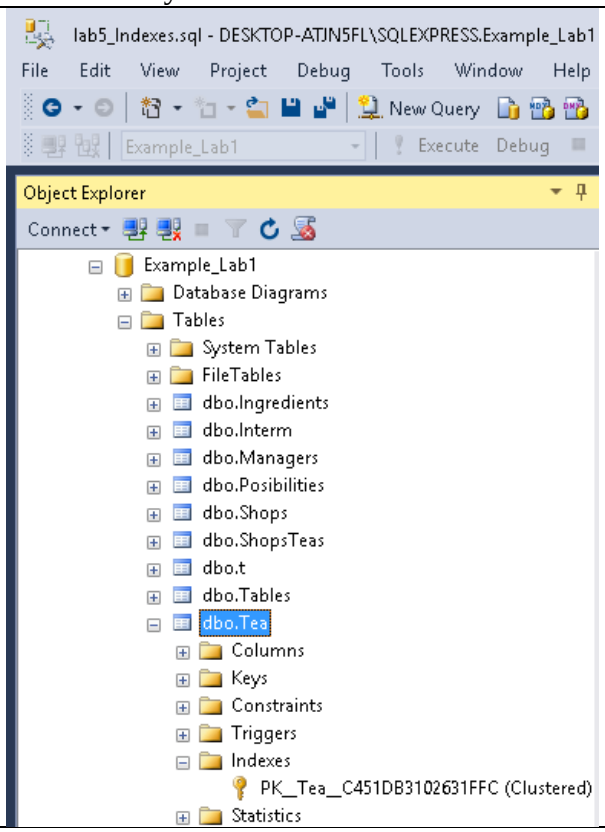
Indexes – example

```
use Example_Lab1
go

create table Tea(
Tid int primary key identity,
TName varchar(50),
Price int)

insert into Tea values ('Mint', 10),
('Ginger', 12), ('Fruits', 9), ('Rose', 8)

select * from Tea
```

Results | Messages

	Tid	TName	Price
1	1	Mint	10
2	2	Ginger	12
3	3	Fruits	9
4	4	Rose	8

Automatically a clustered index is created on the primary key (when this one is created). On a table one can have only one clustered index.

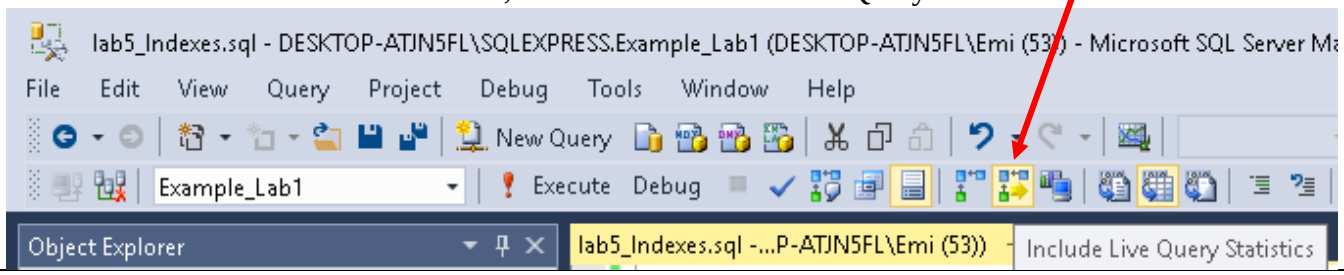



```
-- 1 clustered index was created on the primary key
-- PK__Tea__C451DB3102631FFC

select * from Tea
order by Tid
```

