

# SQL

## \*Course Contents:

- Day1: DB Concepts, DB Design, ERD, File based System

- Day2: DB Mapping, SQL, Create DB

- Day3: Joins, DB constraints for DB integrity

- Day4: Subqueries, Union, Security + users

- Advanced SQL: (team)

DB Designer / DB Developer / DB Admin

BI Developer / System Analyst / programmer

- Day5: DB schema, Merge statement, Ranking Functions

- Day6: if, while, vars, Functions

- Day7: View, Index

- Day8: Stored procedures, triggers, Backup & restore

## \* Database Life Cycle:

1- Analysis: done by System analyst that produce Req. doc .docx

2- DB Design: describe System as Diagrams by ERD From UML.

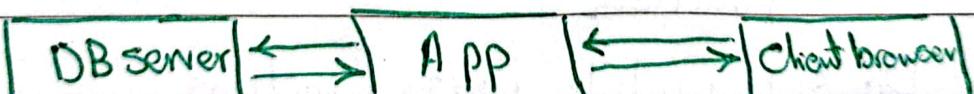
3- DB Mapping: set of rules applied on ERD to get DB schema then actual tables.

4- DB Implementation: implement physical schema.  
we need tool (RDBMS) & language (SQL)

5- GUI application

6- Client

all developer || all end user || no DB just like  
app and database



## \* File based System:

• Delimited file or Fixed width File.

• Problems: bad performance, bad searching & sorting, No DB sharing, bad modification, no security, all is plain text, Duplication, no relations, no integrity, no auto backup.

## \*DB System:

- Clear Structure tables.
- Primary key for each table to stop redundancy.
- Schema for columns and sizes.

## \*ERD:

(From presentation)

- entities
- Attributes
- Relationships
- weak entity
- degree of relations
- Self relation
- participation
- Cardinality (Relation type)
- Candidate & primary key & Composite key

## \* Mapping:

is the rules to convert ERD to tables.

1:M , M:M , 1:1 , MV, Repeating group.

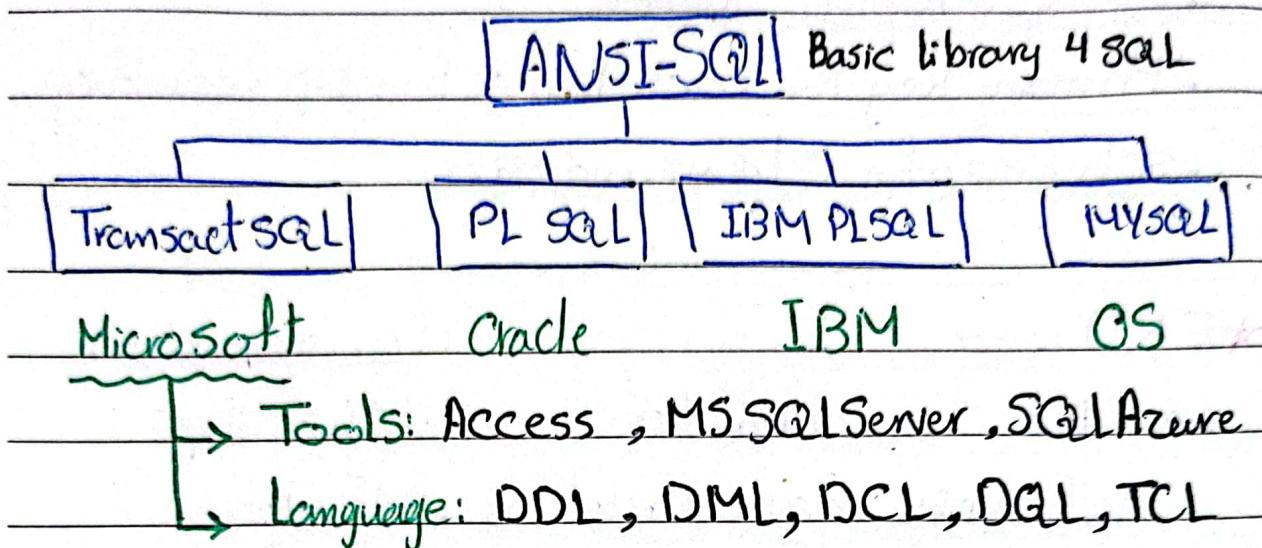
## \* Column:

- each column must have domain which is a range of values which indicates the DT for it and size.

