Identifying Type of Indexes

- Index:
  - Is a data structure associated with a table
  - Enables quick access to data
  - Accelerates queries that join tables, and perform sorting and grouping
  - Can be used to enforce uniqueness of rows
  - Contains a collection of keys and pointers stored in B-Tree in the memory

Identifying Type of Indexes (Contd.)

- Indexes are of two types:
  - **Clustered index**: Sorts and stores the data rows in the table based on their key values.
  - **Nonclustered index**: Contains the index key values and row locators that point to the storage location of the data but the physical order of rows is different.

Clustered Index

- Clustered indexes sort and store the data rows in the table or view based on their key values. These are the columns included in the index definition. There can be only one clustered index per table, because the data rows themselves can be sorted in only one order.

- The only time the data rows in a table are stored in sorted order is when the table contains a clustered index. When a table has a clustered index, the table is called a clustered table. If a table has no clustered index, its data rows are stored in an unordered structure called a heap.

Nonclustered Index

- Nonclustered indexes have a structure separate from the data rows. A nonclustered index contains the nonclustered index key values and each key value entry has a pointer to the data row that contains the key value.

- The pointer from an index row in a nonclustered index to a data row is called a row locator. The structure of the row locator depends on whether the data pages are stored in a heap or a clustered table. For a heap, a row locator is a pointer to the row. For a clustered table, the row locator is the clustered index key.

