int 4)	0	Reads: 24 (24 scans) Writes: 0	0 singleton lookups; 24 scans/weeks; 0 deletes
5	dbo.Users IX_Reputation_Includes (2)	[1 KEY] Reputation (int 4) [1 INCLUDE] Views (int 4)	[1 KEY] Id (int 4)	0	Reads: 0 Writes: 0	0 singleton lookups; 0 scans/weeks; 0 deletes
6	dbo.Users IX_Votes_Includes (3)	[1 KEY] Votes (int 4) [1 INCLUDE] Reputation (int 4)	[1 KEY] Id (int 4)	0	Reads: 0 Writes: 0	0 singleton lookups; 0 scans/weeks; 0 deletes

Stats: Sorta UNreliable

Usage stats: sys.dm_db_index_usage_stats

Operational: sys.dm_db_index_operational_stats



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Build the execution plan for this.

```
SELECT TOP 10 Id  
FROM dbo.Users  
ORDER BY LastAccessDate;  
GO
```

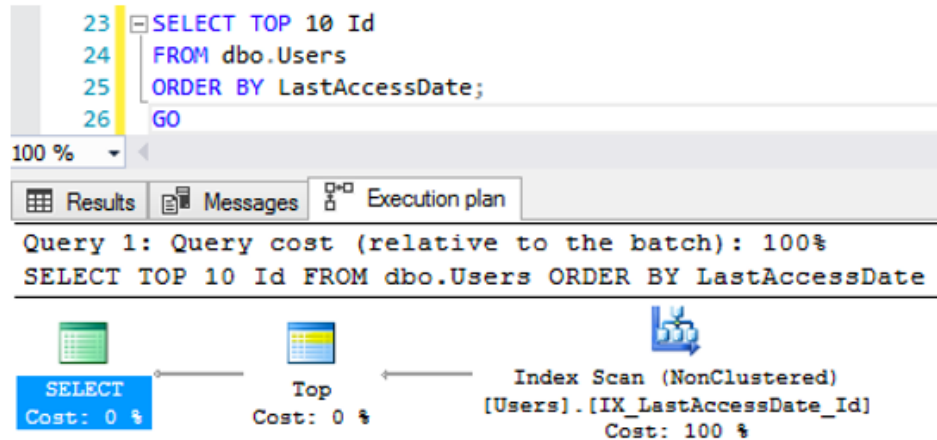
Flash back to How to Think Like the Engine:

- Clustered index on Id (white pages)
- Nonclustered on LastAccessDate, Id (black pages)



1.3 p16

It's a “scan” – but what does that mean?



It's efficient – it doesn't scan the whole index.

```
23 SELECT TOP 10 Id
24 FROM dbo.Users
25 ORDER BY LastAccessDate;
26 GO
```

100 %

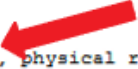
Results Messages Execution plan

SQL Server parse and compile time:
CPU time = 0 ms, elapsed time = 0 ms.

SQL Server Execution Times:
CPU time = 0 ms, elapsed time = 0 ms.

SQL Server parse and compile time:
CPU time = 0 ms, elapsed time = 0 ms.

(10 row(s) affected)
Table 'Users'. Scan count 1, logical reads 3, physical reads 0, read-ahead reads 0,



1.3 p18

It's just labeled a scan

The DMVs don't distinguish between types of scans

sp_BlitzIndex @TableName = 'Users'

