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Databaser

Topics for today:

Triggers

Indexes

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Triggers

- Stored TSQL code that is used to automatically perform a task when some type of SQL Server action occurs.

- An interesting feature of triggers is their ability to fire either after some event occurs, or instead of.

For example

Create a trigger that would ignore any DELETE statement that would remove more than thousand rows in a table.

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Triggers

Triggers are classified into two main types.

1. After Triggers (For Triggers)
2. Instead Of Triggers

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Triggers

1. DML Triggers
2. DDL Triggers
3. Logon Triggers

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Triggers

After Triggers

These triggers run after an insert, update or delete on a table.

They are **not supported for views**.

AFTER TRIGGERS can be classified further into three types as:

(a) AFTER INSERT Trigger.
(b) AFTER UPDATE Trigger.
(c) AFTER DELETE Trigger.

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Triggers

Instead Of Triggers

These can be used as an interceptor for anything that anyone tried to do on table or view.

If you define an *Instead Of trigger* on a table for the Delete operation, they try to delete rows, and they will not actually get deleted (unless you issue another delete instruction from within the trigger)
INSTEAD OF TRIGGERS can be classified further into three types as:-

(a) INSTEAD OF INSERT Trigger.
(b) INSTEAD OF UPDATE Trigger.
(c) INSTEAD OF DELETE Trigger

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DML After Trigger

```
USE AdventureWorks
CREATE TABLE Test ( col1 varchar(50) );
```

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DML After Trigger

1. CREATE TRIGGER TestTrigger1 ON Person.Address
2. AFTER INSERT
3. AS
4. INSERT INTO Test (col1) VALUES ('trigger fired');

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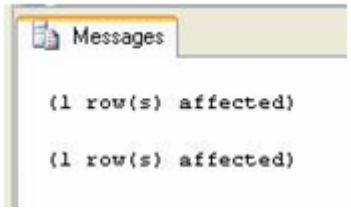
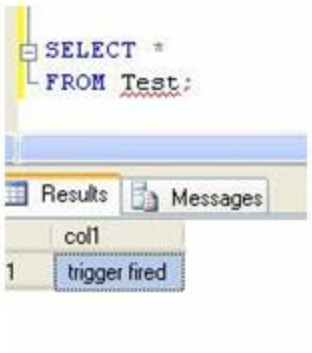
DML After Trigger

```
INSERT INTO Person.Address
(AddressLine1, City, StateProvinceID, PostalCode)
VALUES
('address1', 'city1', 79, '53150');
```





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DML After Trigger

Triggers have access to two special tables that track deleted items and inserted items.

The ‘Inserted’ and ‘Deleted’ tables are automatically managed by SQL Server.

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Trigger

```
TRUNCATE TABLE TEST;
DROP TRIGGER Person.TestTrigger1;
```

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INSTEAD OF INSERT Trigger

DEMO

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INSTEAD OF INSERT Trigger

```
INSERT INTO Person.Address (AddressLine1, City,
StateProvinceID, PostalCode) VALUES ('address3
Ave', 'city3', 79, '33333');
```

```
SELECT AddressLine1 FROM Person.Address
WHERE PostalCode = '33333';
```

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Trigger

Triggers are often used to enforce business logic and monitor events.

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Logon Triggers

1. Fire in response to the logon event that is raised when a user sessions is being established.

2. Can be used to audit and control server sessions, such as denying the number of login sessions for a specific user.

3. Always run after the authentication phase, but before the user session is actually established, which means that trigger logon will not fire if authentication fails.

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Logon Triggers

Example:

Logon trigger rejects attempts to logon for **“testuser1”**, if they are initiated outside business hours i.e. between 10:00 and 18:00 hours.