Ex: tinyint  $\rightarrow$  1 Byte { -128 : +127 }

Age (20 : 30)  $\Rightarrow$  need constraint

## \* Implementation:



## \* DBMS:-

- Server running in back ground for controlling files
- Client: the GUI studio to write queries and access DBs.

each DB is mdf mandatory data file ldf log data file for archiving.

\* Create data base wizard.

\* Try to copy or move files.

\* Create database manually [mdf, ldf, ndf, File groups, sizes]

Actual Fig.

\* In the demo:-

- Create data base
- Create with mdf + log
- Create with mdf + ndf + LOG
- Create with File groups
- Alter DB modify FG FG1 DEFAULT
- Alter DB to add file group
- Alter DB to add file 2 file group
- Remove file
- Drop DB
- Add table to FG.

\* Tables:

- Create table & Table on File group
- Columns & DT show SQL DT on W3Schools
- Table Constraints: show SQL Const. on W3Schools
  - default - check between x and y
  - check in ('v1', 'v2') - check ( $v > x$ )
  - check  $\text{len}(x) = y$  - Primary key
  - Foreign Key [on delete - on update]
  - Null / Not Null - Unique

\* Show Constraints in object explorer.

## • Alter Table

- add column

- remove column

- change column DT

- add constraint

- drop constraint

## • Inserting data

- one row
- many rows
- Col. ordering

- default values

## • Update data

## • Delete data Vs. Truncate. Explain on LOG

## • drop table and database.

## \* Notes:-

• وانا بغير الـ column || يتابع الـ DT اكتر حجم اكتر مساحة

مساحة لـ data || لـ data لـ data لـ data

هي في Fit

• عاليات اتحقق || DB Integrity

- Domain Integrity: range of values [constraints]

- Entity Integrity: uniqueness [PK, Unique]

- Referential Integrity: FK

- DB objects || DB constraints

Rules - Triggers - Indexes



طريقتين اعتبريهما . one اما جوهرة Computed att. we

Function و هذه ت Depend على طول او براه جواه Table  
و هي runtime . جوهرة الطيور :-

Col.Computed as ( equation) ←

وكذا هو مش ديجورنه حاجة بحسب SQL هنرة

. persisted لمواجره فالها رد اديف Select

Table معها اكتر من Shared Constraint Lock .

على شاهد ك اعما لاوا

الى يسجلن أول ال worth اللي يستكتب بيها .

. 2GB يوصل لـ Varchar(n)

الى يخزن الصورة bytes فعندي حللين اخرين لها

جوهرة path او اخرن ال DB بس و ده

يعتمد على Case جناعتي

queries الى فيه ترتيب لكل ال Template Browser .

. SQL يمكن ترتيب قال ال اللي هم

## \* Identity & Sequence

. Identity is a property to one column in a table  
auto incremental Identity (start, inc) Can't be  
reset unless using Truncate, value assigned  
and deleted can't be reused. we don't insert  
the value each time , SQL do it for me.

## Sequence:-

of EXNA

• It's T-SQL Object user defined schema bound

• Can be either ascending or descending order.

• not associated with specific table.

• Values is generated when inserting values.

• each sequence has min, max, start values.

• when Cycle it restart from min

• when Cache SQL store amount of cache specified  
to System table.

Create Sequence A start with A increment By B

## \* Schema:

• each object in SQL is Schema.Object.

• why Schema after SQL 2000?

— to allow use the same object name in different  
schemas.

— to grouping or logical classifying tables.

— to specify security to group of tables.

• use ~~use~~ DB then create schemas.

• Create table on Schema.

• transform table to schema.

- you should specify the name of schema when using table after transposing.
- you can drop schema only if it's empty, and use [if exists] option to stop nonexistence error.

## \* Select:-

- Select \* From table.
- Select Col1 , Col2 From table.
- Select \_\_\_\_\_ From table where Cond.
- Select distinct (it also order result)
- Select Col1 + Col2 as alias From table.
- Select Top x From table. [with Ties]
- Select\* into. T1 From T2 where Cond.
- Select \* From T where x like 'pattern'.

