Using INCLUDE to Cover Queries

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Module Overview

Using INCLUDE for covering

Best uses for INCLUDE

INCLUDE for Better Covering

Prior to 2016, index key limited to 900 bytes/16 columns

2016: CL index key limited to 900 bytes/32 columns

2016: NC index key limited to 1,700 bytes/32 columns

Leaf-level can include non-key columns, with NO limitations

You can cover EVERYTHING!

But just because you can, doesn't mean you should...

Best Uses for INCLUDE: Option 1

```
SELECT [e].[LastName], [e].[FirstName],
  [e].[MiddleInitial], [e].[Phone]
FROM [dbo].[Employee] AS [e]
WHERE [e].[LastName] LIKE '[S-Z]%';
```

Table has a clustered index on EmployeeID (an identity)

```
CREATE INDEX [NCIndexLNOnly]
ON [dbo].[Employee]
([LastName]);
```

Only useful for HIGHLY selective queries (which is NOT this one!)

Actual structure on disk:

Tree level(s): LastName, EmployeeID

Leaf-level: LastName, EmployeeID

Best Uses for INCLUDE: Option 2

```
SELECT [e].[LastName], [e].[FirstName],
  [e].[MiddleInitial], [e].[Phone]
FROM [dbo].[Employee] AS [e]
WHERE [e].[LastName] LIKE '[S-Z]%';
```

Table has a clustered index on EmployeeID (an identity)

```
CREATE INDEX [NCIndexCoversAll4Cols]
ON [dbo].[Employee] ([LastName],
[FirstName], [MiddleInitial], [Phone]);
```

OK, but a bit overkill...

Actual structure on disk:

Tree level(s): LastName, FirstName, MiddleInitial, Phone, EmployeeID

Leaf-level: LastName, FirstName, MiddleInitial, Phone, EmployeeID

Best Uses for INCLUDE: Option 3

```
SELECT [e].[LastName], [e].[FirstName],
  [e].[MiddleInitial], [e].[Phone]
FROM [dbo].[Employee] AS [e]
WHERE [e].[LastName] LIKE '[S-Z]%';
```

Table has a clustered index on EmployeeID (an identity)

```
CREATE INDEX [NCIndexLNinKeyInclude3OtherCols]
ON [dbo].[Employee] ([LastName])
INCLUDE ([FirstName], [MiddleInitial], [Phone]);
```

The science...

Actual structure on disk:

Tree level(s): LastName, EmployeeID

Leaf-level: LastName, EmployeeID, FirstName, MiddleInitial, Phone

Best Uses for INCLUDE: Option 4

```
SELECT [e].[LastName], [e].[FirstName],
  [e].[MiddleInitial], [e].[Phone]
FROM [dbo].[Employee] AS [e]
WHERE [e].[LastName] LIKE '[S-Z]%';
```

Table has a clustered index on EmployeeID (an identity)

```
CREATE INDEX [NCIndexCoveringLnFnMiIncludePhone]
ON [dbo].[Employee] ([LastName], [FirstName], [MiddleInitial])
INCLUDE ([Phone]);
```

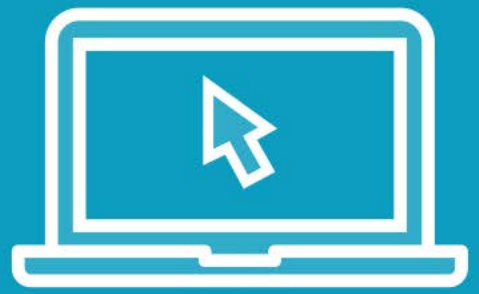
Debatable, but this might be my choice (the ***art*** of indexing)

Actual structure on disk:

Tree level(s): LastName, FirstName, MiddleInitial, EmployeeID

Leaf-level: LastName, FirstName, MiddleInitial, EmployeeID, Phone

Demo



Best uses for INCLUDE

Best Uses for INCLUDE: All Options

Option 1: not an option

Options 2, 3, and 4 have the same-sized LEAF-LEVEL

- Index sizes are similar
- For THIS query ALL of these will have the same number of reads

Options 2, 3, and 4 have different B-tree structures

- Different seek patterns are possible

So, what's the difference?

Best Uses for INCLUDE: All Options

Option 2: all columns are in the tree, no benefit for this query

Option 3: too little in the tree for OTHER queries but PERFECT for this one

QUERY TUNING

Option 4: more likely to happen after reviewing other existing indexes, other queries, and/or missing index DMVs

SERVER TUNING (index consolidation)

What We Covered

Using INCLUDE for covering

Best uses for INCLUDE