Results | Messages

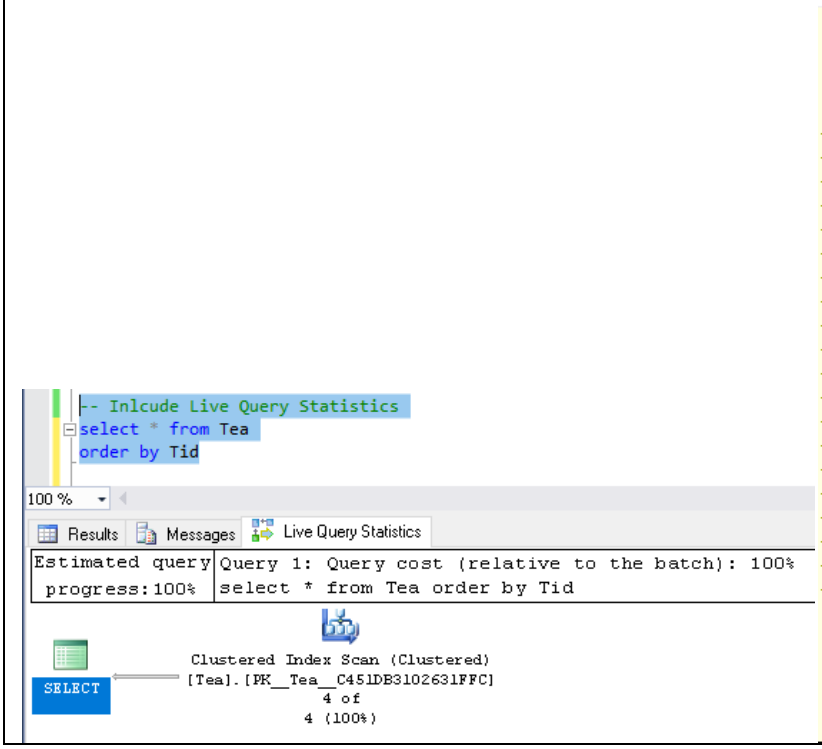
	Tid	TName	Price
1	1	Mint	10
2	2	Ginger	12
3	3	Fruits	9
4	4	Rose	8

To check the indexes and how are used, one can use Include Live Query Statistics.




```
-- Inlcude Live Query Statistics
```

```
select * from Tea
order by Tid
```



Clustered Index Scan (Clustered)

Scanning a clustered index, entirely or only a range.

Estimated operator progress: 100%

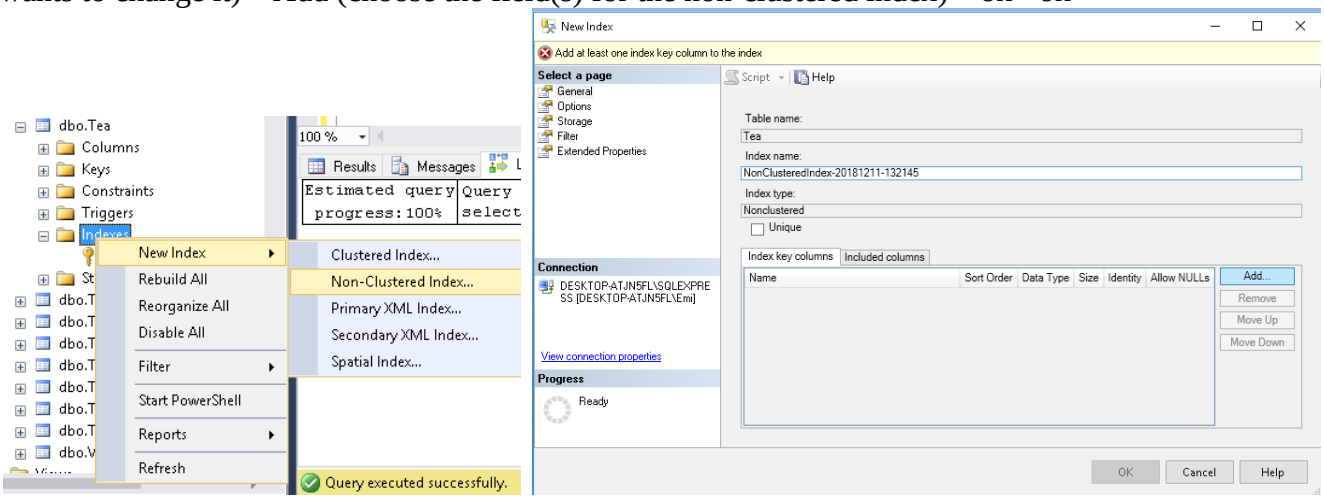
Physical Operation	Clustered Index Scan
Logical Operation	Clustered Index Scan
Actual Execution Mode	Row
Estimated Execution Mode	Row
Storage	RowStore
Number of Rows Read	4
Actual Number of Rows	4
Actual Number of Batches	0
Estimated I/O Cost	0.003125
Estimated Operator Cost	0.0032864 (100%)
Estimated Subtree Cost	0.0032864
Estimated CPU Cost	0.0001614
Estimated Number of Executions	1
Number of Executions	1
Estimated Number of Rows	4
Estimated Row Size	44 B
Actual Rebinds	0
Actual Rewinds	0
Ordered	True
Node ID	0