~~Example:-~~

## \* Synonym:-

- It's like alias but stored in DB and belong to schema.

Create Synonym X For Table Full name.

## \* Order By:

- after where clause
- order by col1 asc | desc , col 2 , col 3

## ★ Joins: Day(5)

- To allow Selecting From multiple tables.

- Types:

- Cross Join → Cartesian product

- inner join

- outer join (left , right , full)

- self join.

- Try : Select x, y From T1, T2 - this will cause cross join.

- that is why we need Join Condition.

- Select x, y From T1 join T2 on T1.A = T2.B

- Select x, y From T1, T2 where T1.A = T2.B

- here you can make alias for Tables.

- For outer you should specify if left, right, full

- in self join you should specify alias for the 2 versions of table.

## \* Rules:

- it's as constraint but can be shared on different tables.
- Create rule rname as Cond.
- then bind it sp\_bindrule rname, 'T. Col'
- it's applied on new inserted data or new updates only, not previous stored data [unlike constraint]

## \* Defaults:

- it's as default constraint but can be shared.
- create default dname as Cond.
- then bind it sp\_binddefault dname, 'T. Col'

(Note) → you should unbind first before dropping rule or default.

## \* UDD:

- sp\_addtype TName, DT
- you can then bind rule and default to it
- you can use it as usual DTs.

## \* Some Select parts. ←

- if you want to select 2 Col and Concat but not the same DT.. you can convert (1.)

Convert (DT, Col)

and then you can Concat any string.

- if you want to replace NULL result with any word - Not removing null rows - user.

IsNull (Col, replacement)

or Coalesce (Col, replace1, replace2, etc.)

- you can also use Concat to avoid null Checking by '-' and converting to string

Concat (Col1, ' ', Col2)

- For date use getDate() and to see parts use Year( ), Month( ), Day( )

## \* Aggregation Functions & Grouping:-

- Count, Max, Min, Avg, Sum
- to do some combination and computations.
- to categorize then Compute use group by after From Clause.
- where clause is for data before grouping  
if you wish to Filter after grouping use Having
- you can group over 2 or more columns.
- to add total sum like with sum after grouping  
use Rollup with group by  
Group by rollup (cols)

## \* Subquery:-

- get output of query as input of another one.
- it came to solve the problem of having no aggregation function in where.
- it runs the inner query then replace it with its result in the outer query.
- it can be in where or select col.
- if subquery can solved by join it's better not to use it.
- it can be used in DML.

## \* Union Family:-

- Union all , union , intersect , except.
- SQL allow batch which is running each query separately but showing the result one time together.
- to group 2 results in one use union all  
**BUT** cols must be the same DTs and number of cols are equal.
- to union distinct use union it order & select unique values.
- to get intersection use intersect it also distinct
- to get values appear in result set 1 and not 2 use except . it also distinct

## \* Execution Order:-

From → join → on → where → group by  
Top ← orderby ← Select ← having ←

\* Note

- Show Template Browser.
- Show how to get scripts for tables & DB.

**DexNet™**

## \* Self study pivot table.

## \* Built-in Functions:

- ISNULL ( Col, replacement)
  - Get Date() Current date
  - Convert ( ~~DT~~ DT , Val )
  - Convert ( DT , ValDate , Style ) 102, 111, 113
  - aggregation Functions
  - date name ( Date )      . eomonth ( Date )
  - upper
  - lower
  - Format ( date , 'dd-MMM-yy' )  
this return string Month return \*
  - Substring ( Val, start, length )
  - Sin( ), power( x, y )
  - Cast is as convert but preferred with dates use Convert.

\* Select into From table to another one From — Day(s)  
different DB { DB Schema Table }

- Can have Conditions and Cols.

-Table may be not exists.

-Table may be not exists.

- Similar to Create table script

\* insert into table Select Clause.

-table must exist.

- get data only.

\* GUID is some type of ID [global

universal ID] Some letters & numbers

similar to windows serial in format.

\* Select col1, Case

when Col2 Cond1 then result1

when Col2 Cond2 then result2

else default result

end as alias

From Table where clause.

