

Weekly Maintenance



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Overview



Index maintenance

Statistics maintenance

Database consistency

Demo



Index Maintenance



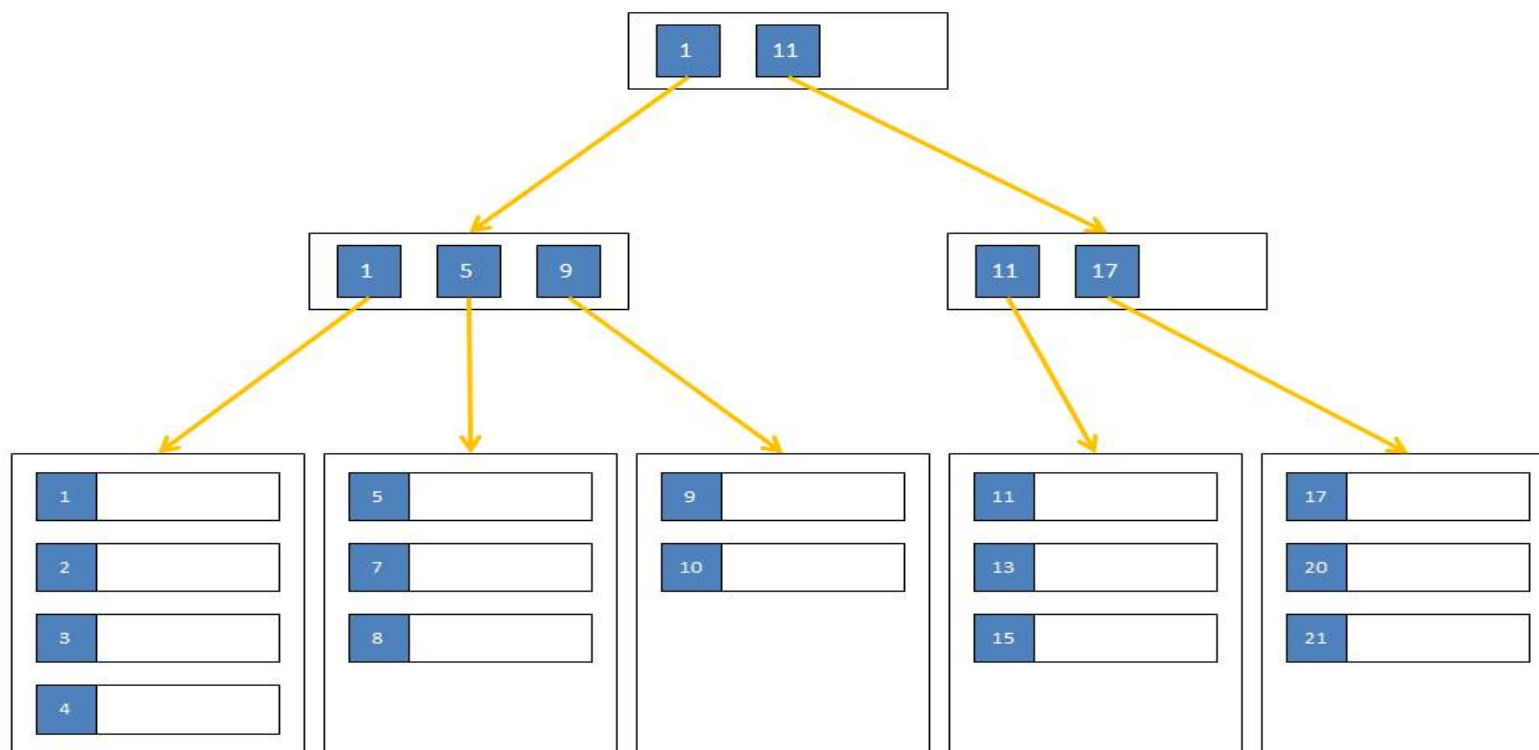
Index

An index is an on-disk structure associated with a table or view that speeds retrieval of rows from the table or view.

-- [Microsoft Docs](#)



What's an “on-disk structure” ?



A generic representation of how indexes seek to find the pages they need



Index Types

Clustered

Non-Clustered

We will not cover Columnstore Indexes, Filtered and other specialty in this course



Clustered Index

The screenshot displays the SQL Server Enterprise Manager interface. On the left, the Object Explorer shows the database structure. The 'dbo.Posts' table is selected, and its columns are listed. The 'Id' column is marked as the primary key (PK), and the 'CreationDate' column is highlighted. The main window shows the 'Index Properties - CI_CRDate_ID' dialog box. The 'Table name' is 'Posts', the 'Index name' is 'CI_CRDate_ID', and the 'Index type' is 'Clustered'. The 'Index key columns' table lists the columns included in the index.

