Practice Class 9

Objectives

Relational Database Indexes - based on SQL Server.

Note: You must follow the response template provided.

Assignment 9.1

This problem is based on the *Production.WorkOrder table* from the *AdventureWorks2012 database*. You must download the *AdventureWorks2012.bak*[4] file and restore the database following the tutorial: *Restore to SQL Server*[5]. The *Production.WorkOrder table* has a *Clustered Unique index associated* with the *WorkOrderID* PK[6].

Using the ***SQL Server Profiler and Query Execution Plan***[7] tools, **record and discuss the** values obtained (index/query/rows/cost/pag. reads/...) for each of the experiences below. It is recommended that you present the results obtained in the form of a table containing the following elements:

#	Query	Rows	Cost	Pag. Reads	Time (ms)	Index used	Index on.
1	select * from Production.WorkOrder	72591	.484	531	1171	…	Clustered Index Scan
2	…	…	…	…	…	…	…

Note: Before executing each of the queries you must execute the following instructions:

```
DBCC FREEPROCCACHE;
DBCC DROPCLEANBUFFERS;
```

Experiences:

#1. Index: WorkOrderID (PK)

Query: select * from Production.WorkOrder

#2. Index: WorkOrderID (PK)

Query: select * from Production.WorkOrder where WorkOrderID=1234

#3. Index: WorkOrderID (PK)

Query1: SELECT * FROM Production.WorkOrder
WHERE WorkOrderID between 10000 and 10010

Query2: SELECT * FROM Production.WorkOrder
WHERE WorkOrderID between 1 and 72591

[4] https://github.com/Microsoft/sql-server-samples/releases/download/adventureworks/AdventureWorks2012.bak

[5] https://learn.microsoft.com/en-us/sql/samples/adventureworks-install-configure?view=sql-server-ver16&tabs=ssms#restore-to-sql-server

[6] https://github.com/CarlosCosta-UA/BD-UA/blob/main/aula8/adventure_works_2012_clustered_idx.JPG

[7] Available in SQL Server Management Studio

#4. Index: WorkOrderID (PK)

Query: SELECT * FROM Production.WorkOrder
WHERE StartDate = '2012-05-14'

#5. Index: ProductID

Query: SELECT * FROM Production.WorkOrder WHERE ProductID = 757

#6. Index: ProductID Covered (StartDate)

Query1: SELECT WorkOrderID, StartDate FROM Production.WorkOrder
WHERE ProductID = 757
Query2: SELECT WorkOrderID, StartDate FROM Production.WorkOrder
WHERE ProductID = 945
Query3: SELECT WorkOrderID FROM Production.WorkOrder
WHERE ProductID = 945 AND StartDate = '2011-12-04'

#7. Index: ProductID and StartDate

Query: SELECT WorkOrderID, StartDate FROM Production.WorkOrder
WHERE ProductID = 945 AND StartDate = '2011-12-04'

#8. Index: Composite (ProductID, StartDate)

Query: SELECT WorkOrderID, StartDate FROM Production.WorkOrder
WHERE ProductID = 945 AND StartDate = '2011-12-04'

Assignment 9.2

Base the following table:

```
CREATE TABLE mytemp (
        rid BIGINT /*IDENTITY (1, 1)*/ NOT NULL,
        at1 INT NULL,
      at2 INT NULL,
      at3 INT NULL,
      lixo varchar(100) NULL
);
```

a) Set *rid* as the primary key of the *Clustered Index type*.

b) Record the entry times of 50,000 new records (tuples) in the table using the code below:

```
-- Record the Start Time
DECLARE @start_time DATETIME, @end_time DATETIME;
SET @start_time = GETDATE();
PRINT @start_time

-- Generate random records
DECLARE @val as int = 1;
DECLARE @nelem as int = 50000;

SET nocount ON

WHILE @val <= @nelem
BEGIN
    DBCC DROPCLEANBUFFERS;                          -- need to be sysadmin

    INSERT mytemp (rid, at1, at2, at3, lixo)
```

```
            SELECT cast((RAND()*@nelem*40000) as int),  cast((RAND()*@nelem) as int),
                   cast((RAND()*@nelem) as int),  cast((RAND()*@nelem) as int),
                   'garbage... garbage... garbage... garbage... garbage... garbage...
        garbage... garbage... garbage';
            SET @val = @val + 1;
            END

            PRINT 'Inserted ' + str(@nelem) + ' total records'

            -- Duration of Insertion Process
            SET @end_time = GETDATE();
        PRINT 'Milliseconds used: ' + CONVERT(VARCHAR(20), DATEDIFF(MILLISECOND,
@start_time, @end_time));
```

What is the percentageof fragmentation of indexes and occupation of index pages?

c) Change the *fillfactor* (for example: 65, 80, and 90) from *the clustered index* and see the effect on insertion times.

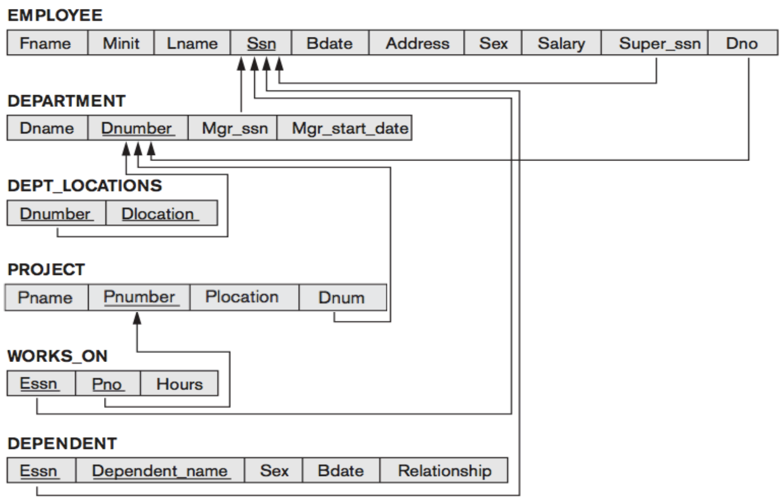
d) Change the table mytemp that make the *rid* attribute as type *identity*. Re-measure insertion times[8].

e) Create an index for each attribute of the mytemp table. Compare the insertion times obtained, without and with all indexes. What can you conclude?

Note: The results obtained in this exercise may vary depending on the type of computer/virtual machine (e.g. HDD/SSD hardware) and the machine load at the time the experiment is taking place;

Assignment 9.3

Based on the database schema presented in the figure below (developed in the theoretical classes):



a) Define the indexes that you find convenient for each of the relationships. Please note that weneed to do the following database queries:

[8] You must change the code provided in point (b) for this new situation.

i. The employee with certain number ssn;
ii. The employee(s) with a certain first and last name;
iii. Employees working for a particular department;
iv. Employees who work for certain project;
v. Dependents of a particular employee;
vi. The projects associated with a given department;