



Unidad Profesional Interdisciplinaria en Ingeniería y tecnologías Avanzadas Unidad de aprendizaje

Bases de Datos Distribuidas

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Actividad

Planes de Ejecución

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Análisis de planes de ejecución

Para su análisis se consideraron 2 tablas copia, las cuales estaban afectadas por índices declarados de diferente manera, estos se establecieron de acuerdo con el uso repetitivo de ciertas columnas que empleaban las consultas. Estos índices se construyeron de la siguiente manera:

Tabla copia 1

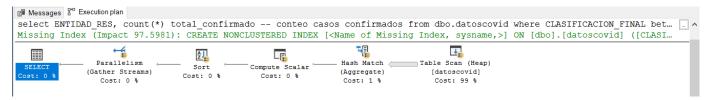
CLUSTER ENTIDAD – índice agrupado de acuerdo a Entidad _RES

Tabla copia 2

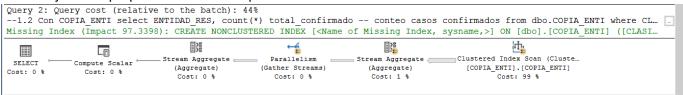
- CLUSTER Clasificación Índice agrupado a partir de Clasificacion_final
- NONCLUSTER Defunción índice no agrupado de FECHA_DEF
- NONCLUSTER UBICACIÓN –índice no agrupado de (ENTIDAD_RES, MUNICIPIO_RES).

Consulta 1: Listar los casos positivos por entidad de residencia.

Plan de ejecución inicial



Plan de ejecución propuesto con Tabla copia 1



Plan de ejecución propuesto con Tabla copia 2

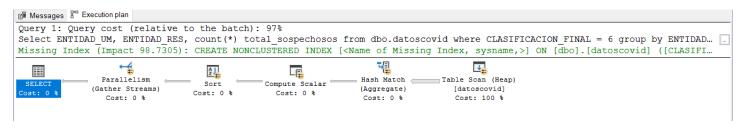


| Plan de ejecucion inicial | | Plan de ejecución pr | opuesto(Tabla 1) | Plan de ejecución propuesto(| Tabla 2) |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Table Scan (Heap) Scan rows from a table. | | Clustered Index Sc Scanning a clustered index, entirely or o | ' | Index Scan (NonClustered) Scan a nonclustered index, entirely or only a range | |
| Physical Operation | Table Scan | Physical Operation | Clustered Index Scan | Physical Operation | Index Scan |
| Logical Operation | Table Scan | Logical Operation | Clustered Index Scan | Logical Operation | Index Scan |
| Estimated Execution Mode | Batch | Estimated Execution Mode | Row | Estimated Execution Mode | Row |
| Storage | RowStore | Storage | RowStore | Storage | RowStore |
| Estimated Operator Cost | 475.362 (99%) | Estimated Operator Cost | 422.768 (99%) | Estimated Operator Cost | 48.8975 (92%) |
| Estimated I/O Cost | 471.164 | Estimated I/O Cost | 418.57 | Estimated I/O Cost | 44.6994 |
| Estimated Subtree Cost | 475.362 | Estimated Subtree Cost | 422.768 | Estimated Subtree Cost | 48.8975 |
| Estimated CPU Cost | 4.19808 | Estimated CPU Cost | 4.19808 | Estimated CPU Cost | 4.19808 |
| Estimated Number of Executions | 1 | Estimated Number of Executions | 1 | Estimated Number of Executions | 1 |
| Estimated Number of Rows to be Read | 15265600 | Estimated Number of Rows to be Rea | id 15265600 | Estimated Number of Rows to be Read | 15265600 |
| Estimated Number of Rows for All Executions | 5613880 | Estimated Number of Rows for All Ex | | Estimated Number of Rows for All Executions | 5575610 |
| Estimated Number of Rows Per Execution | 5613880 | Estimated Number of Rows Per Execu | | Estimated Number of Rows Per Execution | 5575610 |
| Estimated Row Size | 19 B | Estimated Row Size | 19 B | Estimated Row Size | 19 E |
| Ordered | False | Ordered Ordered | True | Ordered | True |
| Node ID | 4 | Node ID | riue | Node ID | 5 |
| Predicate [covidHistorico].[dbo].[datoscovid].[CLASIFICACION AND [covidHistorico].[dbo].[datoscovid].[CLASIFICA <=(3) Object [covidHistorico].[dbo].[datoscovid] Output List [covidHistorico].[dbo].[datoscovid].ENTIDAD_RES | | Predicate [covidHistorico].[dbo].[COPIA_ENTI].[CL [covidHistorico].[dbo].[COPIA_ENTI].[CL Object [covidHistorico].[dbo].[COPIA_ENTI].[CC Output List [covidHistorico].[dbo].[COPIA_ENTI].ENTI].ENTI].ENTI].ENTI].ENTI].ENTI | ASIFICACION_FINAL]<=(3) DPIA_ENTI] | Predicate [covidHistorico].[dbo].[COPIA_CLASIF].[CLASIFICACI (1) AND [covidHistorico].[dbo].[COPIA_CLASIF]. [CLASIFICACION_FINAL] <= (3) Object [covidHistorico].[dbo].[COPIA_CLASIF].[COPIA_UBIC Output List [covidHistorico].[dbo].[COPIA_CLASIF].ENTIDAD_RE | 'ACION] |

Podemos observar que los costos del Plan de ejecución llevado a cabo por la Tabla copia 1 disminuyen un poco aunque se mantienen altos y a grandes escalas no varia mucho esta diferencia sin embargo a comparación del Plan de ejecución propuesto numero 2 estos costos disminuyen significativamente resaltando de manera inicial el Costo Estimado de Operación que de un total de 475.362 disminuye a 48.89, de igual manera los otros costos, por otro lado a diferencia del plan de ejecucion inicial que emplea Table Scan los planes propuestos 1 y 2 ejecutan operaciones físicas y lógicas de escaneo por índice agrupado y un escaneo de índice respectivamente

Consulta numero 2: Listar los casos sospechosos por entidad.

Plan de ejecución inicial



Plan de ejecución propuesto con tabla 2



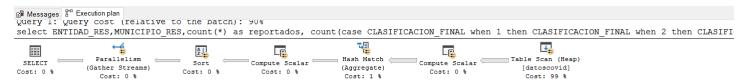
| Plan de ejecución Inic | ial | Plan de ejecucion prop | uesto tabla copia 2 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Table Scan (Heap) Scan rows from a table. | | Clustered Index See Scanning a particular range of rows from | - |
| Physical Operation | Table Scan | Physical Operation | Clustered Index Seek |
| Logical Operation | Table Scan | Logical Operation | Clustered Index Seek |
| Estimated Execution Mode | Batch | Estimated Execution Mode | Batch |
| Storage | RowStore | Storage | RowStore |
| Estimated Operator Cost | 475.362 (100%) | Estimated Operator Cost | 15.9022 (99%) |
| Estimated I/O Cost | 471.164 | Estimated I/O Cost | 15.7442 |
| Estimated Subtree Cost | 475.362 | Estimated Subtree Cost | 15.9022 |
| Estimated CPU Cost | 4.19808 | Estimated CPU Cost | 0.157909 |
| Estimated Number of Executions | 1 | Estimated Number of Executions | 1 |
| Estimated Number of Rows to be Read | 15265600 | Estimated Number of Rows to be Read | 574071 |
| Estimated Number of Rows for All Executions | 572785 | Estimated Number of Rows for All Exec | |
| Estimated Number of Rows Per Execution | 572785 | Estimated Number of Rows Per Executi | |
| Estimated Row Size | 25 B | Estimated Row Size | 21 B |
| Ordered | False | Ordered | True |
| Node ID | 4 | Node ID | 4 |
| Predicate [covidHistorico].[dbo].[datoscovid].[CLASIFICACIO Object [covidHistorico].[dbo].[datoscovid] Output List [covidHistorico].[dbo].[datoscovid].ENTIDAD_UM, [dbo].[datoscovid].ENTIDAD_RES | | Object [covidHistorico].[dbo].[COPIA_CLASIF].[CO Output List [covidHistorico].[dbo].[COPIA_CLASIF].EN [dbo].[COPIA_CLASIF].ENTIDAD_RES Seek Predicates Seek Keys[1]: Prefix: [covidHistorico].[dbc [COPIA_CLASIF].CLASIFICACION_FINAL = | TIDAD_UM, [covidHistorico]. |