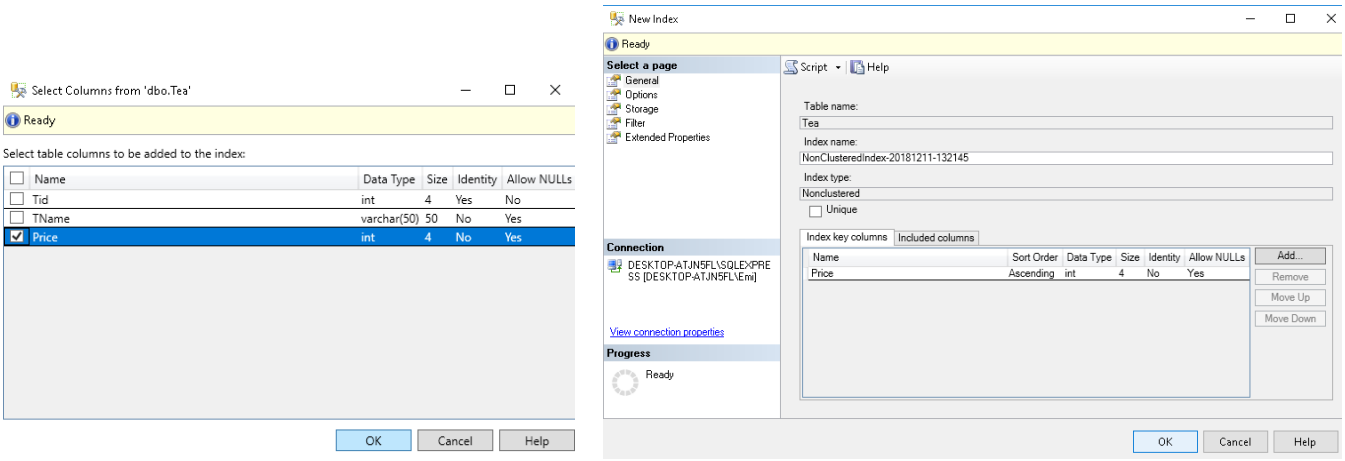
Object
[Example_Lab1].[dbo].[Tea].[PK__Tea__C451DB3102631FFC]

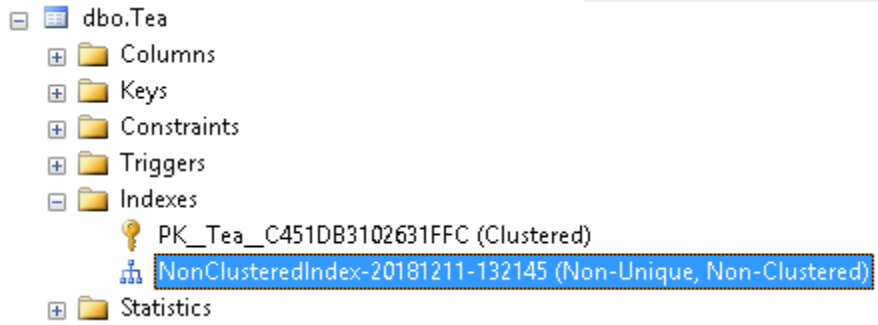
Output List
[Example_Lab1].[dbo].[Tea].Tid, [Example_Lab1].[dbo].[Tea].TName, [Example_Lab1].[dbo].[Tea].Price

<u>Create Non-Clustered Indexes by Design View</u>

- in the table tabs – choose Indexes – right click – new Index – Non-Clustered Index – Name (if one wants to change it) – Add (choose the field(s) for the non-clustered index) – ok - ok








```
-- create non-clustered index - by Design View
-- NonClusteredIndex-20181211-132145
```

Create Non-Clustered Indexes by Code

```
-- all the indexes from the
current database
select * from sys.indexes
```

