Deduping & Eliminating with Inaccurate Read & Write Metrics

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

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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

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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

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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

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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

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A lot of tools use this data.

T-SQL scripts: sp_BlitzIndex, Glenn Berry's 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)

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I'm going to be using my favorite.

sp_BlitzIndex in the First Responder Kit:

- Github repo: FirstResponderKit.org
- 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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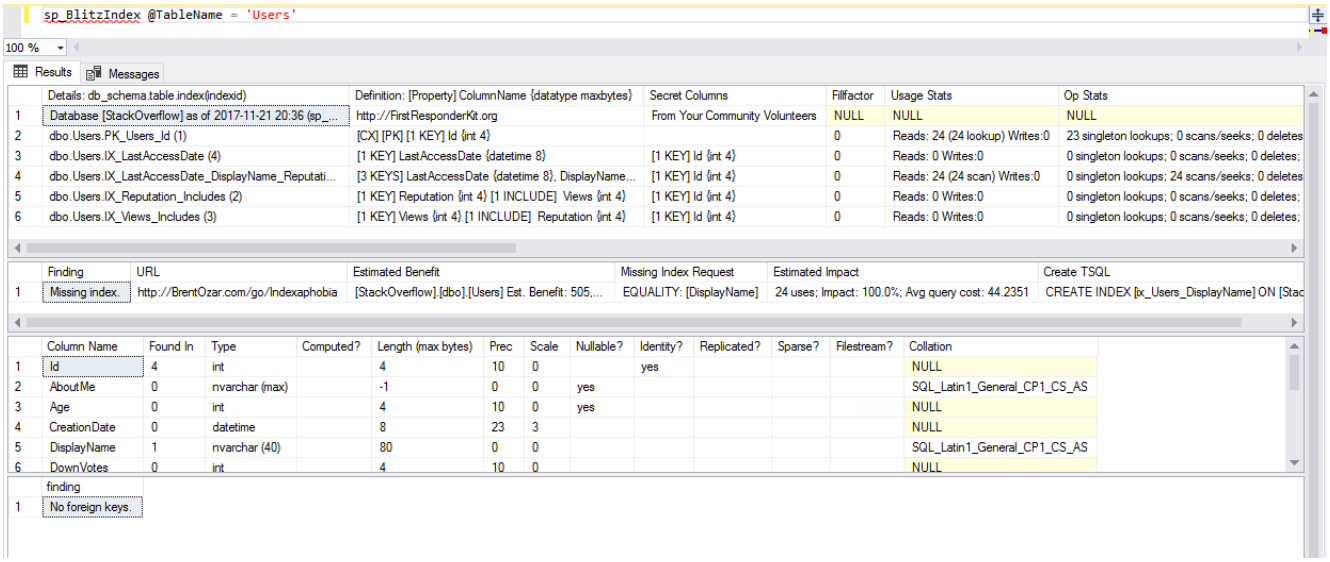
Running it for one table:
sp_BlitzIndex @TableName = ' Users'



```
sp_BlitzIndex @TableName = 'Users'
```