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Logon Triggers

```
USE [master]
CREATE LOGIN [testuser1] WITH
PASSWORD=N'StrongPassword'
,DEFAULT_DATABASE= [master]
,DEFAULT_LANGUAGE= [us_english]
,CHECK_EXPIRATION=OFF, CHECK_POLICY=OFF
```

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Logon Triggers

USE [master]

1. CREATE TRIGGER [connection_limit_trigger] ON ALL SERVER FOR LOGON AS BEGIN DECLARE @ErrorText [varchar](128)
2. SET @ErrorText = 'Cannot allow login to "testuser1" outside of normal business hours. ' SET @ErrorText = @ErrorText + ‘Try again between business hours 10:00 and 18:00.‘
3. IF ORIGINAL_LOGIN() = 'testuser1' AND (DATEPART(HOUR, GETDATE()) < 10 OR DATEPART (HOUR, GETDATE()) > 18) BEGIN PRINT @ErrorText ROLLBACK;
4. END;
5. ENABLE TRIGGER [connection_limit_trigger] ON ALL SERVER GO

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What is an index in sql server?

Index is a way to organize data in a table to make some operations like searching, sorting, grouping etc faster.

So, in other word we need indexing when sql query has:

1. WHERE clause (That is searching)
2. ORDER BY clause (That is sorting)
3. GROUP BY clause (This is grouping) etc.

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Indexes

SQL Server supports two main types of indexes:

1. **Clustered**
2. **Non-clustered**

Both types are implemented using a b-tree structure.