Results | Messages | Live Query Statistics

	object_id	name	index_id	type	type_desc	is_unique	data_space_id	ignore_dup_key	is_primary_key	is_unique_constraint	fill_factor	is_padded
1	3	clst	1	1	CLUSTERED	1	1	0	0	0	0	0
2	5	clust	1	1	CLUSTERED	1	1	0	0	0	0	0
3	6	clst	1	1	CLUSTERED	1	1	0	0	0	0	0
4	7	clust	1	1	CLUSTERED	1	1	0	0	0	0	0
5	7	nc	2	2	NONCLUSTERED	1	1	0	0	0	0	0
6	8	NULL	0	0	HEAP	0	1	0	0	0	0	0
7	9	clst	1	1	CLUSTERED	1	1	0	0	0	0	0
8	17	cl	1	1	CLUSTERED	1	1	0	0	0	0	0
9	17	nc	2	2	NONCLUSTERED	1	1	0	0	0	0	0
10	17	nc2	3	2	NONCLUSTERED	1	1	0	0	0	0	0

Query executed successfully. | DESKTOP-ATJN5FL\SQLEXPRESS ... | DESKTOP-ATJN5FL\Emi (53) | Example_Lab1 | 00:00:03 | 176 rows

```
select name from sys.indexes
```

Results

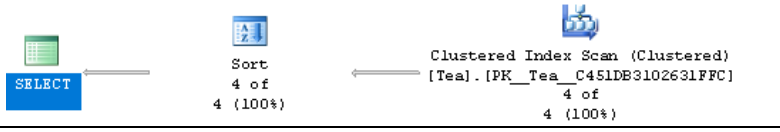
	name
1	clst
2	clust
3	clst
4	clust
5	nc
6	NULL
7	clst
8	cl
9	nc
10	nc2
11	cl

```
select * from Tea
Order by TName
-- only the clustered index is used
```

Results | Messages | Live Query Statistics

Estimated query progress: 100%

Query 1: Query cost (relative to the batch): 100%
select * from Tea Order by TName



Clustered Index Scan (Clustered)

Scanning a clustered index, entirely or only a range.

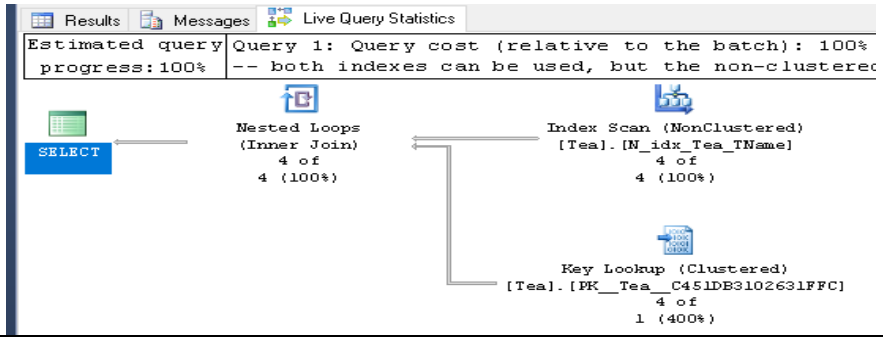
Estimated operator progress: 100%

Physical Operation	Clustered Index Scan
Logical Operation	Clustered Index Scan
Actual Execution Mode	Row
Estimated Execution Mode	Row
Storage	RowStore
Number of Rows Read	4
Actual Number of Rows	4
Actual Number of Batches	0
Estimated I/O Cost	0.003125
Estimated Operator Cost	0.0032864 (22%)
Estimated CPU Cost	0.0001614
Estimated Subtree Cost	0.0032864
Estimated Number of Executions	1
Number of Executions	1
Estimated Number of Rows	4
Estimated Row Size	44 B
Actual Rebinds	0
Actual Rewinds	0
Ordered	False
Node ID	1

Object
[Example_Lab1].[dbo].[Tea].[PK__Tea__C451DB3102631FFC]
Output List
[Example_Lab1].[dbo].[Tea].Tid, [Example_Lab1].[dbo].[Tea].TName, [Example_Lab1].[dbo].[Tea].Price

```
--create index non-clustered on the TName field
IF EXISTS (SELECT name FROM sys.indexes WHERE name = N'N_idx_Tea_TName')
   DROP INDEX N_idx_Tea_TName ON Tea;
GO

CREATE NONCLUSTERED INDEX N_idx_Tea_TName ON Tea(TName);
GO
```

```
-- both indexes can be used, but the non-clustered one is more efficient
select * from Tea
Order by TName
```