Results | Messages

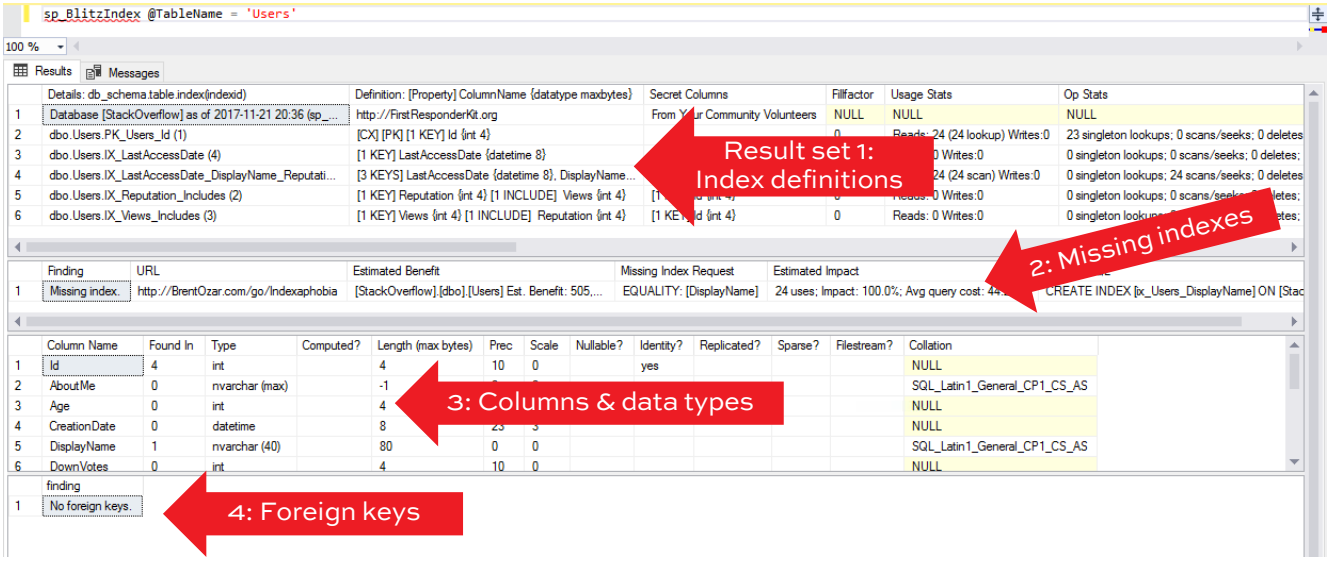
	Details: db_schema.table.index(indexid)	Definition: [Property] ColumnName {datatype maxbytes}	Secret Columns	Fillfactor	Usage Stats	Op Stats
1	Database [StackOverflow] as of 2017-11-21 20:36 (sp_...	http://FirstResponderKit.org	From Your Community Volunteers	NULL	NULL	NULL
2	dbo.Users.PK_Users_Id (1)	[CX] [PK] [1 KEY] Id {int 4}		0	Reads: 24 (24 lookup) Writes:0	23 singleton lookups; 0 scans/seeks; 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/seeks; 0 deletes;
4	dbo.Users.IX_LastAccessDate_DisplayName_Reputati...	[3 KEYS] LastAccessDate {datetime 8}, DisplayName...	[1 KEY] Id {int 4}	0	Reads: 24 (24 scan) Writes:0	0 singleton lookups; 24 scans/seeks; 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/seeks; 0 deletes;
6	dbo.Users.IX_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 uses; Impact: 100.0%; Avg query cost: 44.2351	CREATE INDEX [ix_Users_DisplayName] ON [Stac

	Column Name	Found In	Type	Computed?	Length (max bytes)	Prec	Scale	Nullable?	Identity?	Replicated?	Sparse?	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'



Dedupe/eliminate: focus on set 1.

```
sp_BlitzIndex @TableName = 'Users'
```

Definitions: reliable

Stats: Sorta UNreliable

100 %

Results | Messages

	Details: db_schema.table.index(indexid)	Definition: [Property] ColumnName {datatype maxbytes}	Secret Columns	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)	[CX] [PK] [1 KEY] Id {int 4}		0	Reads: 24 (24 lookup) Writes:0	23 singleton lookups; 0 scans/seeks; 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/seeks; 0 deletes;
4	dbo.Users.IX_LastAccessDate_DisplayName_Reputati...	[3 KEYS] LastAccessDate {datetime 8}, DisplayName...	[1 KEY] Id {int 4}	0	Reads: 24 (24 scan) Writes:0	0 singleton lookups; 24 scans/seeks; 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/seeks; 0 deletes;
6	dbo.Users.IX_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;