- this to generate value according to  
some col values.

- Case can be written in DML as

update in Set clause. if you wish to  
update with multiple cases.

\* Select iif(ColCond., true, False) From Table

- Similar to ternary operator

\* Case can check on value not Condition

case Col when value then result.

- as switch case.

## \* Ranking Functions: Day(5)

• If I wish to get top values of Salary

or the second salary in order, some Q's are not applicable with selects so we need ranking functions.

• Functions: Row\_Number, Dense\_Rank, Ntile, Rank.

### ① Row\_Number.

Select Cols, Row\_Number() over (Order by (Col))

it gives sequential numbers from 1

### ② Dense\_Rank:-

Select Cols, Dense\_Rank() over (Order by (Col))

it gives ties the same ranking number.

### ③ Ntile:-

Select Cols, Ntile() over (Order by (Col))

it takes Parameter int to group result

to x groups given.

- الحروبات و بحسب اقامات

### ④ Rank. Self study.

## ★ Merge Day (5)

لو عايز اقارن بين جدولين و لما يبقى في مختلف احمد

ترسل معن او اميما ظالوا خالي حاجة او امسح

Merge Into Table 1 as alias

using Table 2 as alias

on ~~Expression~~ [matching Col] as join on

when Matched then Code DML

when Not Matched then Code DML

لولا تدين اللي لا يوجد في

باقي الالاقيان اللي هي موجودة في

Table1 على كده

وكذلك Subquery في Table2 كده

بالتالي ماتيجي ماتيجي ماتيجي ماتيجي ماتيجي

and Cond. then ||

Source  $\xrightarrow{\text{is not}} \xleftarrow{\text{is}} \text{Target}$  لو عايزه اقوله اللي موجود فالTarget

when not matched by target then

Source  $\xrightarrow{\text{is}} \xleftarrow{\text{is not}} \text{Target}$  فالSource موجود فالTarget

when not matched by Source then

Note

of OKND

Some Certificates: From Microsoft

MCSE → Query Data, MTA - DB Fund.

Day (5): Join, Subquery, Union, Select Case,  
Ranking Function, Merge, Views, Variable, Control  
of Flow, Function (MV, inline, Scalar)

### \* Variables:-

. local vars, global vars.

. local: SP, Function, batch level

\* it starts with Declare @varname DT

\* assign value:-

- Set @varname = value

- Select @varname = value

- Select @varname = Col From table

- update table Set Col=Val, @var=Col.

\* display value:-

- Select @varname

- ~~Select~~ print @varname.

• global var: read only start with @@

@@ Server name

@@ version

@@ Row Count  $\rightarrow$  last row in resultset

@@ Error  $\rightarrow$  query which caused error

@@ identity  $\rightarrow$  insert value after identity

Declare @x = (select statement)  $\leftarrow$  last row.

Select 1, similarly var || assign values  $\leftarrow$  لو وحدة.

لو واحدني  $\leftarrow$  هي تقط بآخر قيمة كانت فيه.

لو واحدة  $\leftarrow$  هي آخر قيمة لها.

row  $\leftarrow$  row another  $\leftarrow$  row more.

Table type var  $\leftarrow$  var || col  $\leftarrow$  col more.

or previous 2 vars

1.5 Table  $\rightarrow$  they are var || var || vars.

declare @t table ( col DT, ... )

values  $\rightarrow$  var || select from var || var || ...

insert based on select  $\rightarrow$  select into

order by var || var || ...

ڈاکٹریں اور جنی سینوں میں From 2014ء تک یادی ہے۔

From 11 میں اسی طرف کو اپنے احمد اور احمد ایکسپریس

• Table voor mogelijkheden voor IIS en VS

• **الخطي** Al Khali query الـ **الخطي** Al Khali vars فيه ديناميكي query .

الـ dynamic query هو نوع من run jobs وتحالفة

`execute('query as string')`

declare @Col = 'x', @t = 'student'

- `Select @Col From @T`  $\Rightarrow X$
  - `Execute ('Select' + @Col + 'From' + @T)`  $\Rightarrow V$

## \* Control of Flow:-

## Selected Case ١١٦٦٢٠ قضیۃ

- if begin end else , elseif, if لی
  - if exists(), if not exists() مدل موجود create T
  - while Continue break او بمحض حاجة relation لی
  - Case if
  - choose
  - wait For. ] self study.
  - begin try end try begin catch end catch.