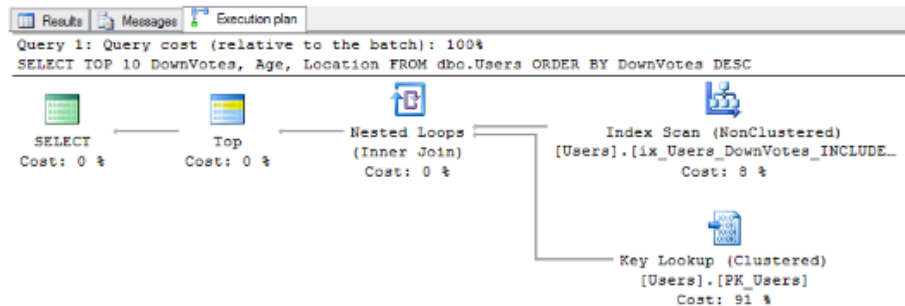
	Details: db_schema.table.index(indexid)	Definition: [Property] ColumnName (datatype maxbytes)	Usage Stats	Op. Stats
1	Database [StackOverflow] as of 2017-07-23 17:09 (sp_...	http://FirstResponderKit.org	NULL	NULL
2	dbo.Users.IX_CreationDate_Reputation_Filtered (7)	[2 KEYS] CreationDate (datetime 8), Reputation (int ...	Reads: 0 Writes:0	0 singleton lookups; 0 scans/seek; 0 deletes; 0...
3	dbo.Users.IX_DownVotes_Includes (5)	[1 KEY] DownVotes (int 4) [7 INCLUDES] Age (int 4...	Reads: 0 Writes:0	0 singleton lookups; 0 scans/seek; 0 deletes; 0...
4	dbo.Users.IX_Id (8)	[1 KEY] Id (int 4)	Reads: 0 Writes:0	0 singleton lookups; 0 scans/seek; 0 deletes; 0...
5	dbo.Users.PK_Users_Id (1)	[CX] [PK] [1 KEY] Id (int 4)	Reads: 0 Writes:0	0 singleton lookups; 0 scans/seek; 0 deletes; 0...
6	dbo.Users.IX_LastAccessDate_Id (2)	[2 KEYS] LastAccessDate (datetime 8), Id (int 4)	Reads: 1 (1 scan) Writes:0	0 singleton lookups; 1 scans/seek; 0 deletes; 0...
7	dbo.Users.IX_LastAccessDate_Id_DisplayName_Age (3)	[4 KEYS] LastAccessDate (datetime 8), Id (int 4), Dis...	Reads: 0 Writes:0	0 singleton lookups; 0 scans/seek; 0 deletes; 0...



1.3 p19

This plan has a key lookup

For every row from the nonclustered index scan, it looks up related values in the clustered index

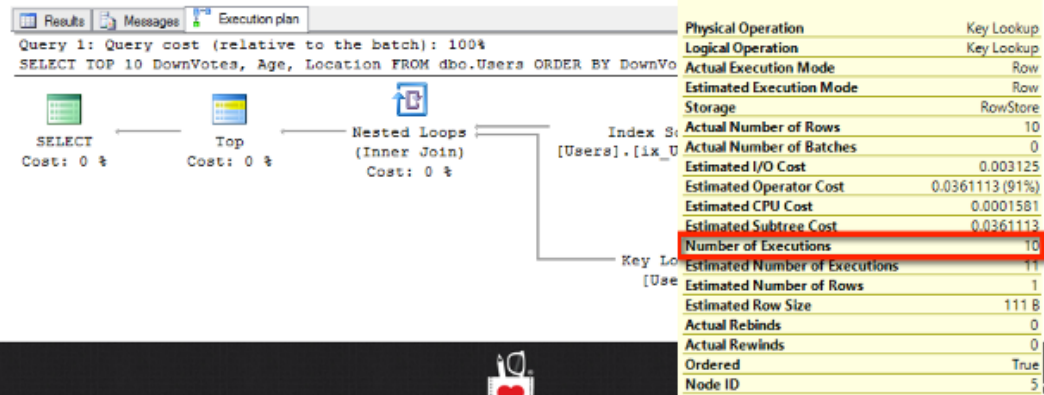


1.3 p20

Key lookup is executed 10 times

Index scan returns 10 rows

Each one has to go do a lookup



3 p21

The stats are different

- **sys.dm_db_index_usage_stats:** Number of times the operator appeared in an execution plan since last reset
- **sys.dm_db_index_operational_stats:** Number of times the operator was executed (recently)

```
67 exec sp_BlitzIndex @SchemaName='dbo', @TableName='Users';
68
69
```