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

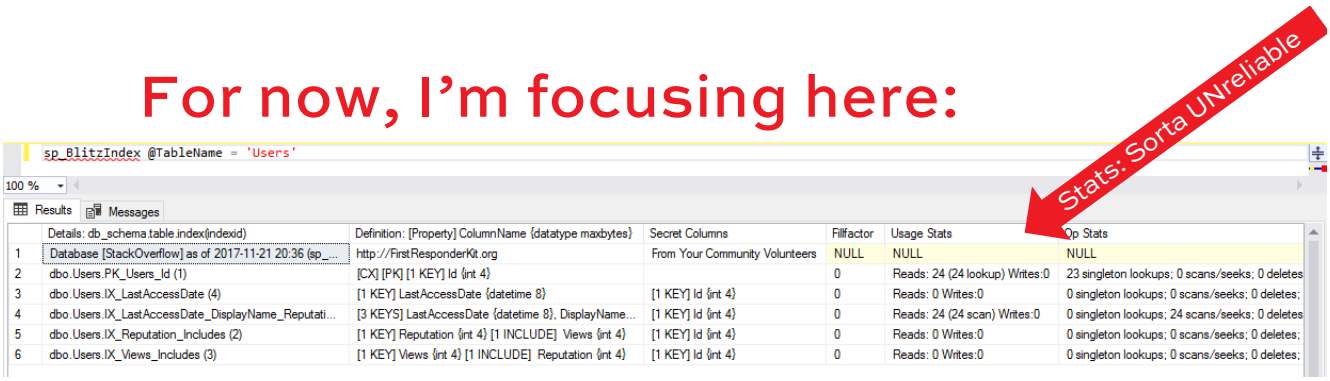
```
sp_BlitzIndex
```

100 %

Results | Messages

	Priority	Finding	Database Name	Details: schema.table.index(indexid)	Definition: [Property] ColumnName {datatype maxbytes}	Secret Columns	Usage
1	-1	sp_BlitzIndex(TM) v5.9.5 - November 15, 2017: Databa...	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 (6)	[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:



	Details: db_schema.table.index(indexid)	Definition: [Property] ColumnName {datatype maxbytes}	Secret Columns	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)	[CX] [PK] [1 KEY] Id {int 4}		0	Reads: 24 (24 lookup) Writes:0	23 singleton lookups; 0 scans/seeks; 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/seeks; 0 deletes;
4	dbo.Users.IX_LastAccessDate_DisplayName_Reputati...	[3 KEYS] LastAccessDate {datetime 8}, DisplayName...	[1 KEY] Id {int 4}	0	Reads: 24 (24 scan) Writes:0	0 singleton lookups; 24 scans/seeks; 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/seeks; 0 deletes;
6	dbo.Users.IX_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;

Usage stats: sys.dm_db_index_usage_stats

Operational: sys.dm_db_index_operational_stats

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)

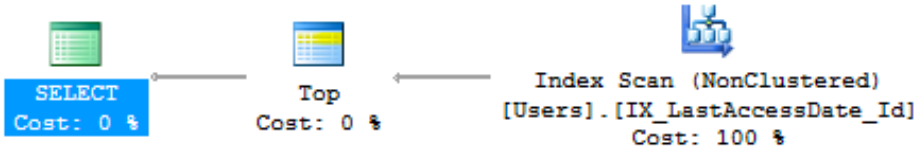
It's a "scan" – but what does that mean?

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

100 %

Results | Messages | Execution plan

```
Query 1: Query cost (relative to the batch): 100%
SELECT TOP 10 Id FROM dbo.Users ORDER BY LastAccessDate
```



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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
```

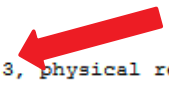
100 %

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,
```



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It's just labeled a scan

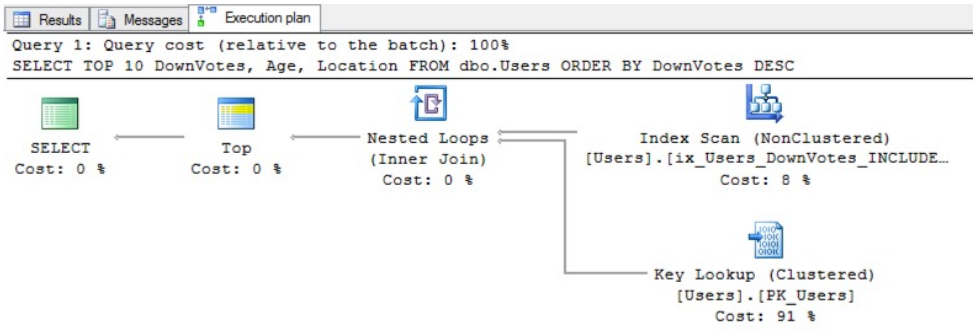
The DMVs don't distinguish between types of scans

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/seeks; 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/seeks; 0 deletes; 0...
4	dbo.Users.IX_Id (8)	[1 KEY] Id {int 4}	Reads: 0 Writes:0	0 singleton lookups; 0 scans/seeks; 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/seeks; 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/seeks; 0 deletes; 0...
7	dbo.Users.IX_LastAccessDate_Id_DisplayName_Age (3)	[4 KEYS] LastAccessDate {datetime 8}, Id {int 4}, Dis...	Reads: 0 Writ...	0 singleton lookups; 0 s.../seeks; 0 deletes; 0...