## \* Table types:

- physical table الجدول الظاهري يتبعنا
- variable table جدول متغير يخزن في الذاكرة memory وهو خارج批处理 batch
- Local tables Session based table

جائز في System Database || متغير ديناميكي

في temptables أو tempdb

query page على مستوى session

- global tables Shared table

متغير ديناميكي متغير من قبل الجميع

نقطة وقوف في نفس المكان

## \* Windowing Functions:

- lead, lag, FirstValue, LastValue.

rankings over(order By X) مراتب حسب انتظام

rows HAVING window partition by X

- lead ، lag ، FirstValue ، LastValue

آخر قيمة

## \* Import Export: may be Self Study

- Try it wizard.

- bulk insert.

## \* Functions:-

### 1- Built-in Functions:-

- Null: is null , Coalesce , If Null
- Conversion: Convert , Cast
- System Functions: db\_name , SUSER\_name ,  
error\_line , new\_ID
- Aggregation: Max , min , Avg , Sum , Count
- String: upper , lower , Substring , Format ,  
Concat
- Math: power , Sin , Cos , etc.
- Date: getdate , month , day , year
- Ranking: row\_number , Dense\_rank , Ntile ,  
rank
- Windowing: lead , lag , Firstvalue , lastvalue
- Logical: iif , choose .

### 2- User define Functions:-

- Scalar Function: return one value
- inline Table Function: return table  
body is Select From table . Only
- Multi statement Table Function: return table  
body is select + Control of flow .

مما فرق، من اكتب حوة الـ DQL غير Function .  
Select دس

لأن لم يلزم Table بـ multi ولا inline . فار .

كل ما يلزم select \* from

your multi الـ Table يرجع inline .

returns الـ DT اعرفه دا ، Table نوع

هينفخش اسم دا dynamicSQL execute دا اللي فات

حوة الـ String علشان دا عارف دا اللي فات

## \* Identity modifications

اطغرون الـ identity ، كي اكتب بابري لـ

لوجهة حاجة فالـ gap في

وكذا اوقف Set identity\_insert On . اقت.

ادخل الـ automatic identity .

ولازم ارجع اولاً

Day 1: Temp tables, stored proc, Triggers.

Error handling, triggers, transactions,

Select into, GUID, Ranking Function,

Merge, windowing Function, Import, Export,

generate script, Computed Column

Identity modification.

## \* Stored procedure:

- View & Functions are for security of code
- but what about performance?

## \* Execution of query:

Query → parsing check syntax

→ Check from meta, existence of optimize parts

→ query tree order of running query parts

→ memory allocation & registers creation plan

→ result to SQL

لكل view أو function أو query هناك طريقة مختلفة

SP has different steps for performance.

first step is to save SP in system table.

then it acts on query tree & save

then it performs security & performance rules.

View & Function use DML statements.

and SP use Dynamic query instead.

var | declare | Try Catch | Cof Trans.

Calling procName params, —, —

return value or output parameter.

Function || S, default value or.

## Databse

params ديني ابادى ال call by position لـ int.

يترتب call by name او Signature فار call by name.

proc ديني ابادى ال param دينى int

position لـ int بـ one value من sp.

return ديني int دينى الاحدى دينى out params

developer دينى http.StatusCode دينى code دينى

اللى دينى proc دينى

hack دينى with encryption دينى as دينى اس.

params دينى check fail دينى dynamic SQL دينى.

SQL injection دينى

## \* Triggers:

Special type of proc can't be called or pass params to it.

it's called automatically when actions happens on db.

DML triggers: delete, update, insert دينى

on Table دينى after او instead of دينى.

DDL triggers: to IS DB دينى

alter table T disable|enable trigger Trig.

trigger inherits table schema.

**DUX3-life™**

- Trigger For update = Trigger after update.

Note)

للحاجة update() الـ built-in يعني هي  
عمل update(col) وهي جزء من Function  
Statement as col للـ update T/F  
لـ update ولا لا لـ update

وایجاد، حذف و تغییرات در DB JS.