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Indexes

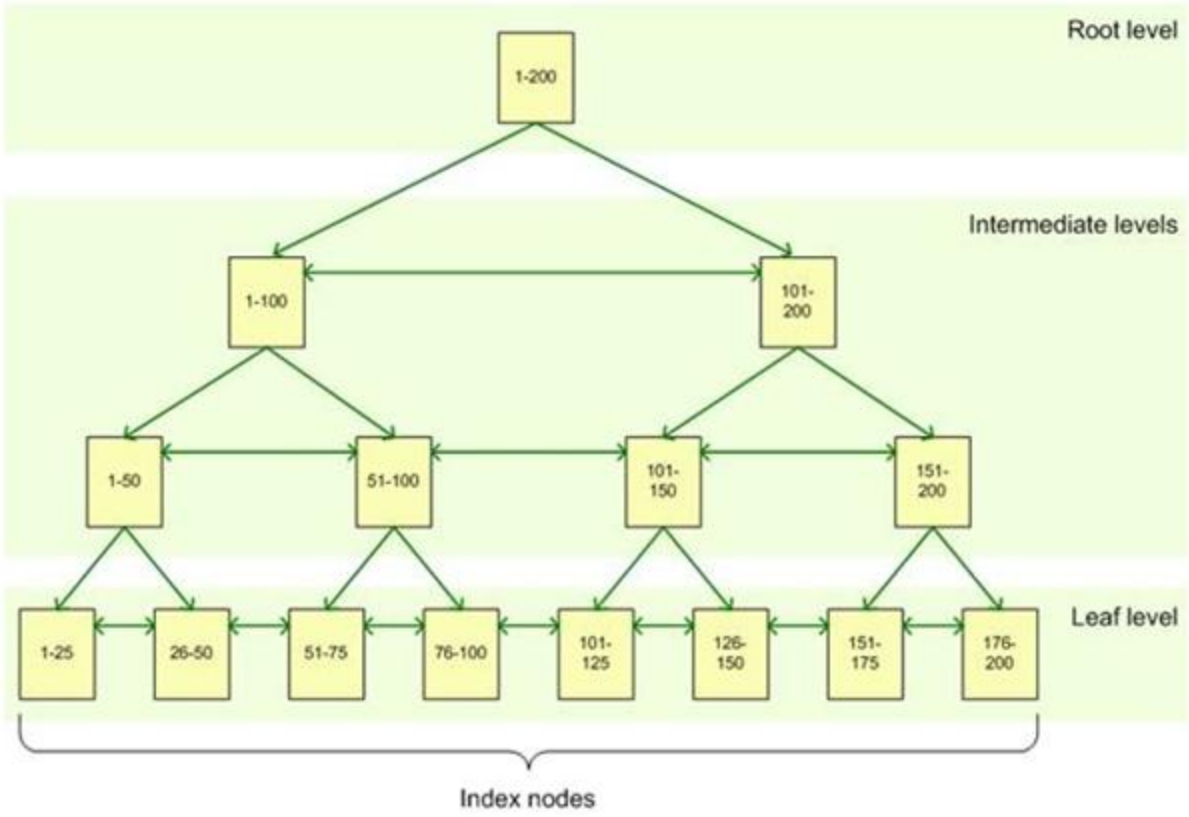
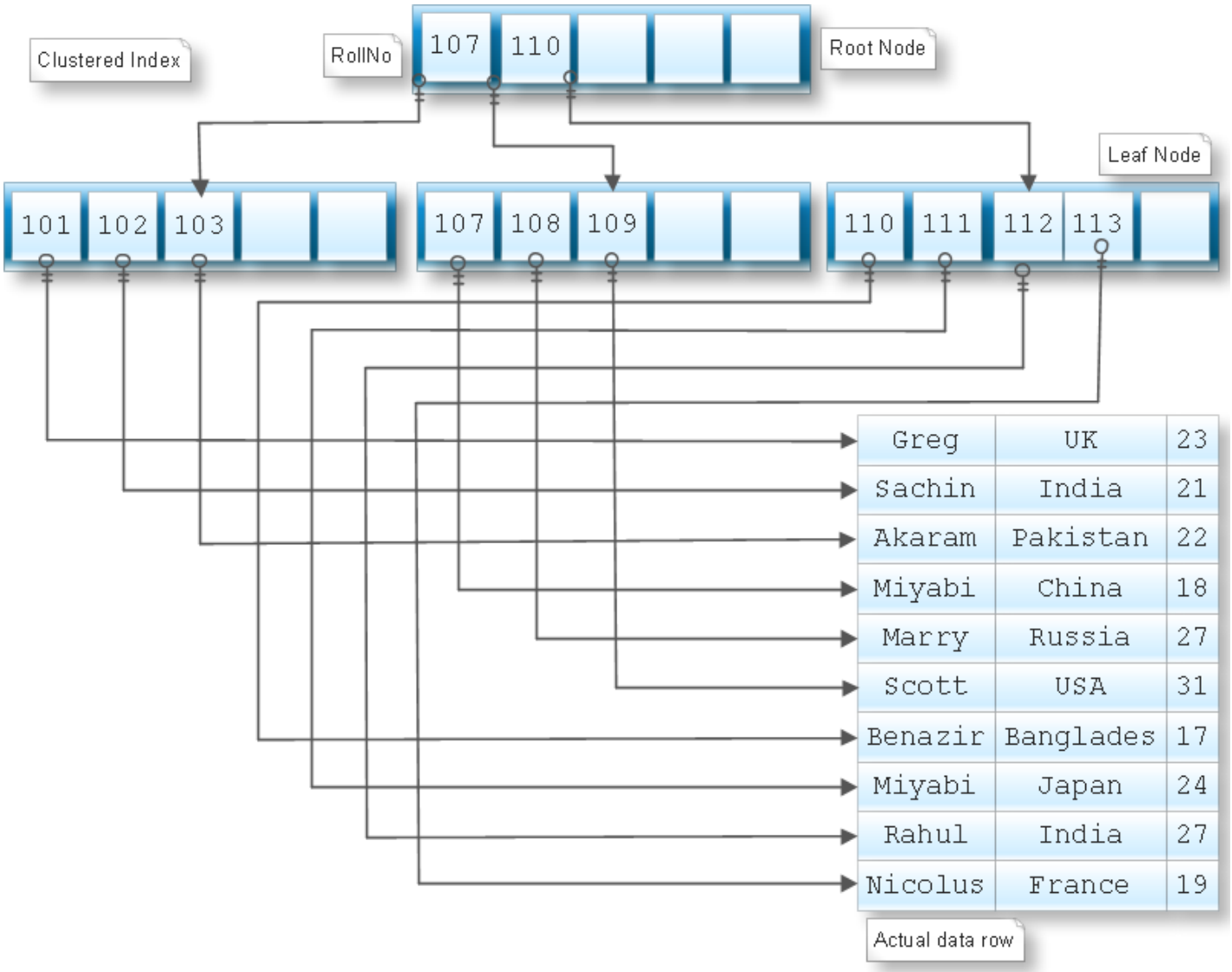