This plan has a key lookup

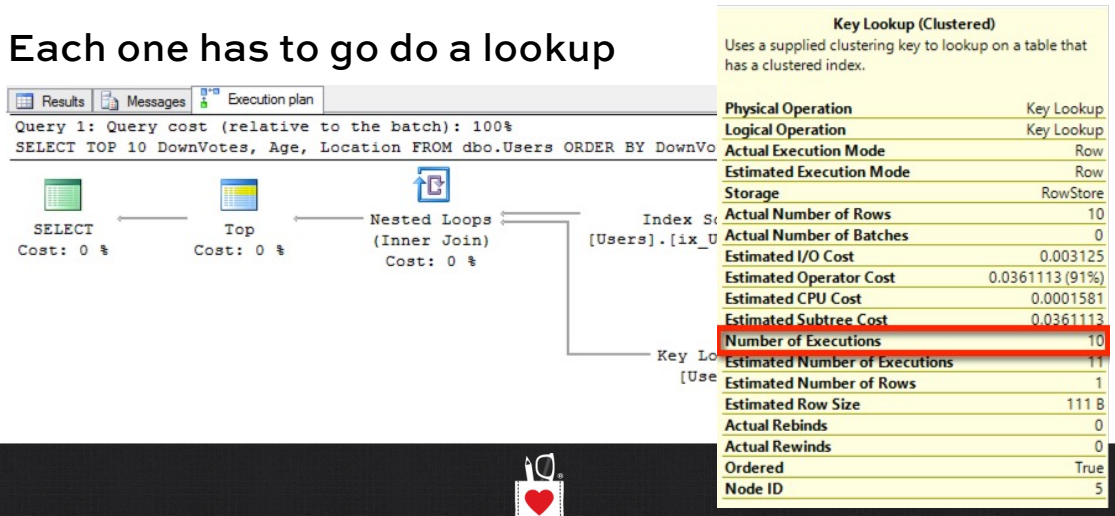
For every row from the nonclustered index scan, it looks up related values in the clustered index



Key lookup is executed 10 times

Index scan returns 10 rows

Each one has to go do a lookup



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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  GO
69
```

100 %

Results | Messages

	Details: db_schema.table.index(indexid)	Definition: [Property] ColumnName {datatype maxbytes}	Secret Columns	Fillfactor	Usage Stats	Op Stats
1	Database [StackOverflow] as of 2017-07-23 17:12 (sp_...	http://FirstResponderKit.org	From Your Community Volunteers	NULL	NULL	NULL
2	dbo.Users.IX_CreationDate_Reputation_Filtered (7)	[2 KEYS] CreationDate {datetime 8}, Reputation {int ...	[1 KEY] Id {int 4}	0	Reads: 0 Writes:0	0 singleton lookups; 0 scans/seeks; 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/seeks; 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/seeks; 0 deletes; 0...
5	dbo.Users.PK_Users_Id (1)	[CX] [PK] [1 KEY] Id {int 4}		0	Reads: 1 (1 lookup) Writes:0	10 singleton lookups; 0 scans/seeks; 0 deletes; ...
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/seeks; 0 deletes; 0...
7	dbo.Users.IX_LastAccessDate_Id_DisplayName_Age (3)	[4 KEYS] LastAccessDate {datetime 8}, Id {int 4}, Dis...	[1 KEY] Id {int 4}	0	Reads: 0 Writes:0	0 singleton lookups; 0 scans/seeks; 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
```

150 %

Results | Messages | Execution plan

Id	Location

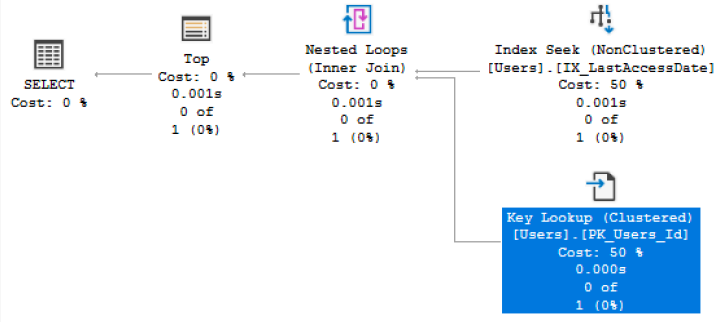
It doesn’t execute the lookup

```
/* 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
```

150 %

Results | Messages | Execution plan

Query 1: Query cost (relative to the batch): 100%
SELECT TOP 10 Id, Location FROM dbo.Users WHERE LastAccessDate > GETDATE() ORDER BY LastAccessDate



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)	[CX] [PK] [1 KEY] Id {int 4}	Reads: 1 (1 lookup) Writes:0	0 singleton lookups; 0 scans/seeks; 0
3	dbo.Users.IX_LastAccessDate (2)	[1 KEY] LastAccessDate {datetime 8}	Reads: 1 (1 seek) Writes:0	0 singleton lookups; 1 scans/seeks; 0

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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?"