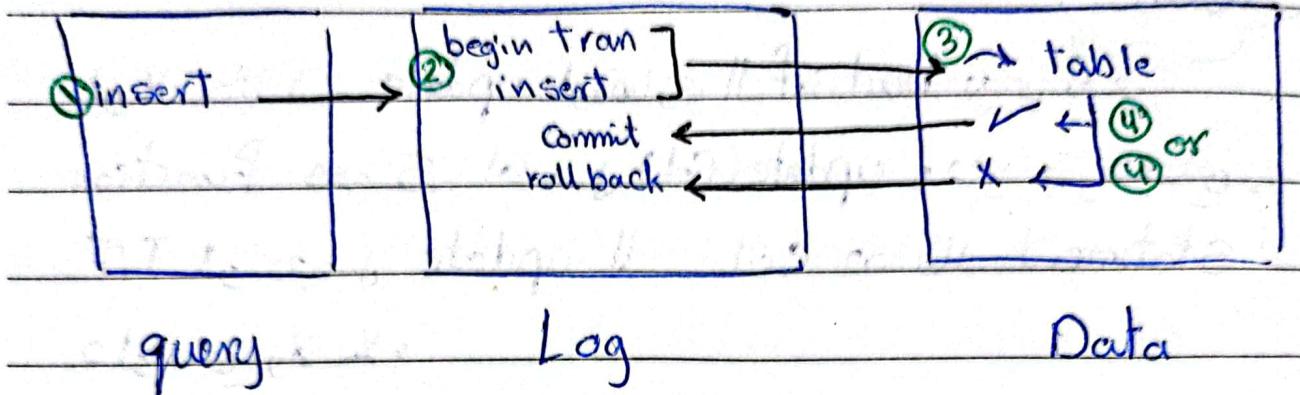
اي استدعاء ولا مسح او ازالة غير جوهر الـ trigger  
وهو يعني حفظ حالي في ذكرى يحيط به  
مع كل الـ trigger يحيط بالـ structure حيث الميدول  
الـ trigger على شكل علامة

- Truncate does not fire triggers.

## \* Transactions :-

- Batch: مجموعه queries لا ينفصلون ورائجون فيهم ديناميكية المدارات.
  - Script: مجموعه queries مكتوبة بـ go بينهم علماً أنّها تمت على الـ DDL قبلها رُؤى الـ DML

- Transactions: one runs multiple queries at a time
- implicit → explicit



explicit: rollback, commit || begin tran || يكتب .  
باتجاه

فقط transaction قبل restart لـ Server .  
auto rollback من Log بعد restart لـ Server .  
و Commit في Tran لا يتحقق حتى في Server .