Object Explorer:

- dbo.Comments
- dbo.LinkTypes
- dbo.PostLinks
- dbo.Posts**
 - Id (PK, int, not null)**
 - AcceptedAnswerId (int, null)
 - AnswerCount (int, null)
 - Body (nvarchar(max), not null)
 - ClosedDate (datetime, null)
 - CommentCount (int, null)
 - CommunityOwnedDate (datetime, null)
 - CreationDate (datetime, not null)**
 - FavoriteCount (int, null)
 - LastActivityDate (datetime, not null)
 - LastEditDate (datetime, null)
 - LastEditorDisplayName (nvarchar(40), null)
 - LastEditorUserId (int, null)
 - OwnerId (int, null)
 - ParentId (int, null)
 - PostTypeId (int, not null)
 - Score (int, not null)
 - Tags (nvarchar(150), null)
 - Title (nvarchar(250), null)
 - ViewCount (int, not null)
- Keys
- Constraints
- Triggers
- Indexes
- Statistics

Index Properties - CI_CRDate_ID

Ready

Select a page: General, Options, Storage, Fragmentation, Extended Properties

Table name: Posts

Index name: CI_CRDate_ID

Index type: Clustered

☐ Unique

Index key columns

Name	Sort Order	Data Type	Size	Identity	Allow NULLs
Id	Ascending	int	4	No	No
CreationDate	Ascending	datetime	8	No	No

Buttons: Add..., Remove, Move Up, Move Down

Connection: KBH-PRECISION\SQL2016 [KBH-PRECISION\Kevin]

View connection properties

Progress: Ready

Buttons: OK, Cancel, Help



Index Types

Clustered

Non-Clustered

We will not cover Columnstore Indexes, Filtered and other specialty in this course



Non-Clustered Index

The screenshot displays the SQL Server Enterprise Manager interface. On the left, the Object Explorer shows the database structure. The 'dbo.Posts' table is selected, and its columns are listed. The 'OwnerUserId' column is highlighted. Below the columns, the 'Indexes' folder shows the 'NC_OwnerUserID' index, which is a Non-Unique, Non-Clustered index. The main pane shows the 'Index Properties' dialog for the 'NC_OwnerUserID' index. The 'Table name' is 'Posts', and the 'Index name' is 'NC_OwnerUserID'. The 'Index type' is 'Nonclustered'. The 'Index key columns' tab is selected, showing 'OwnerUserId' as the key column. The 'Connection' is 'KBH-PRECISION\SQL2016 [KBH-PRECISION\Kevin]'. The 'Progress' bar shows 'Ready'.

```
SQLQuery2.sql - KB...CISION\Kevin (60))* X SQLQuery1.sql - KB...CISION\Kevin (59))
Select p.CreationDate, u.DisplayName
From Posts p
    join Users u on p.OwnerUserId = u.Id
Where u.DisplayName = 'Andy'
```

Index Properties - NC_OwnerUserID

Ready

Select a page: General, Options, Storage, Filter, Fragmentation, Extended Properties

Script | Help

Table name: Posts

Index name: NC_OwnerUserID

Index type: Nonclustered

☐ Unique

Index key columns | Included columns

Name	Sort Order	Data Type	Size	Identity	Allow NULLs
OwnerUserId	Ascending	int	4	No	Yes

Buttons: Add..., Remove, Move Up, Move Down

Connection: KBH-PRECISION\SQL2016 [KBH-PRECISION\Kevin]

View connection properties

Progress: Ready

Buttons: OK, Cancel, Help

Index Maintenance Consideration s

Which Indexes?

- Size (page count)
- Fragmentation %
- Frequency
- Rebuild vs. Reorganize
- Duration



Why and
How?

Why do we do this?

- Better memory usage
- Fresh statistics
- Better query plans

How do we do this?

- SQL Server Maintenance Plans
- Custom T-SQL code
- 3rd party tools
- Community scripts



Statistics Maintenance



Statistics

Statistics for query optimization are binary large objects (BLOBs) that contain statistical information about the distribution of values in one or more columns of a table or indexed view.

-- [Microsoft Docs](#)



Statistics

What are they?

- Information about the data
- Helper data for the query optimizer

When do they update?

- AutoUpdate at 20%
- Scheduled jobs
- Manually



Statistics Properties - Details

Table Name:	dbo.Users		
Statistics Name:	NC_DisplayName		
Statistics for INDEX 'NC_DisplayName'.			

Name	Updated		Rows

NC_DisplayName	Jul 14 2020 4:37PM		6735363
All Density	Average Length		Columns

2.048868E-07	19.42862		DisplayName
1.484701E-07	23.42862		DisplayName, Id
Histogram Steps			
RANGE_HI_KEY	RANGE_ROWS	EQ_ROWS	

curbo	0	81	
Aaron	29545	1297	
Abhi	22520	562	
Adam	25885	2156	
Ahmad	44005	332	
Ajay	18977	500	
Albert	32063	435	
Alex	17325	6435	
Alexander	14863	1033	
Ali	21508	1095	
Amir	45299	445	
Anand	22712	638	
Andrew	27091	2959	
Andy	18519	2028	
Anonymous	40775	994	
Anurag	25727	252	
Arjun	30293	271	
Arun	23311	877	
Ash	12736	585	
Atul	32233	176	
Bala	46149	347	



Database Consistency / CheckDB



DBCC CheckDB

“Checks the logical and physical integrity of all the objects in the specified database...”

-- [Microsoft Docs](#)



What does
DBCC
CheckDB
check?

Lower level checks

- Disk space allocation structures
- Table level integrity
- System metadata
- Options exist



What if
CheckDB
reports
problems?

Stop everything!

- [Read this article](#) from Brent Ozar
- Don't panic
- Verify backups exist
- When was the last successful CheckDB
- Don't try to fix it yet
- Call Microsoft



Where can I run
CheckDB?

You have choices

- On the server
- [From a restored backup](#)
- Availability Group secondary replica



Demo



Index maintenance plan

- Rebuild
- Reorganize
- Update statistics



Summary



What we learned:

- Index types
 - Clustered
 - Non-Clustered
 - What, why and how
- Statistics
 - Data about data
- Check DB
 - When and where