100 %

Results	Messages	Definition (Property) Column Name (Datatype, maxbytes)	Second Column	Fillfactor	Usage State	Op State
1	Database [StackOverflow] as of 2017-07-23 17:12 (sp_...	http://FreeResponseKit.org	From Your Community Volunteers	NULL	NULL	NULL
2	dbo.Users IX_CreationDate_Reputation_Filtered (7)	[2 KEYS] CreationDate (datetime 8), Reputation (int 4)	[1 KEY] Id (int 4)	0	Reads: 0 Writes: 0	0 singleton lookups; 0 scans/seek; 0 deletes; 0...
3	dbo.Users IX_DownVotes_Includes (5)	[1 KEY] DownVotes (int 4) [7 INCLUDES] Age (int 4)	[1 KEY] Id (int 4)	0	Reads: 0 Writes: 0	0 singleton lookups; 0 scans/seek; 0 deletes; 0...
4	dbo.Users IX_Id (8)	[1 KEY] Id (int 4)	[1 KEY] Id (int 4)	0	Reads: 0 Writes: 0	0 singleton lookups; 0 scans/seek; 0 deletes; 0...
5	dbo.Users PK_Users_Id (1)	[1 KEY] Id (int 4)	[1 KEY] Id (int 4)	0	Reads: 1 (1 lookup) Writes: 0	10 singleton lookups; 0 scans/seek; 0 deletes; 0...
6	dbo.Users IX_LastAccessDate_Id (2)	[2 KEYS] LastAccessDate (datetime 8), Id (int 4)	[1 KEY] Id (int 4)	0	Reads: 1 (1 scan) Writes: 0	0 singleton lookups; 1 scans/seek; 0 deletes; 0...
7	dbo.Users IX_LastAccessDate_Id_DisplayName_Age (3)	[4 KEYS] LastAccessDate (datetime 8), Id (int 4), Display...	[1 KEY] Id (int 4)	0	Reads: 0 Writes: 0	0 singleton lookups; 0 scans/seek; 0 deletes; 0...


Similar query, but no rows match

```
/* This plan is slightly different, it has a key lookup - but it doesn't get executed. */  
SELECT TOP 10 Id, Location  
FROM dbo.Users  
WHERE LastAccessDate > GETDATE()  
ORDER BY LastAccessDate;  
GO
```

50 %

Results Messages Execution plan

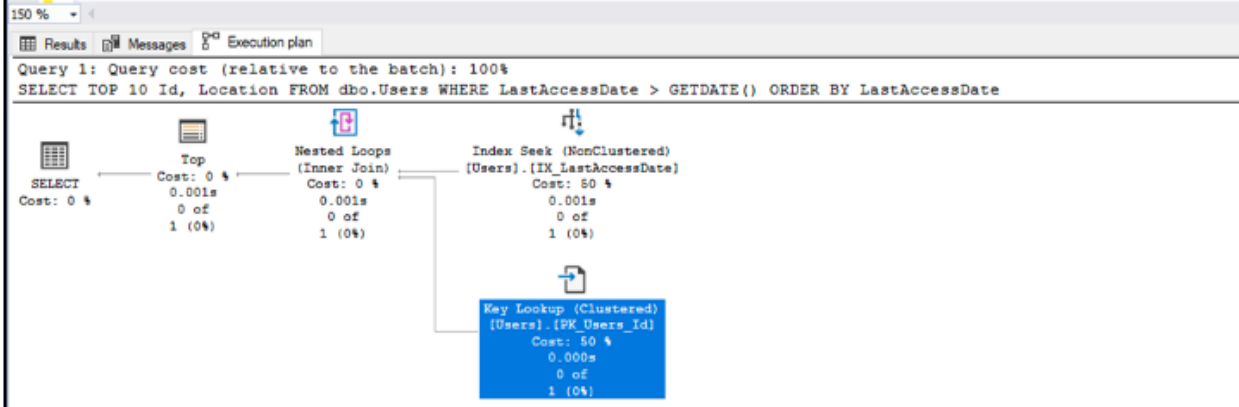
Id	Location
----	----------



1.3 p23

It doesn't execute the lookup

```
/* This plan is slightly different, it has a key lookup - but it doesn't get executed. */  
SELECT TOP 10 Id, Location  
FROM dbo.Users  
WHERE LastAccessDate > GETDATE()  
ORDER BY LastAccessDate;  
GO
```