Try Catch يحيط Transaction . rollback

Try Catch يحيط Transaction . rollback

try catch لـ Commands || ISMS rollback لـ Oracle

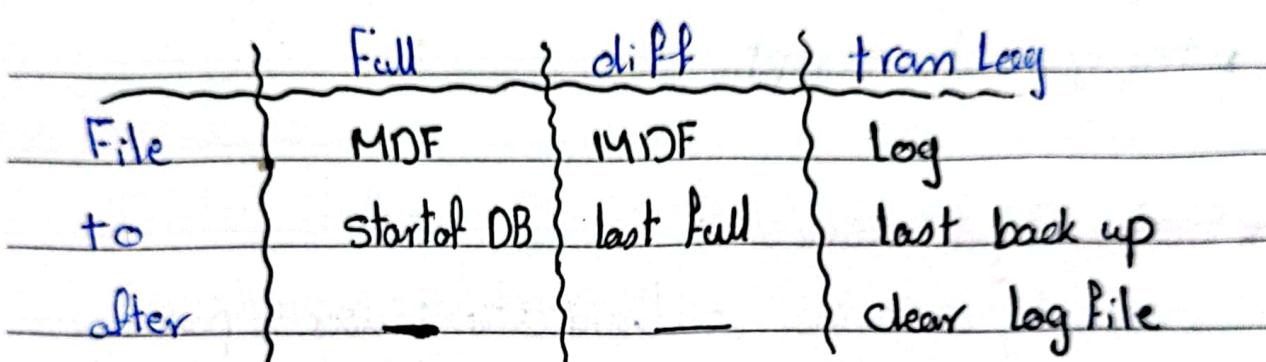
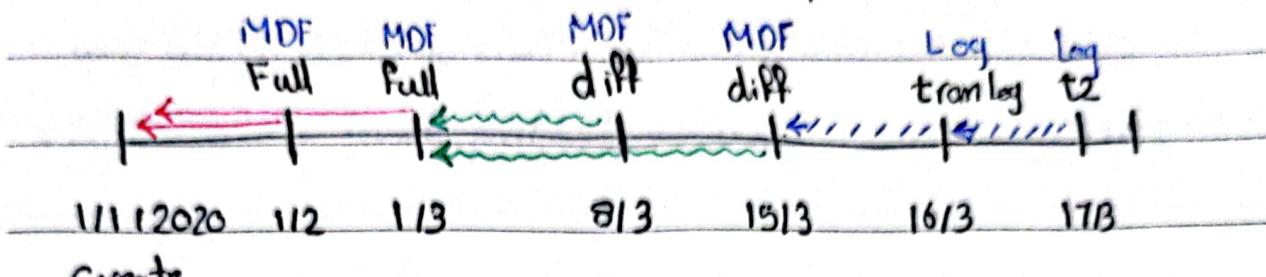
• Re Note ACID Concepts.

explicit trans لا يحيط بالهاردي حش . Truncate .

is rollback لـ Oracle

## \* Backup Types:

- Full Backup, differential Backup, transaction Backup



مدل f الديقة full او diff  $\Rightarrow$  back propagation.

فقط هدر اجس Time ہمیں فایلوم، لکھا اور

لیاختنیم || Log و درستگیرن فیلم || from time

فَأُقْدِرُ أَحَدُ لِوْقَتٍ هَذَا الْيَوْمَ

نحو ۱-۵٪ Full exhibit ۱-۵٪ من شهر JS diff، من JS diff اسبوع

J S tran

• Try to back up on different types.

- automatic backup with SCAL Agent.

in steps write back up database DBName

to disk = 'file path'

## \* output key word.

Trigger || is, defining query ای گو ہو، view، اف، .

select deleted, inserted || ہیں is، view اسی

. Triggers || نہیں Testing || is لے کر .

\* try Detach & attach.

\* try generate script.

## \* Security & users.

. Security is either authentication: user + pass or authorization: permissions

- Authentication:-

. windows auth: when you add current user in installing SQL (windows admin) so no need to use user+pass

. SQL auth: users allowed to use SQL only.

by allowing mixed mode on server and restart Service. (sa user SQL admin)

1- allow mixed mode

2- enable sa

3- try Connect.

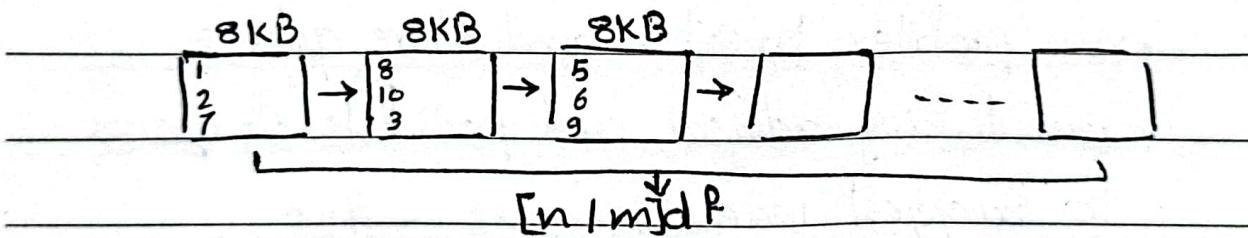
\* try to add new Login user.

### - Authorizations:-

- go to users folder to targeted DB
- add user with login name.
- now you can access DB not schema objects
- you need to give permissions to user on schema.