De igual manera vimos necesario un índice para la consulta numero 2, debido a que usaba un Table Scan para la búsqueda de la misma, nuestra propuesta tomó como base la tabla copia 2 que contenía precisamente como índice agrupado la clasificación y no agrupado la Entidad y municipio.

Como resultado se obtuvo una disminución de costos como es el caso del Costo Estimado de Operación que de 475.362 bajó a 15.90, emplear el uso del índice agrupado que se estableció, así como recurrir al operador Hash de igual manera para comparar los datos, el cual mejora su rendimiento debido a que se maneja un predicado independiente en la consulta o dicho de otra forma, pertenece solo a una tabla.

Consulta numero 3: Listar el Top 5 de municipios por entidad con el mayor numero de casos reportados, indicando casos sospechosos y casos confirmados.

Plan de ejecución inicial



Plan de ejecución propuesto con Tabla copia 2

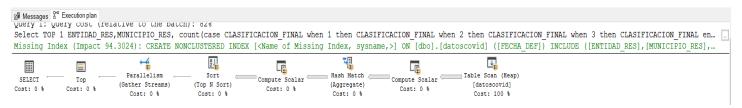


| Plan de ejecución inicial | | | Plan de ejecución propuesto a pa | rtir de tabla copi |
|---------------------------------------------------|-------------------|--|-----------------------------------------------------------------------|--------------------|
| Table Scan (Heap) Scan rows from a table. | | | Index Scan (NonClustere Scan a nonclustered index, entirely or only a | • |
| Physical Operation | Table Scan | | Physical Operation | Index Scan |
| Logical Operation | Table Scan | | Logical Operation | Index Scan |
| Estimated Execution Mode | Batch | | Estimated Execution Mode | Row |
| Storage | RowStore | | Storage | RowStore |
| Estimated Operator Cost | 475.362 (99%) | | Estimated Operator Cost | 48.8975 (95%) |
| Estimated I/O Cost | 471.164 | | Estimated I/O Cost | 44.6994 |
| Estimated Subtree Cost | 475.362 | | Estimated Subtree Cost | 48.8975 |
| Estimated CPU Cost | 4.19808 | | Estimated CPU Cost | 4.19808 |
| Estimated Number of Executions | 1 | | Estimated Number of Executions | 1 |
| Estimated Number of Rows to be Read | 15265600 | | Estimated Number of Rows to be Read | 15265600 |
| Estimated Number of Rows for All Executions | 15265600 | | Estimated Number of Rows for All Execution | ons 15265600 |
| Estimated Number of Rows Per Execution | 15265600 | | Estimated Number of Rows Per Execution | 15265600 |
| Estimated Row Size | 27 B | | Estimated Row Size | 47 B |
| Ordered | False | | Ordered | True |
| Node ID | 5 | | Node ID | 8 |
| Object | | | Object | |
| [covidHistorico].[dbo].[datoscovid] | | | [covidHistorico].[dbo].[COPIA_CLASIF].[COPIA | _UBICACION] |
| Output List | | | Output List | |
| [covidHistorico].[dbo].[datoscovid].ENTIDAD_RES, | [covidHistorico]. | | [covidHistorico].[dbo].[COPIA_CLASIF].ENTIDA | AD_RES, |
| [dbo].[datoscovid].MUNICIPIO_RES, [covidHistorico | o].[dbo]. | | [covidHistorico].[dbo].[COPIA_CLASIF].MUNIC | IPIO_RES, |
| [datoscovid].CLASIFICACION_FINAL | | | [covidHistorico].[dbo].[COPIA_CLASIF].CLASIFI | CACION_FINAL |

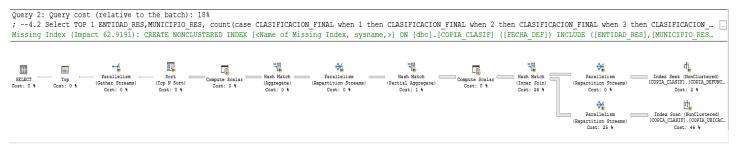
Como en los casos anteriores el índice resultó ser mas efectivo para la disminución de costos de operación, así como ocupó como recursos como en la consulta anterior los índices cluster y noncluster implementados en la tabla copia 2.

También se puede observar la ausencia del uso del Hash Match, el cual se encuentra reemplazado por el Stream Aggregate.

Consulta 4: Determinar el municipio con el mayor número de defunciones en casos confirmados Plan de ejecución inicial