What the DMVs say

Usage stats says the plan included the seek

Operational stats says it wasn't executed

```
/* How does that show up in the DMVs? */  
exec sp_BlitzIndex @SchemaName='dbo', @TableName='Users';
```

150 %				
Results		Messages		
	Details: db_schema table index(indexid)	Definition: [Property] ColumnName (datatype maxbytes)	Usage Stats	Op Stats
1	Database [StackOverflow2013] as of 2019-06-11 10...	http://FirstResponderKit.org	Server: SQL2019 Days Uptime: 0.04	NULL
2	dbo.Users.PK_Users_Id (1)	[CK] [PK] [1 KEY] Id (int 4)	Reads: 1 (1 lookup) Writes: 0	0 singleton lookups; 0 scans/seek; 0
3	dbo.Users.IX_LastAccessDate (2)	[1 KEY] LastAccessDate (datetime 8)	Reads: 1 (1 seek) Writes: 0	0 singleton lookups; 1 scans/seek; 0



1.3 p25

So, the contents don't match.

When I use them, I'm really just asking:

- Is this index helping? (reads)
- Is this index hurting? (writes)
- Roughly how much? (quantity: millions, billions)

But your next question is,
“When did these numbers reset?”



1.3 p26

Uh, well...I can't tell.

When SQL Server restarts (which we can measure)

When an Availability Group failed over (harder to tell)

When Azure SQL DB fails over, restarts (can't see)

SQL 2012, 2014: resets on ALTER INDEX REBUILD

- SQL 2012: fixed in SP2 CU12, or SP3 CU3
- SQL 2014: fixed in RTM CU14, or SP1 CU8, or SP2
- SQL Server 2016 & newer: unaffected



1.3 p27

Index DMVs: Your takeaways

- “Scan” may not be the whole table
- “Seek” might actually be the whole table

`sys.dm_db_index_usage_stats` - “usage stats”

- Show # of times an operator appeared in a query plan that was run
- The operator may have been accessed many times, or not at all
- Reset by system restart, or by index rebuild if on buggy versions

`sys.dm_db_index_operational_stats` – “op stats”

- Show number of times an operator was accessed
- Very volatile, can be reset by memory pressure

Only check when you have enough uptime to reflect business processes.



I'm not saying not to use these.

I'm just saying don't put too much faith in the details.

Your goal is just to know, "Are these indexes kinda getting used, or totally ignored?"

```
67 exec sp_BlitzIndex @SchemaName='dbo', @TableName='Users';
68
69
```

100 %

	Results	Messages
	Database: db_schema table index(index)	Definition: [Property] Column Name (datatype, maxbytes)
1	Database [StackOverflow] as of 2017-07-23 17:12 (sp_...	http://FreeResponseKit.org
2	dbo.Users IX_CreationDate_Reputation_Filtered (7)	[2 KEYS] CreationDate (datetime 8), Reputation (int 4)
3	dbo.Users IX_DownVotes_Includes (5)	[1 KEY] DownVotes (int 4) [7 INCLUDES] Age (int 4)
4	dbo.Users IX_Id (8)	[1 KEY] Id (int 4)
5	dbo.Users PK_Users_Id (1)	[1 KEY] Id (int 4)
6	dbo.Users IX_LastAccessDate_Id (2)	[2 KEYS] LastAccessDate (datetime 8), Id (int 4)
7	dbo.Users IX_LastAccessDate_Id_DisplayName_Age (3)	[4 KEYS] LastAccessDate (datetime 8), Id (int 4), DisplayName (nvarchar 40), Age (int 4)

Our scripts try to prioritize stuff.

We want you to focus on the biggest bang-for-the-buck first.

Findings here are a little more fun – we use psychiatry terms.

There's nothing *wrong* with some psychiatric disorders, either.