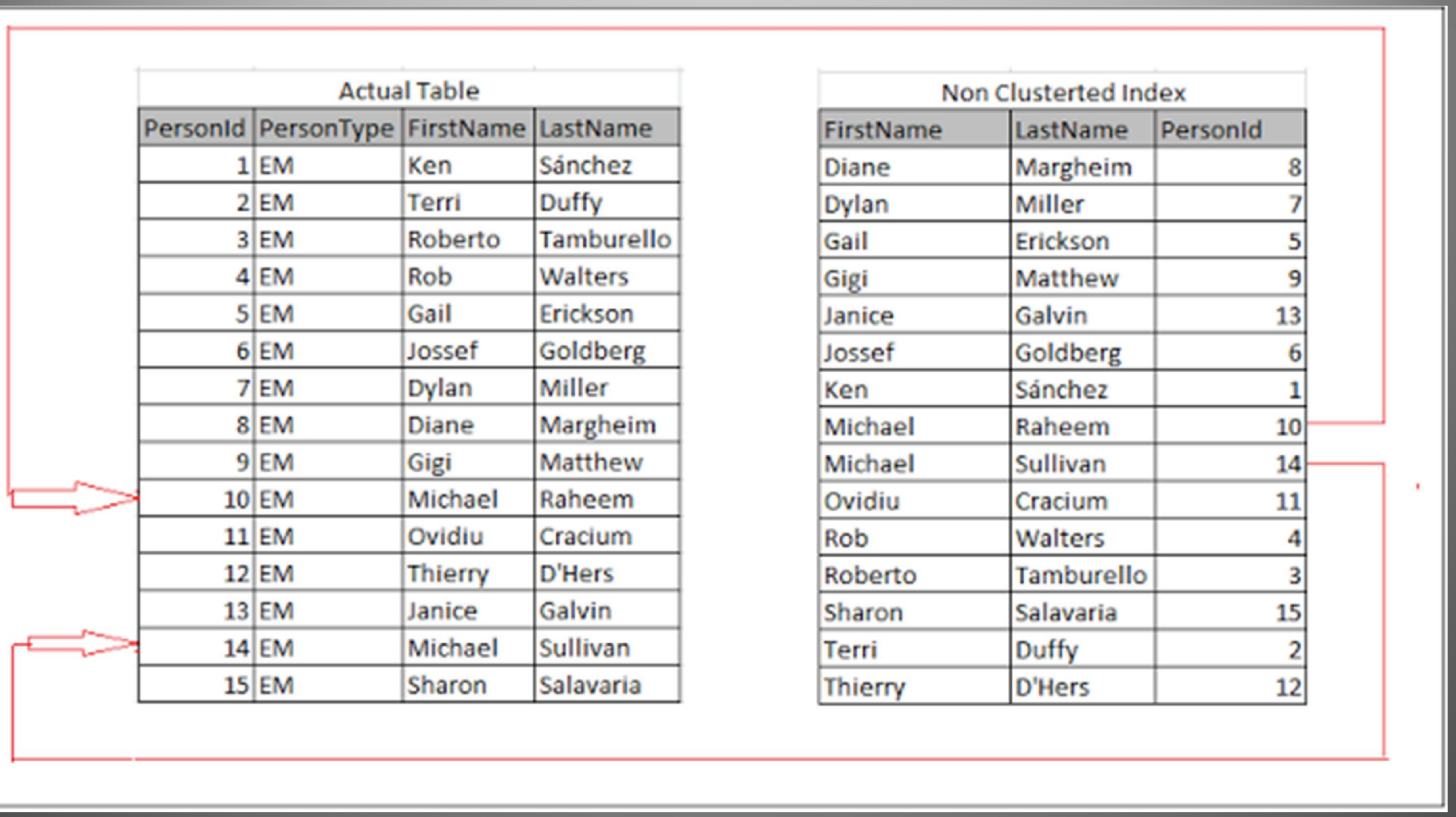
Actual Table

PersonId	PersonType	FirstName	LastName
1	EM	Ken	Sánchez
2	EM	Terri	Duffy
3	EM	Roberto	Tamburello
4	EM	Rob	Walters
5	EM	Gail	Erickson
6	EM	Jossef	Goldberg
7	EM	Dylan	Miller
8	EM	Diane	Margheim
9	EM	Gigi	Matthew
10	EM	Michael	Raheem
11	EM	Ovidiu	Cracium
12	EM	Thierry	D'Hers
13	EM	Janice	Galvin
14	EM	Michael	Sullivan
15	EM	Sharon	Salavaria

Non Clusterted Index

FirstName	LastName
Diane	Margheim
Dylan	Miller
Gail	Erickson
Gigi	Matthew
Janice	Galvin
Jossef	Goldberg
Ken	Sánchez
Michael	Raheem
Michael	Sullivan
Ovidiu	Cracium
Rob	Walters
Roberto	Tamburello
Sharon	Salavaria
Terri	Duffy
Thierry	D'Hers

- A non clustered index is a subset of a table. When we define a non clustered index, SQL server store the set of non clustered key in a different pages.
- Let us consider a table with four columns and a non clustered index on that table.
- The actual table is stored in the order of personid column (Cluster index key.
- The non clustered index key column are stored apart from the actual table.In the Non clustered index ,records are stored in the order of Firstname and lastname (Non Clustered index key) and not as in the order of actual


Actual Table
PersonId PersonType FirstName LastName
1 EM Ken Sánchez
2 EM Terri Duffy
3 EM Roberto Tamburello
4 EM Rob Walters
5 EM Gail Erickson
6 EM Jossef Goldberg
7 EM Dylan Miller
8 EM Diane Margheim
9 EM Gigi Matthew
10 EM Michael Raheem
11 EM Ovidiu Cracium
12 EM Thierry D'Hers
13 EM Janice Galvin
14 EM Michael Sullivan
15 EM Sharon Salavaria
Non Clusterted Index
FirstName LastName PersonId
Diane Margheim 8
Dylan Miller 7
Gail Erickson 5
Gigi Matthew 9
Janice Galvin 13
Jossef Goldberg 6
Ken Sánchez 1
Michael Raheem 10
Michael Sullivan 14
Ovidiu Cracium 11
Rob Walters 4
Roberto Tamburello 3
Sharon Salavaria 15
Terri Duffy 2
Thierry D'Hers 12

- Index:
  - In the non clustered index, in this example, the firstname and lastname are alphabetically ordered
  - So, it is of no use to search beyond the firstname and lastname if the match is found in the non clustered index table.
  - Remaining information can be found in original table on the basis of clustered index key(PersonId)

Creating Indexes

- Index:
  - Is created on the most frequently queried column in tables or views
  - Based on two or more columns is called a composite index
  - Can be created by using the CREATE INDEX statement

Syntax:

```
CREATE CLUSTERED INDEX  MyIndex
On
 Student(RollNo)
```

- When you create a PRIMARY KEY constraint, a unique clustered index on the column or columns is automatically created if a clustered index on the table does not already exist and you do not specify a unique nonclustered index.

- When you create a UNIQUE constraint, a unique nonclustered index is created to enforce a UNIQUE constraint by default.

Syntax: Non Clustered Index

```
CREATE NONCLUSTERED INDEX Index2 ON
Actor(ActorId)
```

- Indexes are created to enhance the performance of queries.
- There are two types of indexes, clustered and nonclustered.
- Indexes are created by using the CREATE INDEX statement
- Clustered indexes should be built on an attribute whose values are unique and do not change often. Data is physically sorted in a clustered index.
- Indexes slow down DML operations like INSERT, UPDATE, DELETE on the table, because the indexes and tables both are updated along when a DML operation is performed. So use indexes only on columns which are used to search the table frequently.

- In a nonclustered index, the physical order of rows is not the same as that of the index order.
- A nonclustered index is the default index that is created with the CREATE INDEX command.