Plan de ejecución propuesto



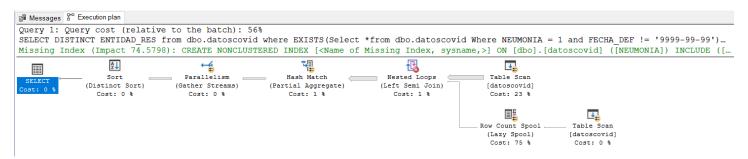
| Plan de ejecución inicial | Plan de ejecución propuesto con tabla copia 2 | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| Table Scan (Heap) Scan rows from a table. | Index Seek (NonClustered) Scan a particular range of rows from a nonclustered index. | Index Scan (NonClustered) Scan a nonclustered index, entirely or only a range. | | | |
| Physical Operation Table Scan | Physical Operation Index Seek Logical Operation Index Seek | Physical Operation Index Scan | | | |
| Logical Operation Table Scan Estimated Execution Mode Batch | Estimated Execution Mode Row Storage RowStore | Logical Operation Index Scan Estimated Execution Mode Row | | | |
| Storage RowStore Estimated Operator Cost 475.362 (100%) | Estimated Operator Cost 1.62444 (2%) Estimated I/O Cost 1.51127 | Storage RowStore Estimated Operator Cost 48.8975 (46%) | | | |
| Estimated I/O Cost 471.164 Estimated Subtree Cost 475.362 | Estimated Subtree Cost 1.62444 Estimated CPU Cost 0.113172 | Estimated I/O Cost 44.6994 Estimated Subtree Cost 48.8975 | | | |
| Estimated CPU Cost 4.19808 Estimated Number of Executions 1 | Estimated Number of Executions 1 Estimated Number of Rows to be Read 411390 | Estimated CPU Cost | | | |
| Estimated Number of Rows to be Read 15265600 Estimated Number of Rows for All Executions 451684 | Estimated Number of Rows for All Executions 411390 Estimated Number of Rows Per Execution 411390 | Estimated Number of Rows to be Read 15265600 | | | |
| Estimated Number of Rows Per Execution 451684 Estimated Row Size 49 B | Estimated Row Size 15 B Ordered True | Estimated Number of Rows for All Executions 15265600 Estimated Number of Rows Per Execution 15265600 | | | |
| Ordered False | Node ID 12 | Estimated Row Size 51 B Ordered False | | | |
| Node ID 6 | Object [covidHistorico].[dbo].[COPIA CLASIF].[COPIA DEFUNCION] | Node ID 14 | | | |
| Predicate [covidHistorico].[dbo].[datoscovid].[FECHA_DEF] <> N'9999-99-99' Object [covidHistorico].[dbo].[datoscovid] Output List [covidHistorico].[dbo].[datoscovid].ENTIDAD_RES, [covidHistorico]. [dbo].[datoscovid].MUNICIPIO_RES, [covidHistorico].[dbo]. [datoscovid].CLASIFICACION_FINAL | Output List [covidHistorico].[dbo].[COPIA_CLASIF].CLASIFICACION_FINAL, Uniq1001 Seek Predicates [1] Seek Keys[1]: End: [covidHistorico].[dbo]. [COPIA_CLASIF].FECHA_DEF < Scalar Operator(N'9999-99-99'), [2] Seek Keys[1]: Start: [covidHistorico].[dbo]. [COPIA_CLASIF].FECHA_DEF > Scalar Operator(N'9999-99-99') | Object [covidHistorico].[dbo].[COPIA_CLASIF].[COPIA_UBICACION] Output List [covidHistorico].[dbo].[COPIA_CLASIF].ENTIDAD_RES, [covidHistorico].[dbo].[COPIA_CLASIF].MUNICIPIO_RES, [covidHistorico].[dbo].[COPIA_CLASIF].CLASIFI.CACION_FINAL, Uniq1001 | | | |

En esta consulta se ve el porque se incluyó el segundo índice NONCLUSTERED hacía referencia a la columna de FECHA_DEF y se obtuvo el siguiente plan de ejecución.

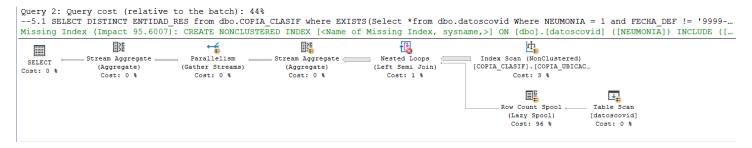
Podemos darnos cuenta de aquí que los costos estimados de operación se encuentran distribuidos entre los dos índices NONCLUSTERED y por cada uno se observa una notable disminución con respecto al que se tiene en el plan de ejecución inicial que es de un total de 475.36 a un 1.62 y 48.89 que se observa en los NONCLUSTERED.

Consulta 5: Determinar por entidad si por casos sospechosos hay defunciones reportadas asociadas a neumonía.

Plan de ejecución inicial



Plan de ejecución propuesta solución 1



Plan de ejecución propuesta solución 2



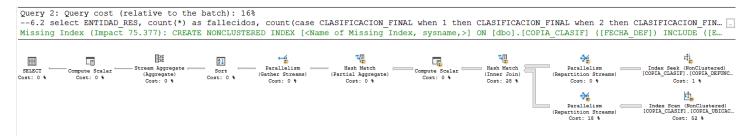
| Plan de ejecución inicial | _ | Plan de ejecución propues | sta 1 | Plan de ejecución prop | ouesta 2 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Table Scan | | Index Scan (NonClustered) | | Clustered Index Seek (Clu | stered) |
| Scan rows from a table. | | Scan a nonclustered index, entirely or only a range | | Scanning a particular range of rows from a clu | stered index. |
| Physical Operation Tab | e Scan | Physical Operation | Index Scan | Physical Operation | Clustered Index See |
| Logical Operation Tab | e Scan | Logical Operation | Index Scan | Logical Operation | Clustered Index See |
| Estimated Execution Mode | Row | Estimated Execution Mode | Row | Estimated Execution Mode | Ro |
| Storage Ro | wStore | Storage | RowStore | Storage | RowSto |
| Estimated I/O Cost | 71.164 | Estimated Operator Cost | 48.8975 (3%) | Estimated Operator Cost Estimated I/O Cost | 15.9022 (98 |
| Estimated Operator Cost 475.36 | 2 (23%) | Estimated I/O Cost | 44.6994 | Estimated I/O Cost Estimated Subtree Cost | 15.74 15.90 |
| Estimated CPU Cost | 1.19806 | Estimated Subtree Cost | 48,8975 | Estimated Subtree Cost Estimated CPU Cost | 0.1579 |
| Estimated Subtree Cost | 75.362 | Estimated CPU Cost | 4.19808 | Estimated CFO Cost Estimated Number of Executions | 0.1379 |
| Estimated Number of Executions | 1 | Estimated Number of Executions | 1 | Estimated Number of Rows Per Execution | 37580 |
| Estimated Number of Rows for All Executions 15 | 265600 | Estimated Number of Rows to be Read | 15265600 | Estimated Number of Rows to be Read | 5740 |
| | 265600 | Estimated Number of Rows for All Executions | 15265600 | Estimated Number of Rows for All Execution | |
| | 265600 | Estimated Number of Rows Per Execution | 15265600 | Estimated Row Size | 4 |
| Estimated Row Size | 15 B | Estimated Row Size | 15 B | Ordered | Tri |
| Ordered | False | Ordered | True | Node ID | |
| Node ID | 4 | Node ID | 4 | | |
| [covidHistorico].[dbo].[datoscovid] Output List [covidHistorico].[dbo].[datoscovid].ENTIDAD_RES Table Scan | | [covidHistorico].[dbo].[COPIA_CLASIF].[COPIA_UBIC Output List [covidHistorico].[dbo].[COPIA_CLASIF].ENTIDAD_RE Table Scan | | [covidHistorico].[dbo].[COPIA_CLASIF].[FECHA_ Object [covidHistorico].[dbo].[COPIA_CLASIF].[COPIA_ Output List | |
| Scan rows from a table. | | Scan rows from a table. | | [covidHistorico].[dbo].[COPIA_CLASIF].ENTIDAL Seek Predicates | D_RES |
| · · · · · · · · · · · · · · · · · · · | e Scan | Physical Operation | Table Scan | Seek Keys[1]: Prefix: [covidHistorico].[dbo]. | |
| | e Scan | Logical Operation | Table Scan | [COPIA_CLASIF].CLASIFICACION_FINAL = Scalar | Operator((6)) |
| Estimated Execution Mode | Row | Estimated Execution Mode | Row | | |
| | wStore | Storage | RowStore | | |
| | 71.164 | Estimated I/O Cost | 471.164 | | |
| Estimated Operator Cost 0.00817 | | Estimated Operator Cost | 0.0081733 (0%) | | |
| | 6.7923 | Estimated CPU Cost | 16.7923 | | |
| | 081733 | Estimated Subtree Cost | 0.0081733 | | |
| Estimated Number of Executions | 1 | Estimated Number of Executions | 1 | | |
| Estimated Number of Rows for All Executions | 1 | Estimated Number of Rows for All Executions | 1 | | |
| Estimated Number of Rows Per Execution | 7 | Estimated Number of Rows Per Execution | 1 | | |
| | 265600 | Estimated Number of Rows to be Read | 15265600 | | |
| Estimated Row Size Ordered | 35 B | Estimated Row Size | 35 B | | |
| Node ID | False 6 | Ordered Node ID | False 6 | | |
| Predicate [covidHistorico].[dbo].[datoscovid].[NEUMONIA]=(1) AND [covidHistorico].[dbo].[datoscovid].[FECHA_DEF]<>N'9999-99 Object [covidHistorico].[dbo].[datoscovid] | -99' | Predicate [covidHistorico].[dbo].[datoscovid].[NEUMONIA]=(1) [covidHistorico].[dbo].[datoscovid].[FECHA_DEF]<>N Object [covidHistorico].[dbo].[datoscovid] | | | |