Let your freak flag fly.



sp_BlitzIndex			
100 %			
Results		Messages	
Priority	Finding	Database	
1	sp_BlitzIndex(TMI) v5.9.5 - November 15, 2017. De	NULL	
2	50 Multiple Index Personalities: Duplicate keys	StackOz	
3	50 Multiple Index Personalities: Duplicate keys	StackOz	
4	50 Indexphobias: High value missing index with Low I...	StackOz	
5	50 Indexphobias: High value missing index with Low I...	StackOz	
6	50 Indexphobias: High value missing index with Low I...	StackOz	
7	60 Multiple Index Personalities: Borderline duplicate ke...	StackOz	
8	60 Multiple Index Personalities: Borderline duplicate ke...	StackOz	
9	100 Index Hoarder: Many NC indexes on a single table	StackOz	
10	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
11	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
12	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
13	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
14	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
15	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
16	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
17	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
18	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
19	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
20	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
21	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
22	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
23	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
24	150 Index Hoarder: Unused NC index with Low Writes	StackOz	
25	200 Abnormal Psychology: Recently modified tables/ind...	StackOz	
26	200 Abnormal Psychology: Recently modified tables/ind...	StackOz	

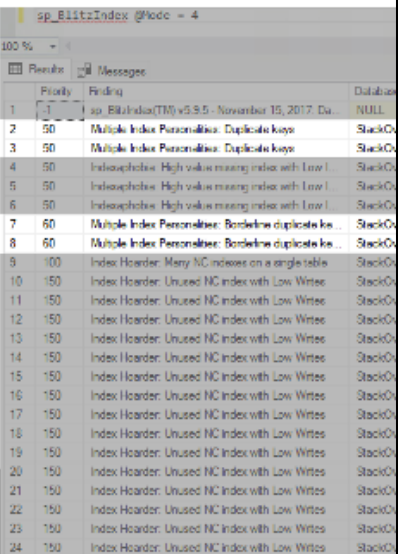
Our scripts try to prioritize stuff.

50: Duplicate keys:

These are no-brainers to dedupe.

60: Borderline duplicate:

These have the same leading field, but may have different subsequent fields. Will take a little bit more work.



Priority	Finding	Database
1	sp_BlitzIndex (v5.9.5) - November 15, 2017. Cu...	NULL
2	Multiple Index Personalities: Duplicate keys	StackOv
3	Multiple Index Personalities: Duplicate keys	StackOv
4	Indexscopies: High value missing index with Low I...	StackOv
5	Indexscopies: High value missing index with Low I...	StackOv
6	Indexscopies: High value missing index with Low I...	StackOv
7	Multiple Index Personalities: Borderline duplicate ke...	StackOv
8	Multiple Index Personalities: Borderline duplicate ke...	StackOv
9	Index Hoarder: Many NC indexes on a single table	StackOv
10	Index Hoarder: Unused NC index with Low Writes	StackOv
11	Index Hoarder: Unused NC index with Low Writes	StackOv
12	Index Hoarder: Unused NC index with Low Writes	StackOv
13	Index Hoarder: Unused NC index with Low Writes	StackOv
14	Index Hoarder: Unused NC index with Low Writes	StackOv
15	Index Hoarder: Unused NC index with Low Writes	StackOv
16	Index Hoarder: Unused NC index with Low Writes	StackOv
17	Index Hoarder: Unused NC index with Low Writes	StackOv
18	Index Hoarder: Unused NC index with Low Writes	StackOv
19	Index Hoarder: Unused NC index with Low Writes	StackOv
20	Index Hoarder: Unused NC index with Low Writes	StackOv
21	Index Hoarder: Unused NC index with Low Writes	StackOv
22	Index Hoarder: Unused NC index with Low Writes	StackOv
23	Index Hoarder: Unused NC index with Low Writes	StackOv
24	Index Hoarder: Unused NC index with Low Writes	StackOv



How I use sp_BlitzIndex to D/E

1. **sp_BlitzIndex @GetAllDatabases = 1**
(and figure out what database to tune)
2. **Run sp_BlitzIndex in the database I want to tune**
(and figure out what table I want to focus on)
3. **Scroll across to the More Info column and run it for the particular table I want to tune**

