Ensuring Data Integrity with Constraints

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Overview

To NULL or not to NULL

Default constraints

Primary Keys revisited

Foreign Keys and cascading updates

Unique constraints

Check constraints

To NULL or Not to NULL

Special marker

NULL – absent, unavailable, inapplicable

Three-value logic: true, false and unknown

Criticisms

The constraint:

- NOT NULL
- NULL

Default constraint

A DEFAULT constraint is used to provide a default value for a column. The default value will be added to all new records if no other value is specified.

Demo

Default Constraints

Primary Keys

Ensure uniqueness

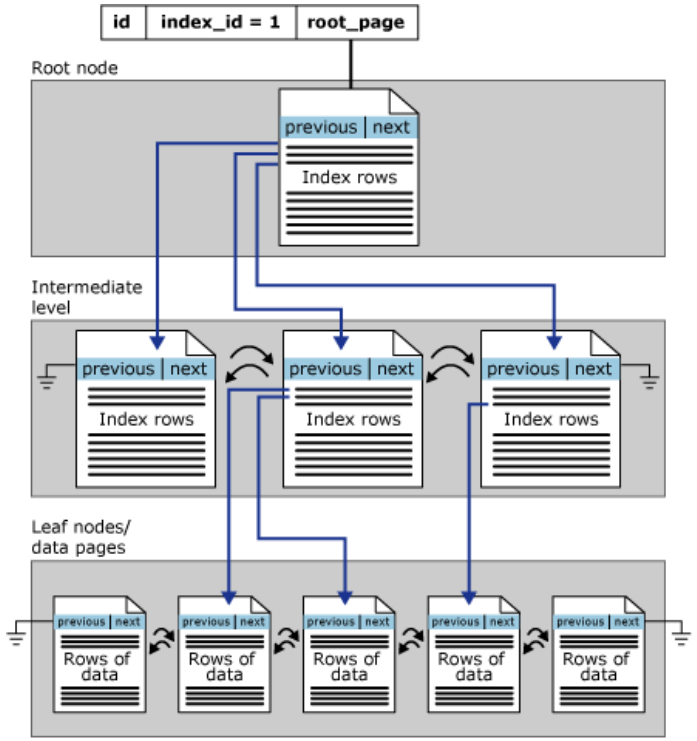
Backing index

Clustered or Nonclustered?

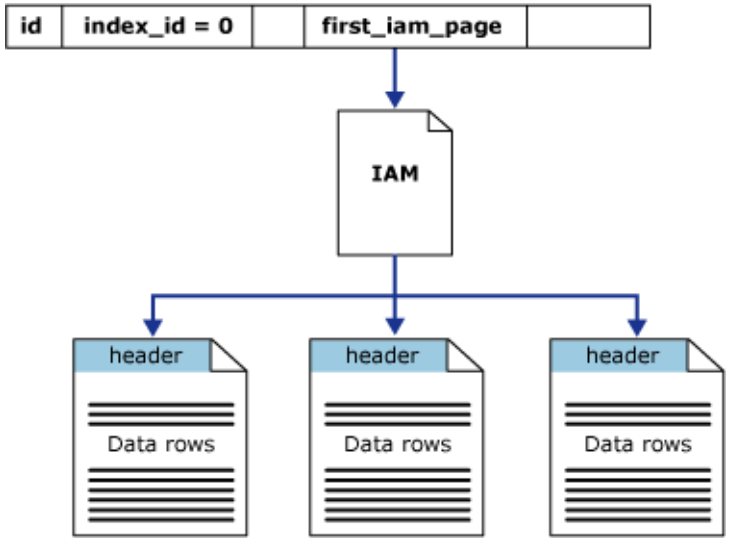
"Clustered indexes sort and store the data rows in the table ... based on their key values. These are the columns included in the index definition."