Se tomaron como propuestas 2 soluciones distintas, las cuales tomaron como base la Tabla copia numero 2, de esta manera se encontró que para el primer plan de ejecución solución hubo una notable disminución del costo de operación representando el 3% pero en un punto este mismo recurrió a realizar una Table Scan que conserva los mismo costos de operación que el plan ejecución inicial, por lo que se tuvieron beneficios de cierta manera, por otra parte el plan de ejecución de la propuesta 2, únicamente recurre a un índice cluster dado por el índice agrupado de clasificación. Se observa una reducción de los costos de 475 hasta un 15.74.

Consulta 6: Listar por entidad el total de casos sospechosos, casos confirmados, total de defunciones en los meses de Marzo a Agosto 2020 y de diciembre de 2020 a Mayo de 2021 Plan de ejecución inicial

| ■ Messages | Execution plan | | | | | | | |
|------------------|----------------------------------------|--------------------------|----------------------------------|--------------------------|-------------------------------------------|----------------------|----------------|---------------|
| Query 1: Qu | ery cost (relative | to the batch): 8 | 4 % | | | | | |
| select ENTI | [DAD_RES, count(*) a | as fallecidos, co | unt(case CLASI | FICACION_FINAL w | hen 1 then CLASIFICA(| CION_FINAL when 2 th | nen CLASIFICAC | ION_FINAL whe |
| Missing Ind | dex (Impact 95.2857) | : CREATE NONCLUS | TERED INDEX [< | Name of Missing | <pre>Index, sysname,>] ON</pre> | [dbo].[datoscovid] | ([FECHA_DEF]) | INCLUDE ([EN |
| SELECT Cost: 0 % | Parallelism (Gather Streams) Cost: 0 % | Compute Scalar Cost: 0 % | Hash Match (Aggregate) Cost: 1 % | Compute Scalar Cost: 0 % | Table Scan (Heap) [datoscovid] Cost: 99 % | | | |

Plan de ejecución propuesta



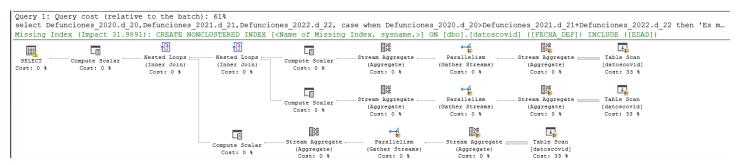
| Plan de ejecución inicial | | Plan o | le ejecu | ción propuesto | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Table Scan (Heap) Scan rows from a table. | Dhu | Index Seek (NonClustered) an a particular range of rows from a nonclustered assigned Operation | index. | Index Scan (NonClustered) Scan a nonclustered index, entirely or only a range. | |
| Physical Operation Table S Logical Operation Table S | Loc | gical Operation | Index Seek | Physical Operation | Index Scan |
| Estimated Execution Mode | r Feti | timated Execution Mode | Row | Physical Operation | |
| | Sto | orage | RowStore | Logical Operation | Index Scan |
| | Est | | 0.966721 (1%) | Estimated Execution Mode | Row |
| Estimated Operator Cost 475.362 (9 Estimated I/O Cost 471 | ESU | timated I/O Cost | 0.899421 | Storage | RowStore |
| Estimated I/O Cost 4/1 Estimated Subtree Cost 475 | ESU | timated Subtree Cost | 0.966721 | Estimated Operator Cost | 48.8975 (52%) |
| Estimated Subtree Cost 4/5 Estimated CPU Cost 4.19 | LSU | timated CPU Cost timated Number of Executions | 0.0672996 | Estimated I/O Cost | 44.6994 |
| Estimated Number of Executions | | timated Number of Executions | 244583 | Estimated Subtree Cost | 48.8975 |
| Estimated Number of Rows to be Read 15265 | | timated Number of Rows for All Executions | 244583 | Estimated CPU Cost | 4.19808 |
| Estimated Number of Rows for All Executions 257 | 55 Esti | timated Number of Rows Per Execution | 244583 | | 4.13000 |
| Estimated Number of Rows Per Execution 257 | 55 Esti | timated Row Size | 15 B | Estimated Number of Executions | |
| Estimated Row Size | B | dered | True | Estimated Number of Rows to be Read | 15265600 |
| Ordered | se No | ode ID | 10 | Estimated Number of Rows for All Executions | 15265600 |
| Node ID | 4 | | | Estimated Number of Rows Per Execution | 15265600 |
| | | oject ovidHistorico].[dbo].[COPIA_CLASIF].[COPIA_DEFUN | ICIONII | Estimated Row Size | 23 B |
| Predicate | | utput List | ICION | Ordered | False |
| [covidHistorico].[dbo].[datoscovid].[FECHA_DEF]>=N'2020-03-0 | | ovidHistorico].[dbo].[COPIA_CLASIF].CLASIFICACION | I FINAL. | Node ID | 12 |
| AND [covidHistorico].[dbo].[datoscovid].[FECHA_DEF] <= N'2020 08-31' OR [covidHistorico].[dbo].[datoscovid].[FECHA_DEF] >= N'2020-12-01' AND [covidHistorico].[dbo].[datoscovid]. [FECHA_DEF] <= N'2021-05-31' Object [covidHistorico].[dbo].[datoscovid] Output List [covidHistorico].[dbo].[datoscovid].ENTIDAD_RES, [covidHistorico].[dbo].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid].[datoscovid]. | See [1] [CC Enc Ope ([db 01") | niq1001 ek Predicates] Seek Keys[1]: Start: [covidHistorico].[dbo]. OPIA_CLASIF].FECHA_DEF >= Scalar Operator(N'202 dd: [covidHistorico].[dbo].[COPIA_CLASIF].FECHA_DE perator(N'2020-08-31'), [2] Seek Keys[1]: Start: [covi- bo].[COPIA_CLASIF].FECHA_DEF >= Scalar Operator '), End: [covidHistorico].[dbo].[COPIA_CLASIF].FECH alar Operator(N'2021-05-31') | EF <= Scalar dHistorico]. r(N'2020-12- | Object [covidHistorico].[dbo].[COPIA_CLASIF].[COPIA_UBICA Output List [covidHistorico].[dbo].[COPIA_CLASIF].ENTIDAD_RES [covidHistorico].[dbo].[COPIA_CLASIF].CLASIFICACIC Uniq1001 | 5, |

Podemos observar que de igual manera existen mejoras respecto al plan de ejecución inicial en sentido de que los costos estimados de operación se reducen y además se dividen esta operación entre los índices noncluster de fecha de defunción y de ubicación como lo demanda la consulta. Además, mejora el trabajo de los operadores de manera paralela a diferencia del caso inicial donde solo el operador inicial se ve afectado.