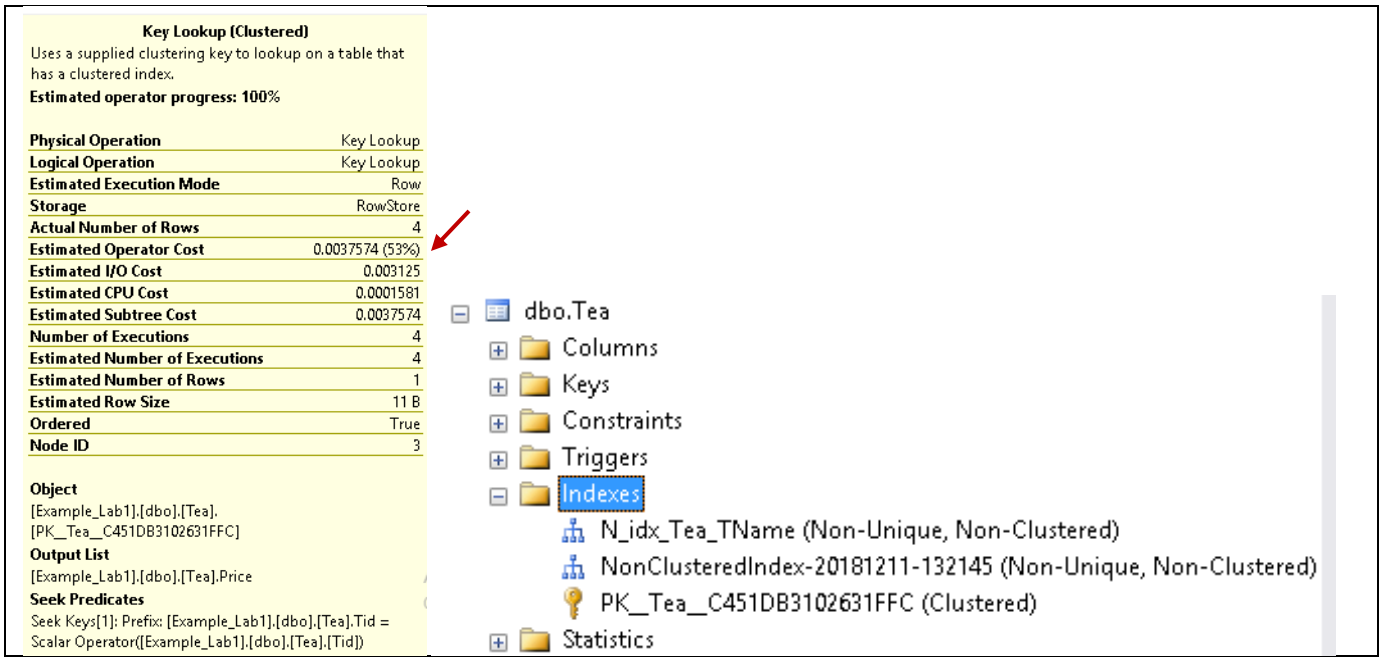
Index Scan (NonClustered)

Scan a nonclustered index, entirely or only a range.

Estimated operator progress: 100%

Physical Operation	Index Scan
Logical Operation	Index Scan
Estimated Execution Mode	Row
Storage	RowStore
Actual Number of Rows	4
Estimated Operator Cost	0.0032864 (47%)
Estimated I/O Cost	0.003125
Estimated CPU Cost	0.0001614
Estimated Subtree Cost	0.0032864
Number of Executions	1
Estimated Number of Executions	1
Estimated Number of Rows	4
Estimated Row Size	40 B
Ordered	True
Node ID	1

Object
[Example_Lab1].[dbo].[Tea].[N_idx_Tea_TName]
Output List
[Example_Lab1].[dbo].[Tea].Tid, [Example_Lab1].[dbo].[Tea].TName



The Non-clustered index should be created on the fields involved in ORDER BY clauses, WHERE clause, JOIN clauses, to increase the efficiency and decrease the execution time.

Create view

```
-- create view
create view vTea
as
  select * from Tea
  where TName LIKe 'a%'
go

-- execute
select * from vTea
order by TName
```