Figure 1: B-tree structure of a SQL Server index


Clustered Index
RollNo
107
110
Root Node
Leaf Node
101
102
103
107
108
109
110
111
112
113
Greg
UK
23
Sachin
India
21
Akaram
Pakistan
22
Miyabi
China
18
Marry
Russia
27
Scott
USA
31
Benazir
Banglades
17
Miyabi
Japan
24
Rahul
India
27
Nicolus
France
19
Actual data row

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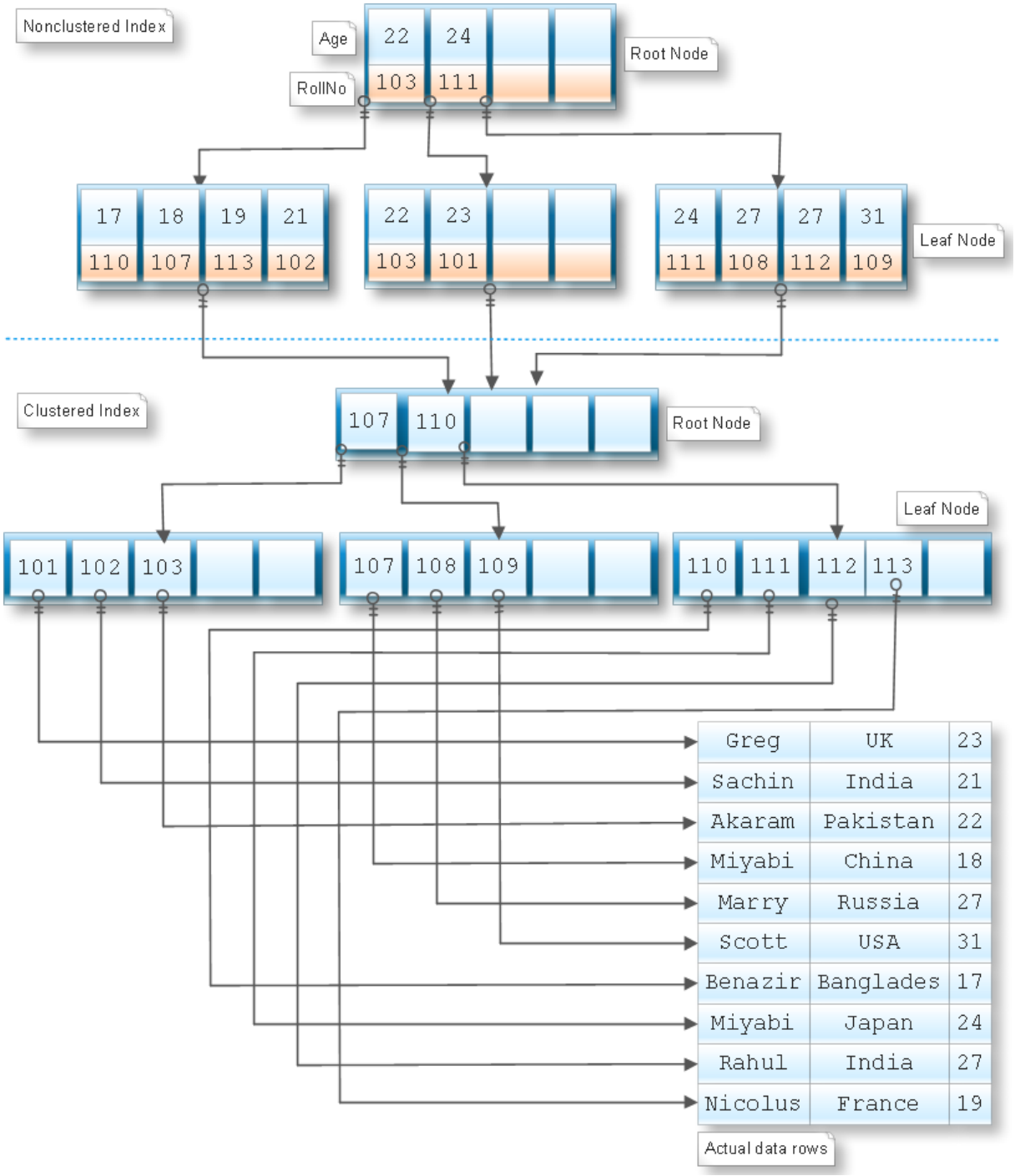