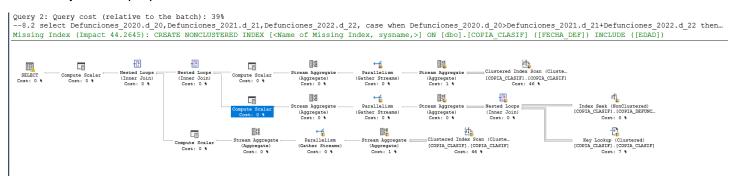
Consulta 7:

Consulta 8: Determinar si en el año 2020 hay una mayor cantidad de defunciones de menores de edad que en el año 2021 y 2022

Plan de ejecución inicial



Plan de ejecución propuesto



| | | Plan de ejecución inici | al | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Table Scan Scan rows from a table. | | Table Scan | | Table Scan | |
| Scall lows from a table. | | Scan rows from a table. | | Scan rows from a table. | |
| Physical Operation Tal | ble Scan | Physical Operation | Table Scan | Physical Operation | Table Scan |
| Logical Operation Tal | ble Scan | Logical Operation | Table Scan | Logical Operation | Table Scan |
| Estimated Execution Mode | Row | Estimated Execution Mode | Row | Estimated Execution Mode | Row |
| Storage R | owStore | Storage | RowStore | Storage | RowStore |
| Estimated Operator Cost 475.36 | 62 (33%) | Estimated Operator Cost | 475.362 (33%) | | 475.362 (33%) |
| Estimated I/O Cost | 471.164 | Estimated I/O Cost | 471.164 | Estimated I/O Cost | 471.164 |
| Estimated Subtree Cost | 475.362 | Estimated Subtree Cost | 475,362 | Estimated Subtree Cost | 475.362 |
| Estimated CPU Cost | 4.19806 | Estimated CPU Cost | 4.19806 | Estimated CPU Cost | 4.19806 |
| Estimated Number of Executions | 1 | Estimated Number of Executions | 1 | Estimated Number of Executions | 1 |
| Estimated Number of Rows to be Read 1 | 5265600 | Estimated Number of Rows to be Read | 15265600 | Estimated Number of Rows to be Read | 15265600 |
| Estimated Number of Rows for All Executions | 111505 | Estimated Number of Rows for All Executions | 10769.3 | Estimated Number of Rows for All Executions | 108018 |
| Estimated Number of Rows Per Execution | 111505 | Estimated Number of Rows Per Execution | 10769.3 | Estimated Number of Rows Per Execution | 108018 |
| Estimated Row Size | 40 B | Estimated Row Size | 35 B | Estimated Row Size | 35 B |
| Ordered | False | Ordered | False | Ordered | False |
| Node ID | 9 | Node ID | 16 | Node ID | 23 |
| [covidHistorico].[dbo].[datoscovid].[FECHA_DEF] >= N'2020-1 AND [covidHistorico].[dbo].[datoscovid].[FECHA_DEF] <= N'2 12-31' AND CONVERT_IMPLICIT(int,[covidHistorico].[dbo]. [datoscovid].[EDAD],0) < (18) Object [covidHistorico].[dbo].[datoscovid] Clustered Index Scan (Clustered) Scanning a clustered index, entirely or only a range. | 2020- | Predicate [covidHistorico].[dbo].[datoscovid].[FECHA_DEF]>= AND [covidHistorico].[dbo].[datoscovid].[FECHA_DI 12-31' AND CONVERT_IMPLICIT(int,[covidHistorico] [datoscovid].[EDAD],0)<(18) Object [covidHistorico].[dbo].[datoscovid] Plan de ejecución propue Index Seek (NonClustered) Scan a particular range of rows from a nonclustered | EF] <= N'2022- .[dbo]. | [covidHistorico].[dbo].[datoscovid].[FECHA_DEF]>=N AND [covidHistorico].[dbo].[datoscovid].[FECHA_DEF] 12-31' AND CONVERT_IMPLICIT(int,[covidHistorico].[c [datoscovid].[EDAD].0] < (18) Object [covidHistorico].[dbo].[datoscovid] Key Lookup (Clustered) Uses a supplied clustering key to lookup on a table clustered index. |] <=N'2021- ibo]. |
| Physical Operation Clustered In | idex Scan | Physical Operation Logical Operation | Index Seek Index Seek | Physical Operation | Key Look |
| Logical Operation Clustered In | dex Scan | Estimated Execution Mode | Row | Logical Operation | Key Loo |
| Estimated Execution Mode | Row | Storage | RowStore | Estimated Execution Mode | , i |
| Storage | RowStore | Estimated Operator Cost | 0.0844256 (0%) | Storage | RowS |
| | 306 (46%) | Estimated I/O Cost | 0.0786806 | Estimated I/O Cost | 0.003 |
| Estimated I/O Cost | 418.608 | Estimated Subtree Cost | 0.0844256 | Estimated Operator Cost | 66.9401 (|
| Estimated Subtree Cost | 422.806 | Estimated CPU Cost | 0.005745 | Estimated CPU Cost | 0.0001 |
| | 4.19808 | Estimated Cr o cost Estimated Number of Executions | 0.003743 | Estimated Subtree Cost | 66.9 |
| Estimated CPU Cost | 4.19808 | Estimated Number of Rows to be Read | 20748.3 | Estimated Number of Executions | 207- |
| Estimated Number of Executions | 1 | Estimated Number of Rows for All Executions | 20748.3 | Estimated Number of Rows for All Executions | 23578990 |
| | 15265600 | Estimated Number of Rows Per Execution | 20748.3 | Estimated Number of Rows Per Execution | 113 |
| Estimated Number of Rows for All Executions | 106014 | Estimated Row Size | 15 B | Estimated Row Size | |
| Estimated Number of Rows Per Execution | 106014 | Ordered | True | Ordered | T |
| Estimated Row Size | 40 B | Node ID | 19 | Node ID | |
| Ordered | False | itoue is | .,, | | |
| Node ID Predicate [covidHistorico].[dbo].[COPIA_CLASIF].[FECHA_DEF]>=N'2020-01- AND [covidHistorico].[dbo].[COPIA_CLASIF].[FECHA_DEF]<=N'202 31' AND CONVERT_IMPLICIT(int,[covidHistorico].[dbo].[COPIA_CLASIF].[FECHA_DEF] [EDAD],0)<(18) Object | 0-12- | Object [covidHistorico].[dbo].[COPIA_CLASIF].[COPIA_DEFU Output List Uniq1009, [covidHistorico].[dbo]. [COPIA_CLASIF].CLASIFICACION_FINAL Seek Predicates Seek Keys[1]: Start: [covidHistorico].[dbo]. [COPIA_CLASIF].FECHA_DEF >= Scalar Operator(N'2C |)22-01-01'), | Predicate CONVERT_IMPLICIT(int,[covidHistorico].[dbo].[COI[EDAD],0)<(18) Object [covidHistorico].[dbo].[COPIA_CLASIF].[COPIA_CLASEP].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF].[COPIA_CLASIF]. | ASIF] |
| [EDAD],0)<(18) | ASIF]. | Seek Keys[1]: Start: [covidHistorico].[dbo]. | | Seek Keys[1]: Prefix: [covidHistorico].[dbo]. [COPIA_CLASIF].CLASIFICACION_FINAL, Uniq1009 | |

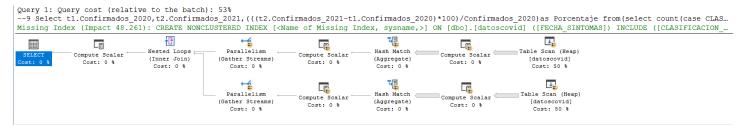
Debido a los Table Scan se refleja un alto costo arriba de 475 en el caso de el plan inicial, en el cual se ejecutan 3 operadores de este tipo, debido a los índices implementados con ayuda de la tabla copia 2 se ejecutan operadores relacionados al NONCLUSTER Y un Clustered que actúa de manera contraproducente en esta consulta pues el costo que observamos no esta muy lejos del plan inicial, ya que debido a la búsqueda que realiza en toda la tabla le afecta la existencia del índice agrupado en las clasificaciones.