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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

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  GO
69
```

100 %

Results | Messages

	Details: db_schema.table.index(indexid)	Definition: [Property] ColumnName {datatype maxbytes}	Secret Columns	Fillfactor	Usage Stats	Op Stats
1	Database [StackOverflow] as of 2017-07-23 17:12 (sp_...	http://FirstResponderKit.org	From Your Community Volunteers	NULL	NULL	NULL
2	dbo.Users.IX_CreationDate_Reputation_Filtered (7)	[2 KEYS] CreationDate {datetime 8}, Reputation {int ...	[1 KEY] Id {int 4}	0	Reads: 0 Writes:0	0 singleton lookups; 0 scans/seeks; 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/seeks; 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/seeks; 0 deletes; 0...
5	dbo.Users.PK_Users_Id (1)	[CX] [PK] [1 KEY] Id {int 4}		0	Reads: 1 (1 lookup) Writes:0	10 singleton lookups; 0 scans/seeks; 0 deletes; ...
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/seeks; 0 deletes; 0...
7	dbo.Users.IX_LastAccessDate_Id_DisplayName_Age (3)	[4 KEYS] LastAccessDate {datetime 8}, Id {int 4}, Dis...	[1 KEY] Id {int 4}	0	Reads: 0 Writes:0	0 singleton lookups; 0 scans/seeks; 0 deletes; 0...

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

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.

```
sp_BlitzIndex @Mode = 4
```

100 %

Results | Messages

	Priority	Finding	Database
1	-1	sp_BlitzIndex(TM) v5.9.5 - November 15, 2017: Da...	NULL
2	50	Multiple Index Personalities: Duplicate keys	StackOv
3	50	Multiple Index Personalities: Duplicate keys	StackOv
4	50	Indexaphobia: High value missing index with Low I...	StackOv
5	50	Indexaphobia: High value missing index with Low I...	StackOv
6	50	Indexaphobia: High value missing index with Low I...	StackOv
7	60	Multiple Index Personalities: Borderline duplicate ke...	StackOv
8	60	Multiple Index Personalities: Borderline duplicate ke...	StackOv
9	100	Index Hoarder: Many NC indexes on a single table	StackOv
10	150	Index Hoarder: Unused NC index with Low Writes	StackOv
11	150	Index Hoarder: Unused NC index with Low Writes	StackOv
12	150	Index Hoarder: Unused NC index with Low Writes	StackOv
13	150	Index Hoarder: Unused NC index with Low Writes	StackOv
14	150	Index Hoarder: Unused NC index with Low Writes	StackOv
15	150	Index Hoarder: Unused NC index with Low Writes	StackOv
16	150	Index Hoarder: Unused NC index with Low Writes	StackOv
17	150	Index Hoarder: Unused NC index with Low Writes	StackOv
18	150	Index Hoarder: Unused NC index with Low Writes	StackOv
19	150	Index Hoarder: Unused NC index with Low Writes	StackOv
20	150	Index Hoarder: Unused NC index with Low Writes	StackOv
21	150	Index Hoarder: Unused NC index with Low Writes	StackOv
22	150	Index Hoarder: Unused NC index with Low Writes	StackOv
23	150	Index Hoarder: Unused NC index with Low Writes	StackOv
24	150	Index Hoarder: Unused NC index with Low Writes	StackOv

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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';

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
```

150 %

Results | Messages

	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
```

150 %

Results | Messages

	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

Azure SQL DB? Log it regularly.

Since your database can (and will) restart without warning, log this data weekly so it's there when you want to do index analysis, and use the most recent:

```
sp_BlitzIndex @Mode = 2,
@OutputDatabaseName = 'MyDB',
@OutputSchemaName = 'dbo',
@OutputTableName = 'BlitzIndex_Mode2'
```

2 = inventory, 3 = missing indexes

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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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