More Info

```
EXEC dbo.sp_BlitzIndex @DatabaseName='StackOverflow', @SchemaName='dbo', @TableName='Posts';  
EXEC dbo.sp_BlitzIndex @DatabaseName='StackOverflow', @SchemaName='dbo', @TableName='Votes';  
EXEC dbo.sp_BlitzIndex @DatabaseName='StackOverflow', @SchemaName='dbo', @TableName='Posts';  
EXEC dbo.sp_BlitzIndex @DatabaseName='StackOverflow', @SchemaName='dbo', @TableName='Comments';
```

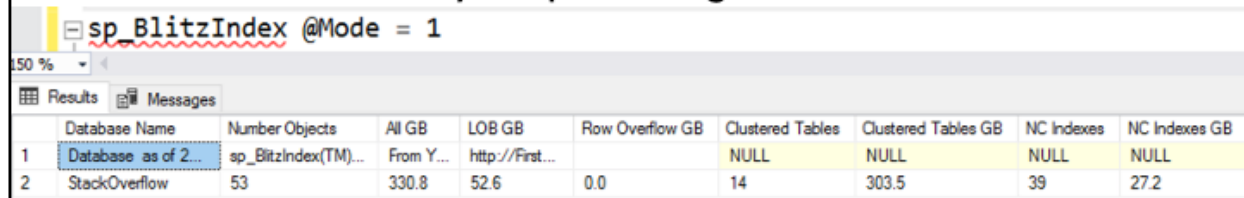
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Advanced sp_BlitzIndex tips

@ThresholdMB: default 250MB, only alerts you for problems with indexes at least this large

@Mode:

- 0 = default, most urgent problems
- 4 = more analysis, includes more warnings
- 2 = inventory of all your indexes & metrics
- 1 = summary of space usage



```
sp_BlitzIndex @Mode = 1
```

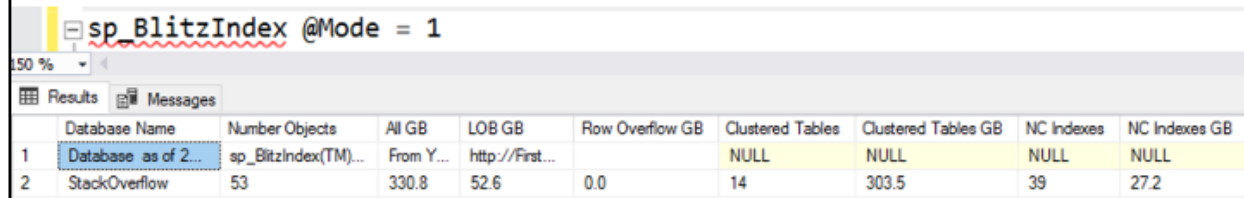
	Database Name	Number Objects	All GB	LOB GB	Row Overflow GB	Clustered Tables	Clustered Tables GB	NC Indexes	NC Indexes GB
1	Database as of 2...	sp_BlitzIndex(TM)...	From Y...	http://First...		NULL	NULL	NULL	NULL
2	StackOverflow	53	330.8	52.6	0.0	14	303.5	39	27.2

Example writeup

“On the Users table, we have:

- 3 duplicate indexes of 15GB total
- 2 unused indexes of 8GB total

By removing these, I saved 23GB of drive space,
made deletes/updates/inserts go faster,
and now I can add more appropriate indexes.”



```
sp_BlitzIndex @Mode = 1
```

	Database Name	Number Objects	All GB	LOB GB	Row Overflow GB	Clustered Tables	Clustered Tables GB	NC Indexes	NC Indexes GB
1	Database as of 2...	sp_BlitzIndex(TM)...	From Y...	http://First...		NULL	NULL	NULL	NULL
2	StackOverflow	53	330.8	52.6	0.0	14	303.5	39	27.2

What we covered

The two SQL Server index usage views:

- Usage by plan: `sys.dm_db_index_usage_stats`
- Usage by index: `sys.dm_db_index_operational_stats`

Why they're not as accurate as you might suspect:

- Seek doesn't mean one row
- Scan doesn't mean the whole table
- Reads doesn't mean the index was actually read
- 1 write doesn't mean 1 row was updated
- They even reset at unusual times
- Analyze with enough uptime to reflect business processes



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