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Indexes

Database

1. For tables that are heavily updated, use as few columns as possible in the index, and don't over-index the tables.

2. If a table contains a lot of data but data modifications are low, use as many indexes as necessary to improve query performance..

3. For clustered indexes, try to keep the length of the indexed columns as short as possible. Ideally, try to implement your clustered indexes on unique columns that do not permit null values. This is why the primary key is often used for the table's clustered index, although query considerations should also be taken into account when determining which columns should participate in the clustered index.

4. The uniqueness of values in a column affects index performance. In general, the more duplicate values you have in a column, the more poorly the index performs. On the other hand, the more unique each value, the better the performance. When possible, implement unique indexes.

5. For composite indexes, take into consideration the order of the columns in the index definition. Columns that will be used in comparison expressions in the WHERE clause (such as WHERE FirstName = 'JOHN') should be listed first. Subsequent columns should be listed based on the uniqueness of their values, with the most unique listed first.

6. You can also index computed columns if they meet certain requirements. For example, the expression used to generate the values must be deterministic (which means it always returns the same result for a specified set of inputs).

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Indexes

Queries

Another consideration when setting up indexes is how the database will be queried.

You must take into account the frequency of data modifications.

Guidelines:

1. Try to insert or modify as many rows as possible in a single statement, rather than using multiple queries.
2. Create nonclustered indexes on columns used frequently in your statement's predicates and join conditions.
3. Consider indexing columns used in exact-match queries.

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TASK 15

1. Create a instead of updatetrigger for **car table** which deny updates for only BMW cars.

2. Create a trigger which is fired when some one tries to execute delete statement against **accident table**. It should rollback.

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TASK 16

1. Configure SQL SERVER authentication to mixed mode.
2. By using T-SQL create two users. user1 and user 2. Grant them access to CAR-INSULT database.
3. Create a logon trigger which should deny user 2 login from 8:00 to 14:00 hrs. Create a TEST dabase with one table named table log_histrory. Create a logon trigger for which insert the login time for all users.
4. Test with user1 and sa login and logout attempts.

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TASK 17

Read article:

http://www.mssqltips.com/sqlservertip/1206/understanding-sql-server-indexing/

1. Check the query cost for driver_id search from person table.
2. Remove the primary key i.e. driver_id from person table. Query the table on driver_id and check its speed.

Practice : pg.570

Analyzing Nonclustered Indexes

1. Create a non cluster index name column on person table . Check the query cost before and after non cluster index implementation

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References:

Trigger

- http://www.devguru.com/technologies/t-sql/7138

Logon Triggers

- http://sqlandme.com/2011/07/13/sql-server-login-auditing-using-logon-triggers/
- http://www.sqlservergeeks.com/blogs/piyush.bajaj.2007/sql-server-bi/308/sql-server-%E2%80%93-logon-trigger

Indexes:

- http://www.devguru.com/technologies/t-sql/7108

- http://www.mssqltips.com/sqlservertip/1206/understanding-sql-server-indexing/