Microsoft: Clustered and Nonclustered Indexes

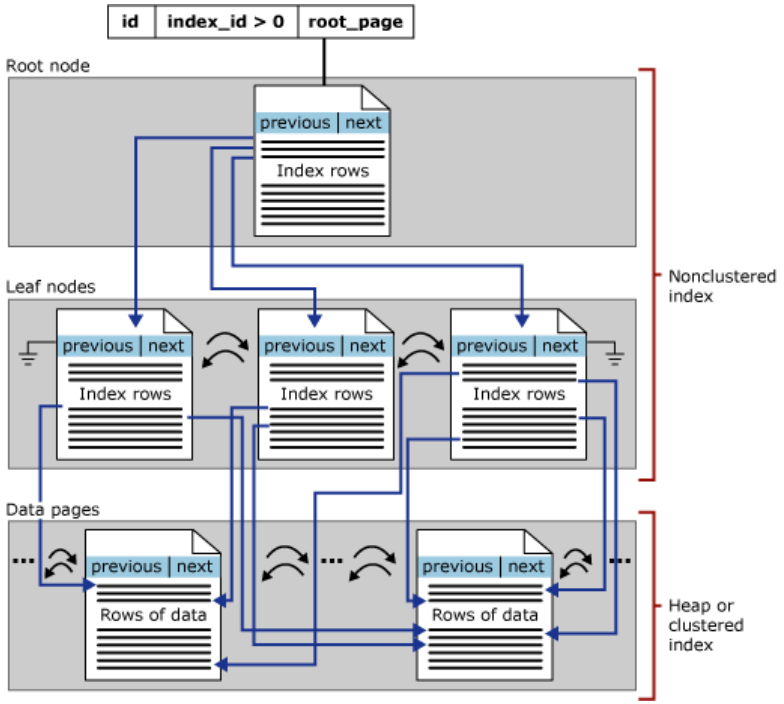
Clustered, Heaps, and Nonclustered



Clustered

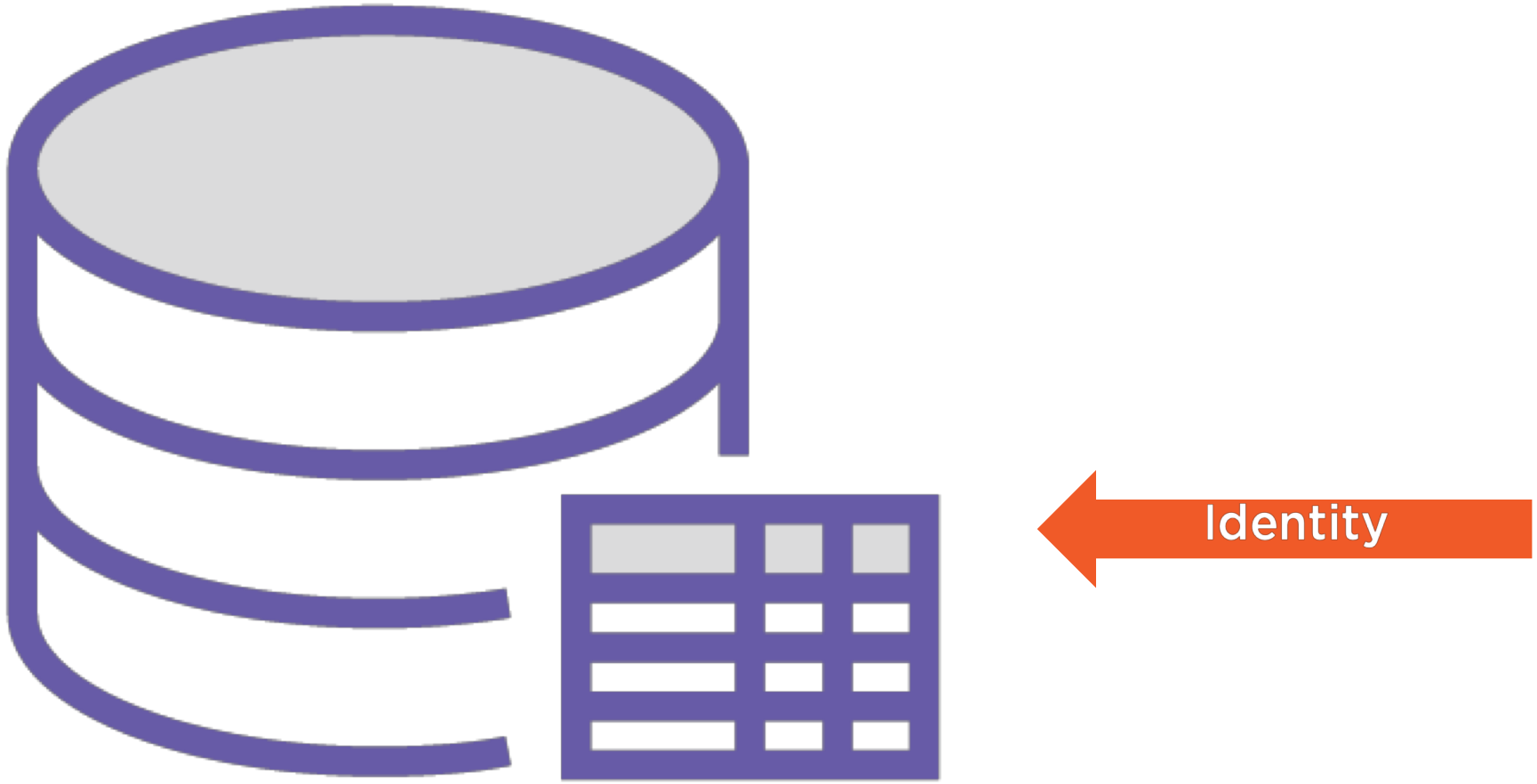


Heap



Nonclustered

Primary Key on an Identity Column



"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."

Microsoft: Clustered and Nonclustered Indexes

Unique Constraints

- Ensures no duplicate values
- Columns not in primary key
- Allow NULL
- Can be referenced by a foreign key
- Clustered or nonclustered?

Demo

Primary and unique constraints

Clustered and nonclustered indexes

Foreign Keys

Build and enforce a link between two tables

Referencing table has a foreign key to a base table

Preserve referential integrity

Cascading referential integrity

Demo

Foreign keys

ON DELETE|UPDATE CASCADE

ON DELETE|UPDATE NO ACTION

ON DELETE|UPDATE SET NULL

ON DELETE|UPDATE SET DEFAULT

No backing index created

CHECK Constraints

Motivation

(Declarative)

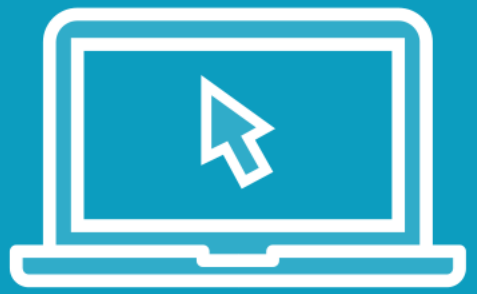
Column and Table levels

Name and Condition

Boolean expression

(No queries)

Demo



Check constraints

Can the number of items ordered be less than one?

Can a delivery date precede the order date?

Can you write a check constraint to verify shoe sizes for the stock table?

How about a constraint to verify country names against current world ISO standards?

Can a price or discount be negative?

```
CREATE TABLE (
        col1 … CONSTRAINT …,
        CONSTRAINT …)
ALTER TABLE ADD [WITH NOCHECK]
        CONSTRAINT …
ALTER TABLE DROP CONSTRAINT …
ALTER TABLE NOCHECK CONSTRAINT
…
ALTER TABLE [WITH CHECK]
        CHECK CONSTRAINT …
ALTER TABLE … CONSTRAINT ALL
```

- Add a constraint at table create time
- Column constraint
- Table constraint
- Add a new constraint
- Remove a constraint
- Temporarily disable a constraint
- Reenable a constraint or check it
- Apply action to all constraints

Summary

Constraints

[NOT] NULL

DEFAULT

PRIMARY KEY

UNIQUE

FOREIGN KEY

CHECK