De igual manera en ambos planes hay Stream Agregate a pesar de no ejecutar un group by en la consulta sin embargo se están realizando agrupaciones de datos.

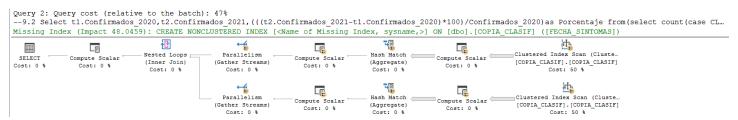
Por otra parte también hay existencia de los Nested Loops debido a la búsqueda entre 2 tablas donde el primer caso se ejecuta en la búsqueda entre fechas y por edad, y ya en la segunda tabla se ubica su respectiva condición a evaluar en que año hay mayores casos de defunciones.

Consulta numero 9: Determinar si en el año 2021 hay un porcentaje mayor al 60 de casos reportados que son confirmados por estudios de laboratorio en comparación al año 2020.

Plan de ejecución inicial



Plan de ejecución propuesto



| Table Scan (Heap) | | Table Scan (Heap) | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Scan rows from a table. | | Scan rows from a table. | |
| Physical Operation | Table Scan | Physical Operation | Table Scan |
| Logical Operation | Table Scan | Logical Operation | Table Scan |
| Estimated Execution Mode | Batch | Estimated Execution Mode | Batch |
| Storage | RowStore | Storage | RowStore |
| Estimated Operator Cost | 475.362 (50%) | Estimated Operator Cost | 475.362 (50%) |
| Estimated I/O Cost | 471.164 | Estimated I/O Cost | 471.164 |
| Estimated Subtree Cost | 475.362 | Estimated Subtree Cost | 475.362 |
| Estimated CPU Cost | 4.19808 | Estimated CPU Cost | 4.19808 |
| Estimated Number of Executions | 1 | Estimated Number of Executions | 1 |
| Estimated Number of Rows to be Read | 15265600 | Estimated Number of Rows to be Read | 15265600 |
| Estimated Number of Rows for All Executions | 3745600 | Estimated Number of Rows for All Executions | 8662950 |
| Estimated Number of Rows Per Execution | 3745600 | Estimated Number of Rows Per Execution | 8662950 |
| Estimated Row Size | 35 B | Estimated Row Size | 30 B |
| Ordered | False | Ordered Node ID | False |
| Node ID | 6 | Node ID | 11 |
| Predicate [covidHistorico].[dbo].[datoscovid].[FECHA_SINTON 01-01' AND [covidHistorico].[dbo].[datoscovid]. [FECHA_SINTOMAS] <= N'2020-12-31' Object [covidHistorico].[dbo].[datoscovid] Output List | //AS]>=N'2020- | Predicate [covidHistorico].[dbo].[datoscovid].[FECHA_SINTON 01-01' AND [covidHistorico].[dbo].[datoscovid]. [FECHA_SINTOMAS] <= N'2021-12-31' Object [covidHistorico].[dbo].[datoscovid] Output List [covidHistorico].[dbo].[datoscovid].CLASIFICACION | |

| | Plan | de ejecución propuesto |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Clustered Index Scan (6 Scanning a clustered index, entirely or only | • | Clustered Index Scan (Clustered) Scanning a clustered index, entirely or only a range. |
| Physical Operation | Clustered Index Scan | Physical Operation Clustered Index Scan |
| Logical Operation | Clustered Index Scan | Logical Operation Clustered Index Scan |
| Estimated Execution Mode | Batch | Estimated Execution Mode Batch |
| Storage | RowStore | Storage RowStore |
| Estimated Operator Cost | 422.806 (50%) | Estimated Operator Cost 422.806 (50%) |
| Estimated I/O Cost | 418.608 | Estimated I/O Cost 418.608 |
| Estimated Subtree Cost | 422.806 | Estimated Subtree Cost 422.806 |
| Estimated CPU Cost | 4.19808 | Estimated CPU Cost 4.19808 |
| Estimated Number of Executions | 1 | Estimated Number of Executions 1 |
| Estimated Number of Rows to be Read | 15265600 | Estimated Number of Rows to be Read 15265600 |
| Estimated Number of Rows for All Executi | ons 3888630 | Estimated Number of Rows for All Executions 8650270 |
| Estimated Number of Rows Per Execution | 3888630 | Estimated Number of Rows Per Execution 8650270 |
| Estimated Row Size | 35 B | Estimated Row Size 30 B |
| Ordered | False | Ordered False |
| Node ID | 6 | Node ID 11 |
| Predicate [covidHistorico].[dbo].[COPIA_CLASIF].[FECH 01' AND [covidHistorico].[dbo].[COPIA_CLAS <=N'2020-12-31' Object [covidHistorico].[dbo].[COPIA_CLASIF].[COPI. Output List | IF].[FECHA_SINTOMAS] | Predicate [covidHistorico].[dbo].[COPIA_CLASIF].[FECHA_SINTOMAS]>=N'2021-01- 01' AND [covidHistorico].[dbo].[COPIA_CLASIF].[FECHA_SINTOMAS] <=N'2021-12-31' Object [covidHistorico].[dbo].[COPIA_CLASIF].[COPIA_CLASIF] Output List |
| [covidHistorico].[dbo].[COPIA_CLASIF].CLASI | FICACION_FINAL | [covidHistorico].[dbo].[COPIA_CLASIF].CLASIFICACION_FINAL |

Para este caso no se observa una mejora significativa en el plan de ejecución propuesto con respecto al plan inicial ya que ambos se mantienen por encima de 400 en costo estimado de operación. Esto puede deberse a que toma como recurso de búsqueda el índice agrupado que se generó en la tabla copia 2, el cual no le beneficia mucho, como posible propuesta para optimizar dicha consulta sería crear un índice no agrupado sobre las clasificaciones y ya no ser uno agrupado, lo cual había beneficiado a consultas anteriores.

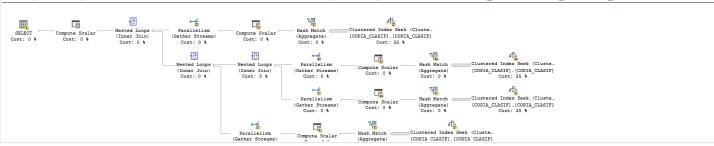
Consulta 10: Determinar en que rango de edad: menor de edad, 19 a 40, 40 a 60 o mayor de 60 hay mas casos reportados que se hayan recuperado.