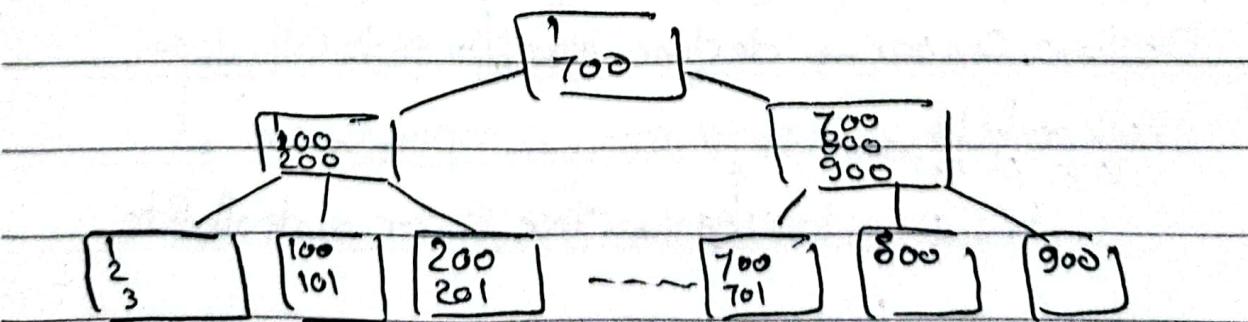
## \* Indexing:-

- Tables without PK is stored as inserted
- Searching on it is sequential. (Scanning)
- each data file is consisted of data pages.



- when set ID as PK data sorted in data pages using ID PK and clustered index is created.

- **clustered index:** is some sort of tree based on PK sorting data.



## - Non Clustered index:-

- Search بدلاني بعمل بدلاني فده ميردو لازم
- data table scan Table بدلاني
- manually بدلاني انجليز non clustered index
- pointer about هنها ال ده بيس وده data page جوا
- سيناريو على harddisc ال دكانيه هي فقط ، ويتم
- Tree بدلاني الذي فات

## - Unique index:-

- unique constraint ، جن جيسيز nonclustered ده بدلاني

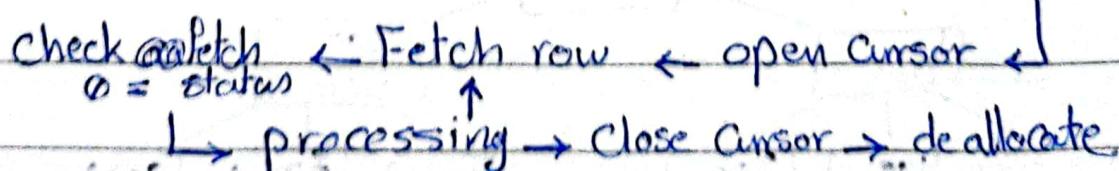
## - which Col. Need index:-

- run profiler to catch and store queries.
- run tuning advisor and pass file of queries to suggest indexes.

## \* Cursor:-

- resultset يرجع SQL على run ال query ا.
- one, all rows ال for loop نسيانis Cursor ال.

Declare Cursor → declare var For each Col



## \*Working with XML & JSON:-

. XML is standard data format for data exchange

. For exporting data to another DBMS

- XML.

. After Select → For XML raw

attributes col || JS, row, & cols JS

. For raw('tagname'), ROOT('root name')

root tag, will tag JS point to

. For raw('Tname'), Element

att. JS Element att col JS

join JS join Jolt من XML will also be

auto return the JS tags S or as it is

↑ For XML auto

SP Jamia, insert while var is or return the output

to Fun or

declare @var XML = ( query For XML , type)

element JS, att, and return the output

Select Col1 "@att" ,

Col2 "tagname" / "tagname"

For XML Path ('root element name')

**SQL Server**  
\* XML Shredding: SQL XML no جدول

1- declare @var XML = 'XML Data'

2- declare @var int ⇒ document handler.

3- Call procedure sp\_xml\_preparedocument  
@dhandler output ,@docs

↳ building memory tree ↳ now it's lossy ↳  
@dhandler is reference

4- Select \* From OPENXML(@dhandler,  
'XML Path') with ( Col DT 'XPath'

5- deallocate memory tree sp\_xml\_removedocument  
@dhandler.

and validated this whole XML will follow this

XML schema ↳

## JSON:

. Starting with 2017.

. JSON Value.

. JSON query.

. For JSON Path