Plan de ejecución inicial

Query 1: Query cost (relative to the batch): 76% Query 1. Query cost of the Datch). 70% select case when R1.P_recuperadas>R4.P_recuperadas and R1.P_recuperadas>R4.P_recuperadas then 'Menores de edad se recupe...
Missing Index (Impact 25.0209): CREATE NONCLUSTERED INDEX [<Name of Missing Index, sysname,>] ON [dbo].[datoscovid] ([FECHA_DEF],[TIPO_PACIENTE],[EDAD],[CLASI... (P Parallelism SELECT Cost: 0 % P 4 ble Scan (Heap)
[datoscovid]
Cost: 25 % -Parallelism Sather Strea Cost: 0 % Hash Match (Aggregate) Cost: 0 % i [] Parallelism (Gather Stream Cost: 0 % le Scan (Heap (datoscovid) Cost: 25 % Table Scan (Heap)
[datoscovid]
Cost: 25 % 唱 **←**4

Plan de ejecución propuesto

Query 2: Query cost (relative to the batch): 24%
--10.2 select case when R1.P_recuperadas>R2.P_recuperadas and R1.P_recuperadas>R3.P_recuperadas and R1.P_recuperadas>R4.P_recuperadas then 'Menores de edad se...
Missing Index (Impact 24.937): CREATE NONCLUSTERED INDEX [<Name of Missing Index, sysname,>] ON [dbo].[COPIA_CLASIF] ([FECHA_DEF],[TIFO_PACIENTE],[EDAD],[CLAS...



| | | Plan de ejecución inicial | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Table Scan (Heap) | | Table Scan (Heap) | | Table Scan (Heap) | |
| Scan rows from a table. | | Scan rows from a table. | | Scan rows from a table. | |
| Physical Operation | Table Scan | Physical Operation | Table Scan | Physical Operation | Table Scar |
| Logical Operation | Table Scan | Logical Operation | Table Scan | Logical Operation | Table Scar |
| Estimated Execution Mode | Batch | Estimated Execution Mode | Batch | Estimated Execution Mode | Batch |
| | RowStore | Storage | RowStore | | |
| Storage Estimated Operator Cost | 475.362 (25%) | | | Storage | RowStore |
| • | | Estimated Operator Cost | 475.362 (25%) | Estimated Operator Cost | 475.362 (25% |
| Estimated I/O Cost | 471.164 | Estimated I/O Cost | 471.164 | Estimated I/O Cost | 471.16 |
| Estimated Subtree Cost | 475.362 | Estimated Subtree Cost | 475.362 | Estimated Subtree Cost | 475.36 |
| Estimated CPU Cost | 4.19808 | Estimated CPU Cost | 4.19808 | Estimated CPU Cost | 4.1980 |
| Estimated Number of Executions | 1 | Estimated Number of Executions | 1 | Estimated Number of Executions | |
| Estimated Number of Rows to be Read | 15265600 | Estimated Number of Rows to be Read | 15265600 | Estimated Number of Rows to be Read | 1526560 |
| Estimated Number of Rows for All Executions | 3863510 | Estimated Number of Rows for All Executions | 2708820 | Estimated Number of Rows for All Executions | 109825 |
| Estimated Number of Rows Per Execution | 3863510 | Estimated Number of Rows Per Execution | 2708820 | Estimated Number of Rows Per Execution | 1098250 |
| Estimated Row Size | 39 B | Estimated Row Size | 48 B | Estimated Row Size | 43 1 |
| Ordered | False | Ordered | False | Ordered | Fals |
| Node ID | 5 | Node ID | 11 | Node ID | 1 |
| AND [covidHistorico].[dbo].[datoscovid].[EDAD]>= [covidHistorico].[dbo].[datoscovid].[CLASIFICACION OR [covidHistorico].[dbo].[datoscovid].[CLASIFICACION OR [covidHistorico].[dbo].[datoscovid].[CLASIFICACION OR [covidHistorico].[dbo].[datoscovid].[CLASIFICACION OR [covidHistorico].[dbo].[datoscovid] Table Scan (Heap) Scan rows from a table. Physical Operation Logical Operation Logical Operation Estimated Execution Mode Storage Estimated Operator Cost Estimated I/O Cost Estimated VO Cost Estimated Number of Rows to be Read Estimated Number of Rows for All Executions Estimated Number of Rows for All Executions Estimated Number of Rows Per Execution Estimated Number of Rows Per Execution Estimated Number of Rows for All Executions Estimated Row Size Ordered Node ID Predicate [covidHistorico].[dbo].[datoscovid].[TIPO_PACIENTE] [covidHistorico].[dbo].[datoscovid].[EDAD] = N=0 [covidHistorico].[dbo].[datoscovid].[CLASIFICACION (ClovidHistorico].[dbo].[datoscovid].[CLASIFICACION (ClovidHistorico].[dbo].[datoscovid].[CLASIF | AND \LTINAL]=(1) \LTINAL]=(1) \LTINAL]= \text{Table Scan} \\ \text{Table Scan} \\ \text{Batch} \\ \text{RowStore} \\ \text{471.164} \\ \text{475.362} (25%) \text{4.19808} \\ \text{1} \\ \text{15265600} \\ \text{2842900} \\ \text{2842900} \\ \text{2842900} \\ \text{43 B} \\ \text{False} \\ \text{False} \\ \text{20} \\ \text{175.362} \ | [covidHistorico].[doo].[datoscovid].[FECHA_DEF]=NAND CONVERT_IMPLICIT(int,[covidHistorico].[doi].[eDAD].0] <= (18) AND ([covidHistorico].[doi].[doi].[cLASIFICACION_FINAL]=(1) OR [covidHistorico].[dl [datoscovid].[CLASIFICACION_FINAL]=(3)) Object | [datoscovid]. oscovid]. | [covidHistorico].[dbo].[datoscovid].[ECHA_DEF]=N' AND [covidHistorico].[dbo].[datoscovid].[CLASIFICACION OR [covidHistorico].[dbo].[datoscovid].[CLASIFICACION OR [covidHistorico].[dbo].[datoscovid].[CLASIFICACION Object [covidHistorico].[dbo].[datoscovid] | 60' AND I_FINAL]=(1) |
| (3)) Object [covidHistorico].[dbo].[datoscovid] | :ION_I IIVAL] = | | | | |

| | | Plan de ejecución propue | sto | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Clustered Index Seek (Clustered |) | Clustered Index Seek (Clustered) | Т | | |
| Scanning a particular range of rows from a clustered index. | | Clustered Index Seek (Clustered) Scanning a particular range of rows from a clustered index. | | Clustered Index Seek (Clustered) Scanning a particular range of rows from a clustered index. | |
| Physical Operation | Clustered Index Seek | Physical Operation Clu | istered Index Seek | | |
| | Clustered Index Seek | | istered Index Seek | Physical Operation | Clustered Index See |
| Estimated Execution Mode | Batch | Estimated Execution Mode | | Logical Operation | Clustered Index See |
| Storage | RowStore | | Batch | Estimated Execution Mode | Batc |
| Estimated Operator Cost | 154.006 (25%) | Storage | RowStore | Storage | RowStor |
| | | Estimated Operator Cost | 154.006 (25%) | Estimated Operator Cost | 154.006 (25% |
| Estimated I/O Cost | 152.477 | Estimated I/O Cost | 152.477 | Estimated I/O Cost | 152.47 |
| Estimated Subtree Cost | 154.006 | Estimated Subtree Cost | 154.006 | Estimated 7/0 Cost Estimated Subtree Cost | 154.00 |
| Estimated CPU Cost | 1.52915 | Estimated CPU Cost | 1.52915 | | |
| Estimated Number of Executions | 1 | Estimated Number of Executions | 1 | Estimated CPU Cost | 1.5291 |
| Estimated Number of Rows to be Read | 5560410 | Estimated Number of Rows to be Read | 5560410 | Estimated Number of Executions | |
| Estimated Number of Rows for All Executions | 2866130 | Estimated Number of Rows for All Executions | 3830780 | Estimated Number of Rows to be Read | 556041 |
| Estimated Number of Rows Per Execution | 2866130 | Estimated Number of Rows Per Execution | 3830780 | Estimated Number of Rows for All Executions | 269958 |
| Estimated Row Size | 39 B | Estimated Row Size | 35 B | Estimated Number of Rows Per Execution | 269958 |
| Ordered | True | Ordered | True | Estimated Row Size | 44 |
| Node ID | 5 | Node ID | 11 | Ordered | Tru |
| | , | | | Node ID | 1 |
| Predicate | | Predicate | | - | |
| [covidHistorico].[dbo].[COPIA_CLASIF].[FECHA_DEF]=N'9999-99' AND [covidHistorico].[dbo].[COPIA_CLASIF].[EDAD]>=N'41' AND [covidHistorico].[dbo].[COPIA_CLASIF].[EDAD]<=N'60' AND [(covidHistorico].[dbo].[COPIA_CLASIF].[TIPO_PACIENTE]<(2) OR [covidHistorico].[dbo].[COPIA_CLASIF].[TIPO_PACIENTE]>(2)) Object [covidHistorico].[dbo].[COPIA_CLASIF].[COPIA_CLASIF] Seek Predicates [1] Seek Keys[1]: Prefix: [covidHistorico].[dbo]. [COPIA_CLASIF].[COPIA_CLASIF] Seek Keys[1]: Prefix: [covidHistorico].[dbo]. [COPIA_CLASIF].[CASIF].[CACION_FINAL = Scalar Operator((1)), [2] Seek Keys[1]: Prefix: [covidHistorico].[dbo]. [COPIA_CLASIF].[CLASIF].[CACION_FINAL = Scalar Operator((3)) | | [covidHistorico].[dbo].[COPIA_CLASIF].[FECHA_DEF]=N'9999-99-99' AND [covidHistorico].[dbo].[COPIA_CLASIF].[EDAD]>=N'19' AND [covidHistorico].[dbo].[COPIA_CLASIF].[EDAD]<=N'40' AND [(covidHistorico].[dbo].[COPIA_CLASIF].[TIPO_PACIENTE]<(2) OR [covidHistorico].[dbo].[COPIA_CLASIF].[TIPO_PACIENTE]>(2)) Object [covidHistorico].[dbo].[COPIA_CLASIF].[COPIA_CLASIF] Seek Predicates [1] Seek Keys[1]: Prefix: [covidHistorico].[dbo]. [COPIA_CLASIF].CLASIFICACION_FINAL = Scalar Operator((1)), [2] Seek Keys[1]: Prefix: [covidHistorico].[dbo]. [COPIA_CLASIF].CLASIFICACION_FINAL = Scalar Operator((3)) | | Predicate [covidHistorico].[dbo].[COPIA_CLASIF].[FECHA_DEF]=N'9999-99-99' AND CONVERT_IMPLICIT(int,[covidHistorico].[dbo].[COPIA_CLASIF].[EDAD],0) <=(18) AND ([covidHistorico].[dbo].[COPIA_CLASIF].[TIPO_PACIENTE]<(2) OR [covidHistorico].[dbo].[COPIA_CLASIF].[TIPO_PACIENTE]>(2)) Object [covidHistorico].[dbo].[COPIA_CLASIF].[COPIA_CLASIF] Seek Predicates [1] Seek Keys[1]: Prefix: [covidHistorico].[dbo]. [COPIA_CLASIF].CASIFI.CACION_FINAL = Scalar Operator((1)), [2] Seek Keys[1]: Prefix: [covidHistorico].[dbo]. [COPIA_CLASIF].CLASIFI.CACION_FINAL = Scalar Operator((3)) | |
| Clustered Index Seek (Clustered) | | | | <u> </u> | |
| Scanning a particular range of rows from a clustered i | ndex. | | | | |
| Physical Operation | Clustered Index Seek | | | | |
| | Clustered Index Seek | | | | |
| Estimated Execution Mode | Batch | | | | |
| | RowStore | | | | |
| Storage | | | | | |
| Estimated Operator Cost | 154.006 (25%) | | | | |
| Estimated I/O Cost | 152.477 | | | | |
| Estimated Subtree Cost | 154.006 | | | | |
| Estimated CPU Cost | 1.52915 | | | | |
| Estimated Number of Executions | 1 | | | | |
| Estimated Number of Rows to be Read | 5560410 | | | | |
| Estimated Number of Rows for All Executions | 1045330 | | | | |
| Estimated Number of Rows Per Execution | 1045330 | | | | |
| Estimated Row Size | 39 B | | | | |
| Ordered | True | | | | |
| Node ID | 20 | | | | |
| Predicate [covidHistorico].[dbo].[COPIA_CLASIF].[FECHA_DEF]=N [covidHistorico].[dbo].[COPIA_CLASIF].[EDAD]>N'60' A ([covidHistorico].[dbo].[COPIA_CLASIF].[TIPO_PACIENT [covidHistorico].[dbo].[COPIA_CLASIF].[TIPO_PACIENTE Object [covidHistorico].[dbo].[COPIA_CLASIF].[COPIA_CLASIF] Seek Predicates [1] Seek Keys[1]: Prefix: [covidHistorico].[dbo]. [COPIA_CLASIF].CLASIFI.CACION_FINAL = Scalar Operat Keys[1]: Prefix: [covidHistorico].[dbo]. | 19999-99-99' AND ND E]<(2) OR 3>(2)) | | | | |
| [COPIA_CLASIF].CLASIFICACION_FINAL = Scalar Operat | | | | | |
| | | | | | |

Para esta consulta vemos la implementación de los Nested loops para apoyarse de los índices y recuperar datos para ambos planes de ejecución solo que a diferencia que el primero por cada operador se realiza un Table Scan lo que hará que el costo sea muy grande. Observando la tabla de cada Table Scan se puede precisar que hay un costo estimado de operador de 475.36 por cada uno, mientras que en el plan propuesto da 154.06.

Observaciones generales.

Con los índices propuestos en un inicio que se llevaron a cabo en copias a manera de "experimentos", lo cual ayudó a darnos cuenta cual de las 2 propuestas funcionaría mejor y desde la primera consulta se vio ese efecto, teniendo una mejor eficiencia por medio de los índices dados a la Copia 2, que en la mayor parte de consultas bastaron estos mismos para reducir los costos estimados, así como la preferencia para la búsqueda en índices en lugar de recurrir a un Table Scan.

A excepción de la consulta numero 9, que fue muy poco útil dicha solución pues los cambios en relación con los costos no fueron muy significativos, así como las operaciones llevadas a cabo por el plan de ejecución fueron similares.